CMTDE 2015 ABSTRACTS

5th Maghreb Conference on Desalination and Water Treatment

21 - 24 December 2015
Sol Azur Hotel 4*, Hammamet, Tunisia

Organized by

الجمعية التّونسيّة لتحلية المياه
TDA
Tunisian Desalination Association

URRTE
Unité de Recherche
Dessalement et Traitement des Eaux

With the collaboration of

European Deasalination Society

PREFACE
to the CMTDE 2015
Conference Proceedings

This Conference Proceedings volume contains the written versions of most of the contributions presented during the fifth Maghreb Conference on Desalination and Water Treatment CMTDE 2015. Like in previous 2013, it took place at Hammamet, Tunisia, from December 21–24, 2015.

It should be noted that due to time constraints, the abstracts were reproduced as they are presented by the authors.

The Conference provided a setting for discussing recent developments in a wide variety of topics including membrane and thermal desalination processes, pretreatment, post-treatment of desalinated waters, wastewater treatment and reuse, economic aspects of desalination, renewable energy.

The Conference has been a good opportunity for participants coming essentially from Tunisia, Algeria, Libya, Morocco and other countries to present and discuss topics in their respective research areas.

We would like to thank all participants for their contributions to the conference program and for their contributions to these proceedings.

We also express our sincere thanks to Professor Miriam BALABAN, Secretary General of the European Desalination Society and Editor in Chief of Desalination and Water Treatment Journal.

A warm thank you to my dynamic organizing committee and specially Lilia BOULIFI for her help in preparing this proceedings volume. We would also like to thank all those who made this conference possible.

It is our pleasant duty to acknowledge the financial support from the Ministry of Higher Education and Scientific Research and the University of Tunis El Manar.

We are looking forward to the Sixth edition of Maghreb Conference on Desalination and Water Treatment that will be held on December 19–22, 2017 at the same location. We hope that it will be an interesting and enjoying at least as all of its five predecessors.

<div align="right">

Chairman
Béchir HAMROUNI
Professor, University of Tunis El Manar
President of the Tunisian Desalination Association

</div>

SCIENTIFIC COMMITTEE

BALABAN Miriam - Roma, Italy
BELGAIED Jamel Eddine - Tunis, Tunisia
BELLAKHAL Nizar - Tunis, Tunisia
BEN AMAR Raja - Sfax, Tunisia
BEN AMOR Mohamed - Nabeul, Tunisia
BEN JABRALLAH Sadok - Bizerte, Tunisia
BENDJAMA Zoubida - Alger, Algeria
BOUFATIT Makhlouf - Alger, Alegria
BOUGUECHA Salah - Jeddah, Saudi Arabia
BOUHELASSA Mohamed - Canstantine, Algeria
BOUHIDEL Kameleddine - Batna, Alegria
BOUSSELMI Latifa - Tunis, Tunisia
DHAHBI Mahmoud - Tunis, Tunisia
ELHASSADI Abdulmonem - Benghazi, Libya
ELMIDAOUI Azzedine - Kenitra, Morocco
FAUVARQUE Jean François - Paris, France
FRIOUI Salah – Guelma, Algeria
GABSI Slimane - Sfax, Tunisia
HAFIANE Amor - Nabeul, Tunisia
HAMROUNI Béchir - Tunis, Tunisia
KAIROUANI Lakdar - Tunis, Tunisia
MONSER Lotfi - Tunis, Tunisia
MZOUGHI Nadia - Tunis, Tunisia
NIBOU Djamel - Alger, Algeria
PONTIE Maxime - Rennes, France
SAIFAOUI Dennoun - Casablanca Morocco
SRASRA Ezeddine - Tunis, Tunisia
YOUNES Mohamed Kadri - Tunis, Tunisia

STEERING COMMITTEE

HAMROUNI Béchir
BOULIFI LiLia
HANNACHI Chiraz
GUESMI Fatma
BOUGUERRA Wided

CMTDE 2015_1	GHELLAB A., KAABI A., Louni I., Guendouzi S.E. Evaluation of the performances of four hybrid photovoltaic / thermal collectors (HPV/T).
CMTDE 2015_2	HIDOURI khaoula, GABSI Slimane Modelling of temperature for simple solar still hybrid with heat pump (SSDHP).
CMTDE 2015_3	NAKIB Maamar, BERREKSI Ali, KETTAB Ahmed, HOULI Samia Research fertilizing potential of treated water at the Mitidja plain (ALGERIA).
CMTDE 2015_4	NAKIB Maamar, BERREKSI Ali, KETTAB Ahmed, HOULI KHALED Samia Study of the possibilities of agricultural use of sewage sludge in the Mitidja plain (ALGERIA).
CMTDE 2015_5	JALLOULI Nabila, ELGHNIJI Kais, HENTATI Olfa, RIBEIRO Ana R., ADRIÁN M.T. Silvad and KSIBI Mohamed. UV and solar photo-degradation of naproxen : reaction kinetics, products identification and toxicity assessment.
CMTDE 2015_6	HAMMAMI Haifa, HIDRI Rabaa, SAIDI Neila, ABDELLY Chedly, ROMDHANE Mohamed Salah, METOUI-BEN MAHMOUD Ouissal Phytoplankton characterization of treated domestic wastewater by aerated lagoon
CMTDE 2015_7	BENSABRA Hakim, AZZOUZ Noureddine Inhibitive effect of phosphate ions on the pitting corrosion behaviour of steel reinforcements. Part (I) : Study in simulated concrete pore solution
CMTDE 2015_8	ACHOURI Ouafa, BENCHEIKH-LEHOCINE Mossaab, UBAY ÇOKGÖR Emine Anaerobic digestion of tannery wastewater. The effect of inoculums to substrate (I/S) ration on anaerobic degradation
CMTDE 2015_9	BOUTERAA Meriem, BENCHEIKH LEHOCINE Maher The effect of oxygen and temperature on biological denitrification
CMTDE 2015_10	GHORAB M.F. and DJELLABI R. Wastewater treatment using TiO_2/Fe(III)/Sunlight
CMTDE 2015_11	ACHOUR Souad, AMOKRANE S., CHAGROUCHE S., HADJ MEKATEL and NIBOU Dj. Adsorption of chromium (VI) from an aqueous solution onto Algerian modified clay, zeolite a and activated carbon
CMTDE 2015_12	MAKHOUKHI Benamar Preparation of new organoclays and applications for the adsorption of textile dyes from aqueous solutions
CMTDE 2015_13	MAKHOUKHI Benamar Diphosphonium ion-exchanged bentonite for bemacide dye removal from aqueous media
CMTDE 2015_14	AL-HENGARI Salah, EL-BOUSIFFI Mohamed Ali, ElMOUDIR Walid Desalination plant of mersa elbrega chemical complex: heat integration lowering the water cost for over 35 years operation
CMTDE 2015_15	ZAMOUCHE-ZERDAZI R. , M. BENCHEIKH LEHOCINE, MENIAI A-H. Respirometric evaluation of the salt shocks effects on the activated sludge activity
CMTDE 2015_16	ZARZOUM K., ZHANI Khalifa and BEN BACHA H. Experimental optimization of a solar still using solar energy
CMTDE 2015_17	HABES Z., AMIRI R. S. MOKHNACHE Ali, CHAKRI N and MESSADI D. Heavy metals in sanitation systems

----
The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet, Tunisia 21-24 December, 2015

1

CMTDE 2015_18	CHERIFI H. , BENTAHAR F. , HANINI S. Kinetic and equilibrium of penicillin adsorption onto dried biomass
CMTDE 2015_19	TRAD Abderachid Effect of internal and external parameters on the performance of solar still
CMTDE 2015_20	ABBAS M., HAMADENE A., ABURIDEH H. and TIGRINE Z. Study of the coupling of multi effects desalination unit to solar parabolic trough concentrator (MED-Pt) in the southern region of ALGERIA
CMTDE 2015_21	BENGUELLA Belkacem Adsorption des metaux lourds par la marne argileuse en solution aqueuse
CMTDE 2015_22	OUNISSI T., SELMANE BEL HADJ HMIDA E., FAUVARQUE J.F. Polymeric anion exchange membrane modified (PAEMm) and electrodialysis
CMTDE 2015_23	SELMANE BEL HADJ HMIDA E., OUNISSI T., REKIK M., FAUVARQUE J.F. Anionic membrane modified and behavior with synthetics and real water in electrodialysis
CMTDE 2015_24	RUITI Manel, BEN THAYER Béchir Study on the removal of turbidity and color related to the presence of iron in the natural water by adsorption on column by charcoal of aleppo pine wood
CMTDE 2015_25	SAMAI Messaouda, CHIKHI Mustapha The elimination of penicillin V by a membrane process of tangential microfiltration
CMTDE 2015_26	ATTOUR A., BRAIK S., BEN AMOR M., LAPICQUE F., LECLERC J.-P. Removal of turbidity from ghdir el golla natural water : A comparative study between electrocoagulation and chemical coagulation processes
CMTDE 2015_27	SMAKDJI Nafila, Pr : KAABI Abdennacer et Pr : BERNARD Lips Etude des ailettes de refroidissement au niveau du distillateur solaire à effet de serre
CMTDE 2015_28	ELAISSAOUI Ines, AKROUT Hanene, BOUSSELMI Latifa Effect of coating methods and cyclic voltammetry on electrochemical degradation of amaranth dye using stainless steel/PbO_2 anode
CMTDE 2015_29	BOUKHELKHAL Asma., BENKORTBI Othmane., HANINI Salah Removal of amoxicillin and ampicillin antibiotics from aqueous solution using an anionic surfactant
CMTDE 2015_30	TRIKI Z., BOUAZIZ M. N., BOUMAZA M. On the use of solar vacuum membrane distillation as an integrated desalination process for the treatment of reverse osmosis brines : A case study from the south of ALGERIA
CMTDE 2015_31	GHIZELLAOUI Souheila, GHIZELLAOUI Samira, Study of the effectiveness ibn ziad station to purify urban and industrial water for the constantine city using activated sludge
CMTDE 2015_32	GHAZOUANI Mouna, AKROUT Hanene, BOUSSELMI Latifa Study of the efficiency of si/bdd electrode in nitrate and organic matter removals of different real effluents
CMTDE 2015_33	GHIZELLAOUI Samira, MENZRI Rayane Inhibition of scaling in hard water
CMTDE 2015_34	AZZAZ A. A., ASSADI A. A., BOUZAZA A., JELLALI S., BOUSSELMI L., WOLBERT D. Studies of methylene blue removal efficiencies from aqueous solutions through photocatalytic process in presence of heavy metal

----

The 5th *Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"*
Hammamet, Tunisia 21-24 December, 2015

2

CMTDE 2015_35	ELWAER Abdulhamid M., ELHAMILE Giuma M., HAKAM Ahmed A. Corrosion and Scaling Problems in Libyan Sea Water Desalination Plants
CMTDE 2015_36	HMIDI Khaoula, KSENTINI Issam, BEN MANSOUR Lassaad * Impact of Starch glue presence in liquid phase on bubble hydrodynamic in electroflotation process
CMTDE 2015_37	SENOUSSI H., BOUHIDEL K. E. Application of Capacitive Deionization (CDI) to NH_4^+ , Pb^{++} and Cr^{6+} Pollutants Removal
CMTDE 2015_38	HMISSI Maha, HARMAND Jerome, SHAYEB Hedi A dynamic modelling approache of a Chemostat
CMTDE 2015_39	AMOUR A., MERZOUK B., TIAIBA M., LECLERC J.-P., LAPICQUE F. Removal of acid red 336 from aqueous solution by continuous electro-coagulation : influence of the type of current and electrodes connections
CMTDE 2015_40	MARZOUGUI Nidhal, REJEB Salwa et HAMMAMI Arwa Effects of urban and industrial waste water on germination and seedling growth of Lawsoni Inermis L.
CMTDE 2015_41	Ltifi Abdelkader, Saidi N., Rabhi M., Hafiane A., Smaoui A., Ch. Abdelly Optimization of the coagulation-flocculation process for pulp and paper mill effluent treatment from a Tunisian plant
CMTDE 2015_42	Derbel Imen And Ben Amar Raja Elaboration and caracterisation of Carbon Ultrafiltration Membrane: Application to membrane distillation
CMTDE 2015_43	Guechi El Khamssa, Hamdaoui Oualid, Beggas Djihed Equilibrium, kinetics and mechanism for the removal of rhodamine B by sorption on okoume SAWDUST from aqueous MEDIA
CMTDE 2015_44	Hamdi Raghda, Ben Amor Mohamed, Tlili Mohamed Mouldi Study of the Early Stages of Calcium Carbonate Formation
CMTDE 2015_45	Slimane F. Z., Ben Miled G., Allouche S., Ellouze F., Ben Amar N. Fouling in Seawater Ultrafiltration Process: Mechanisms and Screening Studies
CMTDE 2015_46	Bouchrit Raja, Boubakri Ali, Bouguecha Salah Al-Tahar Membrane Crystallization: Applied to crystallize Sodium Sulfate from super-saline solution
CMTDE 2015_47	GMAR Soumaya, BEN SALAH Ilhem, TLILI Mohamed, BEN AMOR Mohamed Denitrification of underground water by electrodialysis: Effect of chloride and sulphate ions
CMTDE 2015_48	AID A., AMOKRANE S., MEKATEL H., BENSAFI S., and NIBOU D. Modeling and Optimisation conditions of Cobalt (II) adsorption on algal biomass
CMTDE 2015_49	LADJALI Samir, AKSAS K., AMOKRANE S., AID Asma, MEKATEL El H. and NIBOU Dj. Removal of Nickel ions on Stipa tenacissima L biomaterial and modelling parameters for the adsorption process studies

----

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"

Hammamet, Tunisia 21-24 December, 2015

3

CMTDE 2015_50	ACHOUR Souad, AMOKRANE S., CHAGROUCHE S., MEKATEL H. and NIBOU Dj.
	Kinetics and thermodynamics studies of toxic elements (Ni, Zn and Cu) ions adsorption onto faujasite Y from aqueous solutions: Environmental study
CMTDE 2015_51	BENSAFI S., Aid A., MEKATEL H., AMOKRANE S. and NIBOU D.
	Kinetics and thermodynamics studies of Nickel and Cobalt ions adsorption onto zeolite A from aqueous solutions in binary system.
CMTDE 2015_52	LAIB R., AMOKRANE S., MEKATEL H. and, NIBOU D.
	Removal of Nickel ions from wastewater on paper as adsorbent and modelling parameters for the study
CMTDE 2015_53	AZOUZI Rim, AYED Lamia, CHAREF Abdelkrim
	Impact of treated wastewater use on soil salinity in semi-arid region
CMTDE 2015_54	BENSAFI S., AID A., MEKATEL H., AMOKRANE S. and NIBOU D.
	Kinetics and thermodynamics studies of Nickel ions adsorption onto zeolite A from aqueous solutions
CMTDE 2015_55	LADJALI Samir, AMOKRANE Samira, AID Asma and NIBOU Djamel
	Removal of Cr(VI) by biomass Stipa tenacissima L from aqueous solutions. Kinetic, equilibrium and thermodynamic studies.
CMTDE 2015_56	AID A., AMOKRANE S., MEKATEL H., BENSAFI S., and NIBOU D.
	The removal of Cr(VI), Co(II) and Ni(II) ions from aqueous solutions on algae biomass: Kinetics and thermodynamics studies
CMTDE 2015_57	LOUATI Islem, GUESMI F., HARBI S., HANNACHI Ch., HAMROUNI B.
	Adsorption of nitrates, sulfates on AMX ion exchange membrane : Effect of surface modification and ionic strength
CMTDE 2015_58	El Khamssa GUECHI*, Djihed BEGGAS, Oualid HAMDAOUI
	Removal of cadmium (II) from liquid phase using Fruit luffa as biosorbent
CMTDE 2015_59	DJEKOUNE L, Z. SALEM, R. CHEMINI, L. BOUMEHDI, K. ALLIA
	Cr (VI) removal from aqueous solution by alfa grass : Kinetic, equilibrium and thermodynamic study
CMTDE 2015_60	KHIREDDINE H. E*, TAKORABET L.
	Using of a bioadsorbant extracted from a mine for the retention of phenol in environmental water samples
CMTDE 2015_61	BENMAHDI Fatiha, SEMRA Safia, BOUHELASSA Mohammed
	Investigation of chromium (VI) adsorption in agricultural soils using batch experiment
CMTDE 2015_62	BOUREMMAD Farida, BOUCHAIR Abdennour, KENDOULI Leila
	Study of the adsorption performance of the alga Corallina elongata as a biosorbent for acetic acid
CMTDE 2015_63	SARRAY Yemna, HIDOURI Nejib, MCHIRGUI Ali, BEN BRAHIM Ammar
	Numerical simulation of a simple solar still
CMTDE 2015_64	BAKIRI Zahir, NACEF Saci
	Analysis and optimization of the secondary settler of a wastewater treatment via activated sludge

----

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*

Hammamet, Tunisia 21-24 December, 2015

4

CMTDE 2015_65	NEDJHIOUI Mohamed, MOULAI-MOSTEFA Nadji Effect of surfactant nature on the Physico chemical and rheological properties of micellar systems : method of design of experiments study
CMTDE 2015_66	ETURKI Saifeddine, JANNÈNE Nouha, JEDIDI Naceur et BEN DHIA Hamed Rural wastewater treatment by infiltration percolation process on a reconstituted silica sand filter and swelling clay
CMTDE 2015_67	TAMERSIT Sabrina, BOUHIDEL Kamel-eddine A clean technology for tanneries unhairing waste waters : neutralization by CO_2 , water recycling and free amino acids recovery
CMTDE 2015_68	BEN BELGACEM Imen Etude du traitement d'un rejet hydrique industriel hautement chargé en Fluor
CMTDE 2015_69	BALASKA Fouzia, CHIKHI Mustapha Removal of the dye (red terasil) by tangential microfiltration
CMTDE 2015_70	SDIRI Ali, BOUAZIZ Samir, JAMOUSSI Fakher, HIGASHI Teruo Silicates enhanced heavy metals removal from aqueous solutions by Tunisian natural limestone
CMTDE 2015_71	ATMANI F., YEDDOU-MEZENNER N. Treatment of bilge water by adsorption process on Pretreated EGGSHELL
CMTDE 2015_72	BEN ALAYA Saida, SHAYEB Hedi Study of biodegradability evolution rate and optimisation of kinetic and stoichiometric parameters from agro-food wastewater
CMTDE 2015_73	NEDJHIOUI Mohamed, MOULAI-MOSTEFA N., BELHADJ Y., TIR M., SKENDER A., Effect of biopolymer addition on some physic-chemical properties of anionics surfactants / oil/ water systems
CMTDE 2015_74	HAMMAMI Mahria, JELLOULI ENNIGROU D., HORCHANI NEIFER K., MOKHTAR F. Removal of samarium (III) from aqueous solutions by Poly(Sodium 4-Styrenesulfonate) and Poly(Acrylic Acid) assisted-ultrafiltration
CMTDE 2015_75	BOUCENNA A., BOUAFIA-CHERGUI S., CHABANI M., AMRANE A. , BENSMAILI A. Kinetics study of the photodegradation of nystatin
CMTDE 2015_76	REFFAS Abdelbaki BOUGUETTOUCHA Abdallah CHEBLI Derradji AMRANE Abdeltif Potential of H_2SO_4 pretreated cupressus semperviren forest waste biomass for the removal of Methylene blue from aqueous solutions
CMTDE 2015_77	RHOUATI Salah Softening of the hard waters Fourchi by Chronoamperometry
CMTDE 2015_78	MEKATEL EL Hadj, AMOKRANE S., AID A., KERBACHENE N., TRARI M. and NIBOU Dj. Removal of nickel ions onto NaY Zeolite: Characteristics, kinetic and thermodynamic study
CMTDE 2015_79	REFFAS Abdelbaki, CHEBLI D., BOUGUETTOUCH A., GUEDIRI K., AMRANE A. Valorization of an forest waste, modified P-Brutia cones, by biosorption of Methyl Geen
CMTDE 2015_80	SAKHRAOUI Mahfoud, ZAAMOUCHE-ZERDAZI R., BENCHEIKH LEHOCINE M. Study of amoxicilline inhibitory effect on biomass activity using continuous aeration respirometry

----

*The 5th Maghreb Conference on Desalination and WaterTreatment "**CMTDE 2015**"*

Hammamet,Tunisia 21-24 December, 2015

5

CMTDE 2015_81	LALMI Afaf, BOUHIDEL Kamel - Eddine Waste waters from a lead acid batteries manufacturing plant : Pb^{++} elimination and recovery by a $CaCO_3$ precipitating process
CMTDE 2015_82	HARBI Soumaya, TABASSI D., GUESMI F., HANNACHI Ch., HAMROUNI B. Application of central composite design and artificial neurol network for simultaneous adsorption of Cr(VI) and phenol from aqueous solution using ion exchange resin DOWEX 1X8
CMTDE 2015_83	MEZITI Chafika, BOUKERROUI Abdelhamid, CAGNON Benoît Water treatment with Clay-Carbon Adsorbent
CMTDE 2015_84	HAMDOUNI Afef, HERNANDEZ German Montes-, TLILI Mohamed. Optimized experimental conditions and new kinetic parameters for iron removal from water using calcite as removal agent.
CMTDE 2015_85	TOUMI K.H., CHEBLI D., MEKHALIF T., NACEF S. Étude de la dégradation du p-Nitrophénol par les procédés d'oxydation avancée en milieu homogène
CMTDE 2015_86	ATTOUR A., BEN KHEMIS Y., BEN AMOR M., LAPICQUEC F., LECLERC J.-P. Iron removal from water by electrocoagulation
CMTDE 2015_87	RABAHI Amela, BENCHIKH ELHOCINE Mossaaba A comparative study between chemical coagulation and electrocoagulation by treatment of landfill leachate effluent
CMTDE 2015_88	KOLLI Mounira, BENMAHDI Fatiha, SEMRA Safia, BOUHELASSA Mohamed Etude de processus de desorption de produit 2-4D dans le sol
CMTDE 2015_89	KHETTAF Sami and BOUHIDEL Kamel-Eddine Production of drinking water by microfiltration
CMTDE 2015_90	TOUABI Noura, BOUNOUGHAZ Moussa, MARTINEZ Sanja Optimization of electrochemical zinc recovery process : Effect of the presence copper and surfactant in chloride medium of pH=3
CMTDE 2015_91	SENOUSSI H. & BOUHIDEL K. E. Depollution of industrial waters loaded in hexavalent chromium by electrosorption / CDI : Optimization of treatment process (pH, Flow, Voltage, Contact Time)
CMTDE 2015_92	AMRANE Chahrazad and LALMI Afaf and BOUHIDEL Kamel-Eddine Nitric Acid – Metals Waste Waters From A Brass Pickling Used Bath: Separation, Purification and Recycling by an Hybrid Process Diffusion Dialysis – Selective Physico - Chemical Methods.
CMTDE 2015_93	AMRANE Chahrazad and BOUHIDEL Kamel-Eddine Electroplating sludge lixiviation: recovery of acids, bases and metals by diffusion dialysis
CMTDE 2015_94	AMRANE Chahrazad and BOUHIDEL Kamel-Eddine Analyse et speciation des metaux lourds dans le barrage de timgad (BATNA)
CMTDE 2015_95	CHEMINI R., SADOUNI K., MENOUN A. Condensate recovery improvement by installation a heat exchanger
CMTDE 2015_96	SEMSSOUM A., YENNOUNE A., BENDJAMA Z., REBAI F., BRAHMI L., BOUAKAZ N., NOURI L. Concentration effect on the bio deterioration of the Nonstop Para-Cresol

----
The 5th Maghreb Conference on Desalination and WaterTreatment "CMTDE 2015"

Hammamet,Tunisia 21-24 December, 2015

6

CMTDE 2015_97	SOUADEK Rachida, RIDA Kamel Removal of acetic acid from aqueous solutions by raw phosphate : Kinetic and equilibrium studies
CMTDE 2015_98	ZABAT Nacéra, ABBESSI Mostefa. Study of the formation of a heteropolyanionic complex (P_2W15MO_2 PBO61)8- and regeneration by emulsified liquid membrane
CMTDE 2015_99	AGUENIOU Fazia, BOUGUETTOUCHA Abdelah, CHEBLI Derradji Degradation of tiemonium methyl sulphate by adsorption on lichens
CMTDE 2015_100	LABIADH L., FERNANDES A., CIRÍACO L., PACHECO M.J., GADRIB A., AMMAR S. and LOPES A. Treatment of concentrate sanitary landfill leachate by Anodic oxidation and electro-Fenton combined processes) ; (Calibri, Bold, size 13)
CMTDE 2015_101	AOUN Saad, BENZEDIRA Tewfik, BOUHIDEL Kamel-Eddine Water Recycling and Free Amino Acids Recovery from Wheat Washing Waters by an Hybrid Process : Bentonite / Microfiltration / Electrodeionization
CMTDE 2015_102	EL KHIR W., BOUAFIA-CHERGUI S., CHABANI M., AMRANE A, BENSMAILI A. Parametric study on the effect of the ratios $[H_2O_2]/[Fe^{3+}]$ and $[H_2O_2]/[Substrat]$ on the fenton degradation of oxytetracycline
CMTDE 2015_103	BENREDOUANE S., BERRAMA T., DOUFENE Nassim, DADOU Salima Kinetic and thermodynamic study of the Amoxicillin elimination on activated carbon of vegetable origin
CMTDE 2015_104	DOUFENE Nassim, BERRAMA T., BENREDOUANE S., NEKAA Chakib Dimethyl phthalate DMP removal from aqueous solution by activated carbon prepared from a high biomass productivity : Isotherm equilibrium study
CMTDE 2015_105	CHEBLI Derradji, Abdallah BOUGUETTOUCHA, Zoubir MANAA, Abdeltif AMRANE Sulfamethoxazole degradation by conventional Fenton and microwave-assisted Fenton reaction
CMTDE 2015_106	CHEBLI D., BOUGUETTOUCH A., Z. MANAA, S. NACEF, A. AMRANE Sulfamethaxozole removal by microwave-assisted heterogenous Fenton reaction involving synthetic clay (LDHs)
CMTDE 2015_107	SENOUSSI H. et BOUHIDEL K. E. Selective recovery of heavy metals from electroplating Sludge: Experimental And Modeling
CMTDE 2015_108	BOUKHALFA Nadia, BOUTAHALA Mokhtar The equilibrium and kinetics studies of diclofenac sodium onto organophilic K10 montmorillonite (MK10-C16)
CMTDE 2015_109	HAMOUCHE Karima, REHAMNIA Rabah Study of the corrosion behavior of zinc and Zn–Co alloy electrodeposits in weakly acid bath containing saccharine
CMTDE 2015_110	FRIOUI Salah Performances of the MSF plant in terms of Maintenance and reliability
CMTDE 2015_111	Nassima DJEBRI, M. BOUTAHALA, N. CHELLELI Enhanced removal of bisphenol a by low cost alginate/organo acid activated bentonite composite beads : Equilibrium Isotherms, Kinetic And Thermodynamic Studies

CMTDE 2015_112	SAHAL Samir, MHIRI ALI Use of water desalination in agriculture : Case of Smar Medenine
CMTDE 2015_113	KAHOUL A., AIDOUD R. Inhibition of calcium carbonate scale by using an aqueous extract of olive leaves
CMTDE 2015_114	SAMAI Messaouda, CHIKHI Mustapha Recovery of penicillin v by frontal microfiltration
CMTDE 2015_115	LAHMAR H., KECITA A., TRARI M. $CuBi_2O_4$/ZnO novel hetero-system for the chromate reduction (water depopulation) under solar light
CMTDE 2015_116	SAWADOGO Boukary, KONATE Y., LESAGE G., HERAN M. and MAIGA A. H. Brewery industrial wastewater characterization in sahel region: the case of Brakina in Burkina Faso
CMTDE 2015_117	KHALED Habib Efficiently monitoring corrosion inhibitors of carbon steel in seawater
CMTDE 2015_118	DAAS Nihed, ZAGHOUANE-BOUDIAF Dr. H. Synthesis and characterization of organophilic clay materials for the removal of Benzoic acid & Salicylic acid in aqueous solutions
CMTDE 2015_119	SALMAN Maha Anti-scale Magnetic Method as a Prevention Method for Calcium Carbonate Scaling
CMTDE 2015_120	NAFTI M., HANNACHI Ch., CHAKROUN R., HSEINI J., NOUAÏGUI H., HAMROUNI B. Optimization of a cloud point extraction protocol for hexavalent and trivalent chromium separation and speciation in aqueous samples
CMTDE 2015_121	NAMOUNE F., KARAR A. Glutamic acid inhibitor for calcium carbonate scaling
CMTDE 2015_122	Malak MAAMAR, Radouanne FEZEI, Nebil SOUISSI and Nizar BELLAKHAL Application of doehlert matrix to determine the optimal conditions of bromothymol blue degradation with fenton process
CMTDE 2015_123	Y. AIT OUAISSA, M. CHABANI, A. AMRANE, A. BENSMAILI Removal of tetracycline from synthetic solution by an electro coagulation / activated carbon adsorption process: Kinetic and Evaluation cost operating
CMTDE 2015_124	MAACHOU R., LEFKIR A., BERMAD A., KHOUIDER A. Control of recycle sludge in activated sludge process using adaptive neuro-fuzzy logic controller (ANFIS)
CMTDE 2015_125	ETTEIEB Selma, KAWACHI Atsushi, HAN Junkyu, TARHOUNI Jamila, ISODA Hirok Endocrine disrupting compounds identification in water matrices_case study in TUNISIA
CMTDE 2015_126	BENRACHEDI K; SELATNIA A.; BENRACHEDI L.A. Alfa stems (STIPA Tenacissima L) as substrate for water denitrification
CMTDE 2015_127	BENRACHEDI K., SELATNIA A., BENRACHEDI L. A. An heterotrophic /autotrophic denetrification approach for nitrate removal from drinking water by alfa stems
CMTDE 2015_128	BAKHTI Hayet, BEN HAMIDA Najib, HAUCHARD Didier Aqueous processing of insecticide by electrochemical advanced oxidation process "electro-fenton": the degradation and the mineralization of promecarb

CMTDE 2015_129	BAKHTI Hayet, BEN HAMIDA Najib, HAUCHARD Didier Study of the degradation and the mineralization of isoprocarb insecticide in aqueous medium by the electro fenton process
CMTDE 2015_130	LABRAOUI-DJALLAL Karima 0, BOUNOUGHAZ Moussa 0 Electrochemical impedance spectroscopy study of barium sulfate scale formed from mixture of incompatible waters
CMTDE 2015_131	REFFAS A. and DUCLAUX L. Adsorption of anionic dye "methyl orange" on the prepared activated carbon from pine cone
CMTDE 2015_132	GUIZANI Mokhtar, KATO Hideyakia, FUNAMIZU Noyukia Removal of lps endotoxin from reclaimed wastewater through adsorption using soil
CMTDE 2015_133	SAIFAOUI D., AAROUSSY Y., HASSOUN H. Development of an industrial unit pilot desalination of sea water using heat from sulfuric Units OCP JORF AL ASFAR MOROCCO
CMTDE 2015_134	MISSAOUI Takwa, SMIRI Moêz , HAFIANE Amor High conductivity induced solute leakage in seed imbibed with wastewatertreated with lagooning treatmen
CMTDE 2015_135	Mohamed Amine HELALI, Noureddine ZAABOUBA, Walid OUESLATI, Ayed ADDED Chemical fluxes study at the sediment-water interface to assess the general scheme of the early diagenesis occurring off the Mejerda Outlet (Gulf Of Tunis)
CMTDE 2015_136	Cyrine ANNABI, F. FOURCADE, A. ASSADI, I. SOUTRE, A. AMRANE, N. BELLAKHAL Enoxacin degradation by photo-fenton process : Optimization and biodegradability improvement
CMTDE 2015_137	Adel ZRELLI, Béchir CHAOUACHI, Slimane GABSI Simulation studies on the solar vacuum membrane distillation equipped with a helically coiled fibers
CMTDE 2015_138	CHERIFI Mouna Electro-kinetic removal of heavy metals from sludge generated during a wastewater treatment
CMTDE 2015_139	REZMA Souad, LAFI Ridha, HAFIANE Amor Activated carbon prepared from date stone by physical activation : Characterization and adsorption of dye
CMTDE 2015_140	D. SAIFAOUI,Y. AAROUSSY, H. HASSOUN, I. CERHANE Development of a pilot industrial unit desalination of sea water using tidal energy installed on the sea water discharge canal in the site Jorf Alasfar OCP Morocco
CMTDE 2015_141	OUNIFI Ibtissem, HAMROUNI Béhir Scaling the study in the geothermal waters of the northwest of Tunisia
CMTDE 2015_142	OUNIFI Ibtissem, HAFIANE Amor, FERJANI Ezzedine Fabrication and characterization of composite nanofiltration membranes by interfacial polymerization.
CMTDE 2015_143	BELAIB F., MENIAI A-H, MOKRI A, BOUKELLAL .B Elimination of oxytetracycline by adsorption on synthetic support
CMTDE 2015_144	BEN HAMOUDA Sofiane, GOUIDER Yosra, HAFIANE Amor Synthesis and characterization of pebax and pvdf based composite membranes : Application for dye removal by ultrafiltration

CMTDE 2015_145	ZOUAGHI H., BEN JABRALLAH S., HARMAND S. Numerical and experimental study of evaporation of liquid effluent on an inclined plate
CMTDE 2015_146	Boubakri ali , Bouchrit Raja, Hafiane Amor, Bouguecha Salah Al Tahar Optimization of process parameters for the removal of fluoride by membrane distillation using response surface methodology approach
CMTDE 2015_147	CHMINGUI Hajer Synthesis of ZnO NPs by thermal decomposition of acetate of zinc dehydrate and its high rate of adsorption of methylene blue
CMTDE 2015_148	KAHLOUL Malak, HAFIANE Amor Spectrophotometric study of the interaction of cationic dyes with anionic polyoxometalates
CMTDE 2015_149	SOUADEK Rachida, RIDA Kamel , BOUKHEMKHEM Ali Optimization of acetic acid adsorption from aqueous solutions by raw phosphate : Full factorial design methodology
CMTDE 2015_150	ELABDELLAOUI Fouzia, SEMLALI AOURAGH Naoual Hassania Estimation of freezing crystallization kinetics for seawater desalination: Application to the scraped surface heat exchanger crystallyzer
CMTDE 2015_151	Hadi DEBIH Mesure des proprietes de surfaces de materiaux adsorbants
CMTDE 2015_152	Brahmi Lamia, Kaouah F., Boumaza S., Berrama T., Bendjama Z. Statistical modeling and optimization of the cadmium biosorption process in an aqueous solution using posidonia oceanica
CMTDE 2015_153	Ayadi Ch., Hbaieb S., Kalfat R., Chevalier Y. Molecularly imprinted polyaniline sorbent of sunscreens in water
CMTDE 2015_154	Jahouach-Rabai W., Azzouz-Berriche Z., Chammam B., Bousselmi L., Ghrabi A. Degradation of reactive dyes by gamma irradiation process
CMTDE 2015_155	Lachaal Fethi ; M'rabet Marwa ; Mansouri Youssef ; Gabtni Hakim Application of 2D electrical resistivity tomography method and geochemical tracers for delineation of groundwater recharge by treated wastewater from dhraa tammar wastewater treatment plant in Kairouan region (Central Tunisia)
CMTDE 2015_156	Mime Mounia Insaf, Bengharez Zohra Et Benrachedi Khaled Comparative study of the performance of water treatment processes for haemodialysis applied in two dialysis units and their impact on the quality of produced water
CMTDE 2015_158	Boukezoula T.F., Bakiri Zahir Caractérisation et modélisation du mouvement du lit de boues dans les décanteurs secondaires
CMTDE 2015_159	Hamitouche A., Bendjama Z., Amrane A., and Kaouah F. Biodegradation of M-aminophenol by mixed bacteria
CMTDE 2015_160	Abderrahim Omar, Benaissa Esma, Didi Mohamed Amine Lead(II) and cadmium(II) elimination from aqueous solutions by commercialized resin : LEWATIT TP 214
CMTDE 2015_161	Sirine Saidi, Rym Ben Radhia, Brahim Benhamou, Naima Nafiri, Sadok Ben Jabrallah Numerical study of the humid air condensation in a condenser of a solar desalination unit

----

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet, Tunisia 21-24 December, 2015

10

CMTDE 2015_162	JAHOUACH-RABAI Wafa a,b, AZZOUZ-BERRICHE Zohra b, LAHSNI Rim c, HABIBI Belhassen c, BOUSSELMI LatifaIa, GHRABI Ahmed a Decomposition of pharmaceuticals in wastewater by ionizing radiation
CMTDE 2015_163	KALLEL Amjad, ZAIRI Moncef, TRABELSI Ismail Using brick waste for leachate concentrate treatment by solidification/stabilization process
CMTDE 2015_164	FADEL Ammar, HAFIANE Amor, NACEF Saci Removal of zinc ions from brackish water using natural Algerian (NAB) bentonite
CMTDE 2015_165	BEN GAMRA Anouar, BOZRATI Hend, FERSI Cheïma, GORGI Chiraz and TOUMI Abdessatar Influence of operating conditions on the performance of coagulation-flocculation as pretreatment of tannery wastewater
CMTDE 2015_166	FRIKHA Nader , BENABDALLAH Samira, GABSI Slimane Productivity study of various configurations of desalination by vacuum membrane distillation coupled with solar energy
CMTDE 2015_167	BOUROUNI K., JABER T., BEN JABRALLAH S. Development of a scale model for fouling factor calculation in desalination plants
CMTDE 2015_168	ZARGA Yosra, MAKLHOUF Kalthoum, ELFIL Hamza Calcium sulfate and carbonate co-precipitation
CMTDE 2015_169	GHOUDI Amira, GUIZA Sami and BAGANE Mohamed Adsorption of 2-Nitrophenol by bentonite clay
CMTDE 2015_170	TURKI Thouraya, BEN AMOR Mohamed Electrodialysis as membrane process for nitrate removal from drinking water : Effects of the accompanying compenents
CMTDE 2015_171	HAJJI Sabah, TURKI Thouraya, MZOUGHI Nadia Removal of cadmium and lead from aqueous solution by calcite
CMTDE 2015_172	ZOUAMBIA S., ZOUAMBIA Y., HACHACHE N. Elimination of heavy metals by a treated aquatextile
CMTDE 2015_173	AYARI F., SRASRA E. and TRABELSI AYADI M. Adsorption of acid dye onto bentonite and organophilic bentonite
CMTDE 2015_174	BOUKHALFA N. and MÉNIAI A-H. Calculation of salts activity coefficients in mixed solvents solutions using an adapted Pitzer Model
CMTDE 2015_175	HASSINI Noureddine, BOUCHAMA Mohameda, DOBBI Abdelmadjidb Diffusion and permeation in polymers: consideration on the deborah number
CMTDE 2015_176	DAMOUS Maamar, DÉNÈS Georges, BOUACIDA Sofiane, HAMLAOUI Meriem, MERAZIG Hocine, and DARAN Jean-Claude Di-M-CHLORIDO-BIS[(2-AMINOBENZAMIDE-K2N2,O) CHLORIDOCOPPER(II)]
CMTDE 2015_177	MINYAOUI K., PONTIE M., HANNACHI A. Nanofiltration Versus Reverse Osmosis for Brackish water Desalination
CMTDE 2015_178	CHTOUROU Mariem, WALHA Khaled, COMAS Quim Removal of micro-pollutants using membrane bioreactor (MBR) as an advanced wastewater treatment technology

----

*The 5th Maghreb Conference on Desalination and WaterTreatment "**CMTDE 2015**"*

Hammamet,Tunisia 21-24 December, 2015

11

CMTDE 2015_179	MALLEK Mariem, BEN SALAH Abdelhamid, SALVADO Victoria Silicone rod extraction of cosmetic products in environmental water samples by high-performance liquid chromatography – ultraviolet detection
CMTDE 2015_180	BOUSBA Salim, MENIAI Abdeslam Hassen Determination of the thermodynamic parameters of the adsorption of phenol onto sewage sludge based adsorbent
CMTDE 2015_181	KOURDALI Sidali, BADIS Abdelmalek, BOUCHERIT Ahmed and SAIBA Ali Degradation of red acid utilized in algeria textile industries by electro-fenton : Optimization assessment of toxicity using biomarkers of oxidative stress
CMTDE 2015_182	SAIBA Ali, KOURDALI Sidali Study of the electrocoagulation of water contaminated with metribuzin. Effect of the nature of the electrode and the inter-electrode distance
CMTDE 2015_183	KHELIFI Selma, AYARI Fadhila & BEN HASSAN CHEHIMI Dalila Synthesis, characterization of AL-Fe-pillared clays
CMTDE 2015_184	NEMAMCHA Abderrafik, BOUZIT Fatima Zohra , MOUMENI Hayet Effective approach to remove heavy metals from water using an aquatic plant
CMTDE 2015_185	MOUMENI Hayet, ROUABHIA Fatima, NEMAMCHA Abderrafik, REHSPRINGER Jean luc Elaboration and characterisation of nanoporous ceramic membranes for water nanofiltration process
CMTDE 2015_186	BEN SAAD Marwa, BEN SAID Myriam, BOUSSELMI Latifa and GHRABI Ahmed Application of bioinoculation to enhance rhizocompetence in bacteria removal of horizontal subsurface flow constructed wetland system
CMTDE 2015_187	OUGHLIS-HAMMACHE F., SENHADJI-KEBICHE O. , M. Skiba, LAHIANI-SKIBA M., AIT ALI S., BEN AMOR M. Optimization of methylene blue adsorption process usingwater insoluble cyclodextrin polymer
CMTDE 2015_188	BELLOUL-SAHI S. , SENHADJI-KEBICHE O., TINGRY S., BENAMOR M. Micro-channel cell for the extraction of ionic metal (Zn(II)) using polymer plasticized membranes
CMTDE 2015_189	GHODBANE Houria, HAMDAOUI Oualid Application of photoactivated periodate to the degradation of anthraquinonic dye in water
CMTDE 2015_190	BENHMIDENE A., CHAOUACHI B., GABSI S., BOUROUIS M. An experimental investigation on flow behaviour in bubble pump of absorption diffusion system
CMTDE 2015_191	KESRAOUI Aida, SEFFEN Mongi Removal of cationic dye methylene blue from aqueous solution using a lignocellulosic fibers : Luffa Cylindrica
CMTDE 2015_192	MESSIKH N. The use of mlp neural network for removal 4-chlorophenol by membrane liquid emulsion
CMTDE 2015_193	BARHOUMI Afef, BOUGUERRA Wided, NCIB Sana, ELALOUI Elimame Copper removal from wastewater by electrocoagulation process using aluminum electrodes

CMTDE 2015_194	NCIB Sana, BOUGUERRA Wided, BARHOUMI Afef , LARCHET Cristian, DAMMAK Lasaad, ELALOUI Elimam Preparation and caracterisation of polymer inclusion membranes from cellulose triacetate and acetylated lignin for metals separation
CMTDE 2015_195	BEN AMOR Taissire, HAMROUNI Anissa, BEN AMOR Mohamed Defluoridation of drinking water using functionalized SBA-15 type ordered mesoporous silica
CMTDE 2015_196	HADIDI Noureddin , BENNACER Rachid and OULD-AMER Yacine Heat and mass transfer by natural convection in partially porous cavities
CMTDE 2015_197	RAHAL S., KHALLADI R., MOULAI-MOSTEFA N. Surfactant remediation of crude oil-contaminated soil
CMTDE 2015_198	AFFOUNE Abed Mohamed, KHELIFI Omar et NACEF Mouna Removal Of Nickel(II) ions from aqueous solution by an activated carbon prepared from sewage sludge
CMTDE 2015_199	BERKANI Ismahane*, BENSADOK Kenza, BELKACEM Mohamed. Elimination of nitrate from brackish water in southern algeria
CMTDE 2015_200	TRIKI Z. , BOUAZIZ M. N., BOUMAZA M. An investigation of the performance of a solar vacuum membrane distillation operating a reverse osmosis desalination process in an arid area: A case study from the south of Algeria
CMTDE 2015_201	GOUIDER Hana, ZILI-GHEDIR Leila, BEN NASRALLAH Sassi Mathematical modeling and numerical study of heat and mass transfer in humidifier and condenser for solar humidification dehumidification desalination system
CMTDE 2015_202	BOUGUERRA Wided, MISSAOUI Khaoula, BENKHLIFA Eya, HAMROUNI Béchir Use of adsorption using granular activated carbon (GAC) for the enhancement of coagulation performance for boron removal
CMTDE 2015_203	JEBRI Sonia, BEN AMOR Mohamed Élimination du cadmium dans l'eau par adsorption sur les phosphates de calcium
CMTDE 2015_204	MABROUK W., VIDAL S., SOLLOGOUB C. , MATOUSSI F., HAFIANE A., FAUVARQUE J. F. Synthesis and characterization of new proton exchange membrane deriving from sulfonated polyethersulfone using ionic cross linking for electrochemical applications
CMTDE 2015_205	SELLES Chaouki, BENALI Omar Corrosion inhibitory evaluation of Anacyclus pyrethrum L. Aqueous extracts on the corrosion of mild steel in acidic medium
CMTDE 2015_206	ESSAFI Wafa 1, BEN MAHMOUD Souha 1,2 and HAMZAOUI Ahmed Hichem Interaction of polystyrene co styrene sulfonate with methylene blue as a function of physical chemical parameters in aqueous solution
CMTDE 2015_207	ZOUAMBIA Yamina, ZOUAMBIA Soumia, YOUCEF ETTOUMI Khadidja, KREA Mohamed, MOULAI MOSTEFA Nadji Oranges peels for biosorption of heavy metals
CMTDE 2015_208	BENTURKI Oum Saâd. , BENTURKI Asma Adsorption studies of basic dye on activated carbon derived from Agricultural waste : (ZIZIPHUS JUJUBA) Seed Coat

CMTDE 2015_209	JALALI Jalila ; BALGHOUTHI Moncef ; EZZAOUIA Hatem Preparation and characterization of porous clay ceramic for desalination applications
CMTDE 2015_210	TOUAZI S., BUČKO M., MAKHLOUFI L., LEGAT A, BAJAT J.B. Corrosion of Zn-Mn alloy coating in carbonated concrete solution
CMTDE 2015_211	ASKRI Intissar, BCHIR Mohamed Ali, BALLOUMI Mounir Un marché d'échange des droits d'accès à l'eau en tunisie
CMTDE 2015_212	KAMELI D., HAMMACHE - MAKHLOUFI H., ALIOUANE N. Synergistic corrosion inhibition by phosphonic acid and Cu^{2+} ions on carbon steel in 3% NaCl
CMTDE 2015_213	FARHAT Asma, ROMDHANE Mehrez Decarbonation of the geothermal waters of chott el fejjij : Scaling problem and hardness treatment
CMTDE 2015_214	MTAALLAH Salma, MARZOUK Ikhlass, HAMROUNI Béchir Optimization of cadmium removal by donnan dialysis
CMTDE 2015_215	MTAALLAH Salma, MARZOUK Ikhlass, HAMROUNI Béchir Adsorption of cadmium onto activated alumina : Kinetics and thermodynamic studies
CMTDE 2015_216	KHELLAF Nabila, DJELAL Hayet, AMRANE Abdeltif Aerobic biodegradation of the textile dyes, cibanon navy, solophenyl scarlet and cibacron green
CMTDE 2015_217	BOUNOUALA M., REMLI S. Etude geochimique, mineralogique et optimisation du processus de cristallisation par energie solaire: Cas de salin du chott Merouane El Oued (Algerie)
CMTDE 2015_218	BRAHMI Khaled, Wided BOUGUERRA, BELHSAN Hamza, ELALOUI Elimame, LOUNGOU Mouna, TLILI Zied, HAMROUNI Béchir Use of electrocoagulation with aluminum electrodes to reduce hardness in Tunisian phosphate process mining water
CMTDE 2015_219	Ballasted electroflocculation : An innovative wastewater treatment process BRAHMI Khaled, BOUGUERRA Wided, LOUNGOU Mouna, HAMROUNI Béchir
CMTDE 2015_220	HAMDAOUI Oualid Adsorption of Cu(II) from aqueous phase by CEDAR BARK
CMTDE 2015_221	CHAABOUNI Akram, GUESMI Akram, HARBI Soumaya, HANNACHI Chiraz, HAMROUNI Béchir Modification of CMX ion exchange membrane : Effect of temperature on ion exchange equilibrium
CMTDE 2015_222	BARHOUMI Afef, BOUGUERRA Wided, NCIB Sana, ELALOUI Elimame. Investigation of the operational parameters on humic acid removal from water by electrocoagulation
CMTDE 2015_223	NCIB Sanaa, BOUGUERRA Widedb, BARHOUMI Afef a, ELALOUI Elimama Recovery of copper ions by supported liquid membrane (SLM) extraction
CMTDE 2015_224	ARFAOUI Maroua, OUEJHANI Ali, HAMROUNI Béchir Application of doehlert experimental design for modification of an anionic membrane by electrodeposition

CMTDE 2015_225	BOUKELLOUL Mohamed Laid, BOUNOUALA Mohamed, TALHI K , IDRES Abdelaziz , GADRI Larbi Study of the impact of mine waste on the ground, and surface water sulfur contamination as a result of acid mine drainage (AMD).
CMTDE 2015_226	BEN ALI Mongi *, KAIROUANI Lakdar Multi-objective optimization of operating parameters of a MSF-BR desalination plant using pareto-optimality
CMTDE 2015_227	KHERRAT Rochdi *, HAMDAOUI Oualid, DJELLOUL Chawki Dynamic biosorption of methylene blue by melon peel in FIXED-BED columns
CMTDE 2015_228	BOUCHERIT Nabila, ABOUSEOUD Mahmoud, ADOUR Lydia, Tandjaoui Nassima Enzymatique traitement of direct yallow 106 by purifud peroxidase
CMTDE 2015_229	GHORBEL-ABID Ibtissem, KHAZRI Hassen, WESLATI Najoua, BOUBAKRI Saber, TRABELSI-AYADI Malika Evaluating the adsorptive capacity of smectite local clay on The removal of several pharmaceutical products in aqueous systems
CMTDE 2015_230	HARBI Soumaya, GUESMI Fatma *, CHAABOUNI Akrem, HANNACHI Chiraz and HAMROUNI Béchir Ion exchange equilibrium of major inorganic cations (Na$^+$, K$^+$ AND Ca^{2+} ON DOWEX 50W×8 resin : Effect of ionic strength
CMTDE 2015_231	GUESMI Fatma 1,*, HANNACHI Chiraz 1, HAMROUNI Béchir 1 Removal of fluorides by adsorption onto the modified afn membrane
CMTDE 2015_232	KHRIJI Jamel, LOUATI Islem and HAMROUNI Béchir Removal of boron from geothermal water by reverse osmosis and other physico-chemical processes
CMTDE 2015_233	TABASSI Dorra, HARBI Soumaya, HAMROUNI Béchir Simultaneous adsorption of Cr (VI) ions and phenol onto granular activated carbon: artificial neural network modeling and central composite design optimization
CMTDE 2015_234	DHAOUADI I., JANDOUBI M., JOUINI M., BEN AMOR T., ELFIL H. Boron removal from brackish water by ion exchange resin
CMTDE 2015_235	TOUBAL Abd-El-Aziz, FERTIKH N. and MESSADI Djelloul Experimental study and mathematic simulation of dehp concentration profiles in a solid pvc discs matrix dipped in methanol.
CMTDE 2015_236	ATTAYAT Ameni, KHADHAR Samia, OUESLATI Fethi, MZOUGHI Nadia Polychlorinated biphenyls in groundwater of grombalia : Optimization of analytical procedures, validation and analysis by gas chromatography coupled with electron capture detector
CMTDE 2015_237	OULD BRAHIM I., BELMEDANI M., BELGACEM A., HADOUN H. Removal of dyes from aqueous solutions by adsorption on the SHRIMP carapace
CMTDE 2015_238	GMAR Soumaya, CHAGNES Alexandre*, BEN SALAH SAYEDI Ilhem, FAUVARQUE Jean-François, TLILI Mohamed, BEN AMOR Mohamed MODELLING OF WATER DESALINATION BY ELECTRODIALYSIS PROCESSES
CMTDE 2015_239	SELLAMI Ahlem, KAIROUANI Lakdar Dessalement par compression de vapeur
CMTDE 2015_240	TOUJENI Noureddine, KAIROUANI Lakdar Thermal desalination process combined with organic rankine cycle

----

*The 5th Maghreb Conference on Desalination and WaterTreatment "**CMTDE 2015**"*

Hammamet,Tunisia 21-24 December, 2015

15

CMTDE 2015_241	HAMDI Besma, KAROUANI Lakdar
	Reverse osmosis desalination process combined with solar organic rankine cycle
CMTDE 2015_242	LASSOUED BEN MILED Ghofrane, DJOBBI Bouthaina, BAOUAB Mohamed Hassen, BEN HASSEN Rached
	Contribution to the clarification of surface water from tunisian cactus: Case water dam of Oued El Kebir in ZAGHOUAN, TUNISIA
CMTDE 2015_243	BEN KHALIFA E., HAMMI H., TRABELSI K., HAMROUNI B
	Effect of foreign ions on boron determination in tunisian brines
CMTDE 2015_244	MOUELHI M., MARZOUK I., HAMROUNI B.
	Modelisation of equilibrium and kinetic studies of the fluoride sorption onto activated alumina
CMTDE 2015_245	HADJOUDJA Bouzid, A. Magramene, B. Zaidi, B. Chouial, H. Felfli, S. Gagui, A. Chibani
	Effects of temperature on the electrical conduction of polycrystalline silicon thin films for photovoltaic applications
CMTDE 2015_246	CHOUIAL Baghdadi K. KAMLI, S. GAGUI, B. HADJOUDJA, A. CHIBANI
	Crystalline growth of CuInSe2 compound for photovoltaic applications
CMTDE 2015_247	NAFTI Mariem, HANNACHI Chiraz, CHAKROUN Radhouane, HAMROUNI Bechir, NOUAÏGUI Habib
	Application of a solid phase extraction for chromium speciation in industrial effluent using electrothermal atomic absorption spectrometry
CMTDE 2015_248	TLILI Faouzia et BRIK Bochra
	Intrusion marine de la nappe de Ghar El Melh (Cap-Bon Tunisie) : évaluation de la vulnérabilité par SIG
CMTDE 2015_249	GUESMI Fatma 1,*, AMOURI Sameh, LOUATI Islem, HANNACHI Chiraz , HAMROUNI Béchir
	Application of response surface methodology to optimize nitrate removal from water by electrodialysis
CMTDE 2015_250	1MISSAOUI K., 1BEN KHALIFA E., 1BOUGUERRA W., 1HAMROUNI B.
	Evaluation of boron removal from seawater by coagulation-flocculation combined to adsorption

----

*The 5th Maghreb Conference on Desalination and WaterTreatment "**CMTDE 2015**"*

Hammamet,Tunisia 21-24 December, 2015

16

EVALUATION OF THE PERFORMANCES
OF FOUR HYBRID PHOTOVOLTAIC / THERMAL COLLECTORS (HPV/T)

GHELLAB[a,b] A., KAABI[b] A., LOUNIS[a] I. , GUENDOUZI[a] S. E.

[a]Département du génie mécanique, Ouled Aissa BP 98, University of Jijel, Algeria.
[b]Département du génie climatique, Route Ain El Bey, University of Constantine1, Algeria.
E-mail : ghellab_amel@yahoo.fr

ABSTRACT

The hybrid photovoltaic/thermal collector generates the electrical and the thermal energy simultaneously. It represents photovoltaic cells integrated with thermal solar collector.

The aim of this work is to study four hybrid collectors with bi-fluids in order to evaluate their electrical and thermal efficacy. We investigate the effects of the internal and external parameters on the functioning of the system; such as: the wind velocity, the type of the absorber plate, the mode of heat extraction, and the shape. Afterwards, we attempted to evaluate the effects of the incident solar flux and the temperature on the current-voltage and the power-voltage of the PV module.

KEYWORDS : Hybrid PV/T system, photovoltaic, thermal, solar energy.

MODELLING OF TEMPERATURE FOR SIMPLE SOLAR STILL HYBRID WITH HEAT PUMP (SSDHP)

HIDOURI khaoula, GABSI Slimane

Research unit of Environment, catalysis and process analysis, National engineering school of Gabes, Omar Ibn El Khattab Avenue, Gabes 6029, Tunisia
E-mail : hidourik@yahoo.fr   et   slimanegabsi@yahoo.fr

ABSTRACT

The performance of active solar distiller hybrid with heat pump using different operational parameters is studied theoretically and compared with the experimental data for validation purposes, to find out best factors enhancing still productivity. The thermal performance is evaluated through implementing the following effective parameters; a) with or without orientation, b) with and without heat pump, c) simple or double glass cover, e) temperature differences between the still cover and water. The variation of different parameters with production rate has been studied. It is found that the production rate increases with the increases of water and glass temperature. It can be concluded from this study that active solar stills can be one of the options for enhancing the productivity of stills.

KEYWORDS: *Modelling temperature, solar distiller, active solar still.*

RESEARCH FERTILIZING POTENTIAL OF TREATED WATER AT THE MITIDJA PLAIN (ALGERIA)

NAKIB Maamar [1], BERREKSI Ali [2], KETTAB Ahmed [1], HOULI Samia [3]

(1) Research Laboratory of Water Sciences (LRS-UAE), National Polytechnic School of Algiers, Algeria - enp.edu.dz -
E-mail : mnakib@hotmail.fr, kettab@yahoo.fr
(2)) Research Laboratory of Applied Hydraulics and Environment, University of Bejaia, Hydraulic Department, Algeria, University
of Bejaia (Algeria), E-mail : berreksi.ali@gmail.com, ali_berreksi@yahoo.fr, Tel : (+213) 7734670098
(3) Laboratory of Mobilization and Valorization of the Water Resources (MVRE). Higher National School of Hydraulics (ENSH)
E-mail : houliros@yahoo.fr

ABSTRACT

The objective of this study is to examine the purified water treatment plants 5, quantify inputs of fertilizers, for their agricultural use.In this study we first examined the problems generally under the following three categories: salinity, permeability and toxicity.According to the electrical conductivity (EC 25 °C) and the value of SAR, we have been able to identify the presence of the C3S1 class for 05 STEP nominating usable water without particular control for irrigation of moderately salt tolerant crops, on well-drained soils and good permeability. The study of physical and chemical composition of treated water flow and that of the land by type of plant has allowed us to estimate the nutritional value of these waters and to establish requirements for fertilizers each category of plants. The potentially irrigable areas for each type of culture was discussed and the need for water calculated based cultures. The volume of purified water for 5 stations being 60152,000 m^3/year and needs for all irrigation water to crops therefore represent 85% of this production.

The purified water provide 15% K_2O to the needs of demanding crops and 45% from non-intensive crops. The contribution P_2O_5 is 12,5% compared to the needs of demanding crops and 33% from non-intensive crops. And finally the nitrogen supply on average represent only 6.8% compared to the needs of demanding crops.

Finally it should be noted that the nutritional value of treated water may not exceed the needs of the plant in all the stations. Finally this study confirmed that these waters contain significant amounts of nutrients including K_2O which may partially cover the needs of non-demanding crops, helping to reduce the consumption of chemical fertilizers with beneficial consequences for the environment.

KEY WORDS : wastewater treatment, reuse, purified water, fertilizers.

The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"
Hammamet,Tunisia 21-24 December, 2015

3

STUDY OF THE POSSIBILITIES OF AGRICULTURAL USE OF SEWAGE SLUDGE IN THE MITIDJA PLAIN (ALGERIA)

NAKIB Maamar [1], BERREKSI Ali [2], KETTAB Ahmed [1], HOULI KHALED Samia [3]

(1) Research Laboratory of Water Sciences (LRS-UAE), National Polytechnic School of Algiers, Algeria –
E-mail : mnakib@hotmail.fr, kettab@yahoo.fr
(2) University of Bejaia, Research Laboratory of Water Sciences (LRS-UAE), National Polytechnic School of Algiers, Algeria –
E-mail : ali_berreksi@yahoo.fr
(3) Laboratory of Mobilization and Valorization of the Water Resources (MVRE). Higher National School of Hydraulics (ENSH)
E-mail : houliros@yahoo.fr.

ABSTRACT

The objective of this study is to examine sewage sludge for their agricultural use. This work is primarily focused on the agronomic value of sludge, that is to say making it their wealth to various points of views agronomic: plant nutrition by providing nutrients, maintenance of soil properties by the beneficial effects of organic materials on these properties, etc.Une comparative study with the urban compost and cattle manure was performed, successful agronomic parameters are dryness (dry matter percentage), the percentage of organic matter, that the levels of total nitrogen, phosphorus, potassium, calcium, magnesium and trace elements. The C / N ratios of sludge were also calculated.

But to get the most out of these agronomic benefits, it is necessary that the "safety criteria" are also satisfied. We consider compliance with these thresholds, including through mandatory standards AFNOR NF U 44-051 and NF U 44-095, guarantees the safety of treated sludge. We recall in this context how the sludge are different vis-à-vis stations of the main criteria of safety, mentioning the standards overruns.

KEYWORDS: sewage sludge, organic matter, fertilizers, toxicity.

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet, Tunisia 21-24 December, 2015

4

UV AND SOLAR PHOTO-DEGRADATION OF NAPROXEN: REACTION KINETICS, PRODUCTS IDENTIFICATION AND TOXICITY ASSESSMENT

JALLOULI Nabil[a], ELGHNIJI Kais [b], HENTATI Olfa [a,c], RIBEIRO Ana R. [d], ADRIÁN M.T. Silva[d] and KSIBI Mohamed [1a,c*]

a. University of Sfax, Laboratory of Water, Energy and Environment, National School of Engineers of Sfax (ENIS), Route de Soukra Km 3,5 Po. Box 1173, 3038 Sfax, Tunisia

b. University of Gafsa, Research Unit of Materials, Environment and Energy, Campus Universitaire Sidi Ahmed Zarroug -2112 Gafsa Tunisia

c. Higher Institute of Biotechnology of Sfax (ISBS), Route de Soukra Km 3, 5 Po. Box 1175, 3038 Sfax, Tunisia

d. LCM – Laboratory of Catalysis and Materials – Associate Laboratory LSRE-LCM, Faculdade de Engenharia, Universidade do Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal

*Corresponding author: Prof. Mohamed Ksibi :Tel : +216 74 674 354; Fax : +216 74 674 364; E-mail: mohamed.ksibi@tunet.tn

ABSTRACT

Direct photolysis and TiO_2 photocatalytic degradation of naproxen (NPX) in aqueous solutions (2.6×10^{-4} M) were studied using a UV lamp (λ_{max} =254 nm) and solar irradiation. The degradation of NPX in the batch UV photoreactor was found to be in accordance with pseudo-first order kinetics, the photocatalytic process was more efficient than photolysis. After 3 hours at pH 6.5, 83 % of NPX abatement was obtained by photolysis, with only a 11 % of chemical oxygen demand (COD) removal, whereas the TiO_2-UV process led to higher NPX (98%) and COD (25%) removals. The apparent pseudo-first-order rate constant (k_{app}) for NPX degradation ranged from 0.0050 min^{-1} at pH 3.5 to 0.0095 min^{-1} at pH 6.5 in photolysis, while it was estimated to be 0.0063 min^{-1} under acidic conditions in photocalysis, increasing by 4-fold at pH 6.5. In order to identify the reaction by-products of the NPX degradation, ultra high performance liquid chromatography (UHPLC), coupled to a diode array detector (DAD) and to a triple quadrupole mass (MS) spectrometer detector (UHPLC-DAD-MS), was used together with a hybrid ion trap-orbitrap mass spectrometer. The main reaction intermediates detected by means of exact mass measurements were 1-(6-methoxynaphtalene-2-yl) ethylhydroperoxide,2-ethyl-6-methoxynaphthalene, 1-(6-methoxy-2 naphtyl)ethanol and 1- (6-methoxy-2naphtyl) ethanone and malic acid. The solar photocatalysis of NPX (1.91×10^{-3} M) showed COD removals of 33% and 65% after 3 ad 4 hours of treatment, and some reduction of acute toxicity, evaluated by the exposure of E. andrei to OECD soil spiked with NPX-treated solution.

KEYWORDS : Naproxen; photolysis; photocatalysis; chemical oxygen demand (COD); acute toxicity.1

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet, Tunisia 21-24 December, 2015

5

PHYTOPLANKTON CHARACTERIZATION OF TREATED DOMESTIC WASTEWATER BY AERATED LAGOON

HAMMAMI Haifa [a], HIDRI Rabaa [a], SAIDI Neila [b], ABDELLY Chedly [a], ROMDHANE Mohamed Salah[c]

And METOUI-BEN MAHMOUD Ouissal *[a]

a: Laboratoire des Plantes Extrêmophiles, Centre de Biotechnologie de Borj-Cédria, B. P. 901 Hammam-Lif 2050, Tunis.
b: Centre de Recherches et des Technologies des Eaux, Laboratoire Traitement et Recyclage, B.P. 95-2050, Hammam lif, Tunis.
c: Laboratoire des Écosystèmes et Ressources Aquatiques, Institut National Agronomique de Tunisie (INAT).
* Corresponding author: Ouissal Metoui-Ben Mahmoud, E mail: wissal2@hotmail.com
Tel: +216 79 325738, Fax: +216 79 325638

ABSTRACT

This study is to characterize the phytoplankton population in an ecosystem wastewater treatment by aerated lagoon located in El Mahdia. Biodiversity indices (Shannon index and Pielou index) of the various basins of the wastewater treatment plant, going from input to final output, have been followed. A very high algal density with a relatively low species diversity was observed during the study period. The results showed that the wastewater discharged into the sea is a rich Cyanophyceae environment. These Cyanophyceae have shown a strong adaptation to physical and chemical conditions of the basins in relation to other classes namely the Chlorophyceae, the Diatoms, the Euglenophyceae, the Dinoflagellates and Chrysophytes.
The study of the phytoplankton structure highlighted the dominance of three major species Cyanophycaea: the Oscillatoria, the Synechococcus and the Synechocystis, which are known for their toxic potential.

KEYWORDS : Purification station, Cyanophyceae, indices of biodiversity and similarity.

*The 5ᵗʰ Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet, Tunisia 21-24 December, 2015

6

INHIBITIVE EFFECT OF PHOSPHATE IONS ON THE PITTING CORROSION BEHAVIOUR OF STEEL REINFORCEMENTS. PART (I): STUDY IN SIMULATED CONCRETE PORE SOLUTION

BENSABRA Hakim, AZZOUZ Noureddine

Université de Jijel, Laboratoire des Interactions Matériaux Environnement (LIME), BP 98, Ouled Aissa - Jijel 18000, Algérie ,) Tel. 00213792295013 ,   Fax. 0021334501189
E-mail : hak2dz@yahoo.fr

ABSTRACT

Corrosion of reinforcement steel, induced by chlorides ions penetration, is the main cause of concrete structures damage. Because of its serious economic and social consequences, the protection against this phenomenon remains a major challenge for any country. Thus, various methods to combat this problem have been proposed, among them the use of corrosion inhibitors has become a more attractive alternative due to its effectiveness, ease of use and low cost price.

The aim of this work is to study the inhibitive effect of tri-sodium phosphate on pitting corrosion of steel rebar in a simulated concrete pores solution, using potentiodynamic and electrochemical impedance spectroscopy tests. The use of this mineral compound is also justified by its non-toxicity.

The obtained results indicate that the addition of phosphate ions to the chlorinated solution decreases significantly the corrosion rate by promoting the formation of a passive layer rich in phosphate on steel surface. This layer acts as a physical barrier against chloride ions diffusion. The optimal inhibition rate is given by a phosphate ions concentration corresponding to $[PO_4^{3-}]/[Cl^-]$ equal to 0.5.

KEYWORDS: steel, concrete, corrosion, chloride, inhibitors, phosphate.

THE VALUATION OF WASTEWATER FROM TANNERIES BY BIOLOGICAL TREATMENT
THE OPTIMIZATION OF THE RATIO I / S
ON ANAEROBIC DIGESTION OF LIQUID WASTE FROM TANNERIES

ACHOURI Ouafa[a] ; BENCHEIKH-LEHOCINE Mossaab [a] ; UBAY ÇOKGÖR Emine [b]

a Université of Constantine 3 Faculté de Génie de procédés pharmaceutique Constantine, Algérie
b Faculty of civil engineering, the laboratory of environment engineering Istanbul Technical University, Turqey
E-mail : wafaachouri@gmail.com

ABSTRACT

In recent years, water sources are increasingly threatened by pollution and especially caused by industrial waste water, they are different from each other and also their treatment as an example liquid discharge tannery which are rich in organic matter,

That's why a biological treatment is recommended; the proposed anaerobic digestion comes to these waters to enhance not only their depollution but also as a process that produces energy.

The value of a substrate used in the anaerobic treatment is measured by the percentage of methane that can produce it, The aim of this paper is to treat wastewater tannery in mesophilic anaerobic digestion phase study based on this test the optimization of ratios in the performance of anaerobic digestion of tannery effluents; the ratio used is 0; 1.54; 1.15; 0.64; 0.32 in a mesophilic environment (35°C), after a retention time of 18 days were accomplished has a maximum volume of biogas worth 110.97 ml ; the percentage of methane (CH4) in this experiment exceeded the 50% which is a satisfactory and encouraging.

KEYWORDS : Anaerobic digestion ; biogas ; ratio ; batch ; tannery wastewater

EFFECT OF OXYGEN AND TEMPERATURE ON BIOLOGICAL DENITRIFICATION

BOUTERAA Meriem, BENCHEIKH LEHOCINE Maher

Université of Constantine 3
Faculté de Génie de procédés pharmaceutique ; Département de génie de l'environnement
Constantine, Algeria ; e-mail : mimibou@rocketmail.com

ABSTRACT

Nitrate contamination is one of the major problems in groundwater, which is increasingly becoming a threat to groundwater supplies. Nitrate in drinking water for animal and human consumption is not recommended for health reasons. The world health organization has set a limit of 10 mg/l Nitrate for human consumption and 100 mg/l Nitrate for animals. Nitrogen in groundwater results from human excreta, ground garbage and industrial effluents, particularly from food processing plants. In increasing denitrification rates enhances nitrogen removal. Nitrates cause cancer, methemoglobinemia (blue baby syndrome), hypertension and thyroid hypertrophy and Eutrophication of lakes and reservoirs.

In this search using a batch reactor this reactor was used to purify water contaminated with nitrate (biological denitrification), the influence of the dissolved oxygen concentration and temperature in the process was tested using acetate sodium as a carbon source.

The presence of oxygen to reduce the effectiveness of the nitrogen and causes an increase in the concentration of nitrate in the treated water.

To optimize the operating conditions affecting the denitrification process we investigated the role of oxygen on the degradation mechanism of the carbon source (sodium acetate) and the denitrification capacity of our microorganisms. For this we used two types of culture (aerobic and anoxic).

The water temperature in the processing facilities is reacted by essentially the temperature of the ambient air. However, the same climatic conditions, thermal differences are often found between facilities. They are due to energy loss in transit of raw effluent collection system and within the system.

Any change in temperature has an immediate impact on the activity of the biomass. The study made in this section is based on the influence of temperature on the reduction of nitrate.

All experiments were conducted using sodium acetate as a carbon source.

KEYWORDS : *Bio-denitrification; batch reactor; OD; Temperature; substrate on biomass*.

WASTEWATER TREATMENT USING TIO$_2$/Fe(III)/SUNLIGHT

GHORAB M.F. and DJELLABI R.

LTEVDI, Chemistry Department, Unibersity Badji Mokhtar Annaba, BP 12 RP Annaba, ALGERIA
E-mail : mfghorab@yahoo.com

ABSTRACT

Methylene blue and hexavalent chromium are two important toxic pollutants which exist frequently in many categories of industrial wastewaters. For practical reasons, the simultaneous removal of these contaminants is an attractive approach. We report here the results of a simultaneous removal of methylene blue and hexavalent chromium using a combined system TiO$_2$/Fe(III)/solar. The comparison between the three processes, i.e., iron cycle (Fe(III)/solar), photocatalytic reactions (TiO$_2$/solar) and the combined system (TiO$_2$/Fe(III)/solar) for single and simultaneous removal cases was investigated. The results show that, only the TiO$_2$/Fe(III)/solar system ensures a complete simultaneous removal. The effects of concentration ratio of substances, pH solution and the presence of H$_2$O$_2$ in the combined of system were investigated. Finally, based on the obtained results, a removal pathway of both pollutants by the system TiO$_2$/Fe(III)/H$_2$O$_2$/solar is proposed. This fast synergistic combined system is a significant option for both oxidation and reduction reactions for water decontamination with a high efficiency, short treatment time and low energy cost, which respects the principal goals of Green Chemistry.

KEYWORDS : Wastewater treatment; Methylene blue ; Hexavalent chromium ; Iron cycle ; Photocatalysis; Sunlight

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

10

ADSORPTION OF CHROMIUM (VI) FROM AN AQUEOUS SOLUTION ONTO ALGERIAN MODIFIED CLAY, ZEOLITE A AND ACTIVATED CARBON.

ACHOUR Souad[a], AMOKRANE Samira[b], CHAGROUCHE S. [a], HADJ MEKATEL[b] and NIBOU Djamel[b]

[a]Centre de Recherche Nucléaire de Draria, B.P.43, 16003, Draria, Alger, Algérie

[b]Laboratoire de Technologie des Matériaux, Faculté de Génie Mécanique et Génie des Procédés, Université des Sciences et de la Technologie Houari Boumediene, B.P. 32, El-Alia, Bab-Ezzouar, Alger, Algérie

ABSTRACT

The removal of chromium (VI) ions from aqueous solutions onto Algerian modified clay, zeolite A and activated carbon were investigated in batch. The adsorbents were characterized by X-ray powder diffraction, Infrared spectroscopy, Scanning electronic microscopy, Differential thermal and gravimetric analysis and Nitrogen adsorption technique for specific area surface and porous volume. The effects of parameters as initial concentration, pH, solid-liquid ratio (S/L) and temperature were studied. The Freundlich and the Langmuir models have been applied and the adsorption equilibrium adsorption was found to best fit the Langmuir adsorption isotherm, where good correlation between theoretical and experimental equilibrium concentration of chromium (VI) ion was observed onto Algerian modified clay and activated carbon. However, the adsorption equilibrium has been found to follow the Freundlich model onto zeolite A. Kinetic studies showed that the first-order sorption model was the most prevalent for the adsorption of chromium (VI) ions. The rate constant of the exchanged ions appears to be controlled by chemical sorption process. Thermodynamic parameters were calculated and showed that adsorption enthalpy was endothermic nature and the reaction was spontaneous of Algerian modified clay and activated carbon. However, the adsorption enthalpy was exothermic on the zeolite A. A comparison of the removal of chromium (VI) from aqueous solutions by Algerian modified clay, zeolite A and activated carbon revealed that the adsorption rate decreased in the following order: Activated carbon (98 %) >Algerian modified clay (90%) > zeolite A (61%)

KEYWORDS : Chromium ; Algerian modified clay ; zeolite A ; activated carbon ; Characterization ; Removal ; Environment.

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet, Tunisia 21-24 December, 2015

11

PREPARATION OF NEW ORGANOCLAYS AND APPLICATIONS FOR THE ADSORPTION OF TEXTILE DYES FROM AQUEOUS SOLUTIONS

BENAMAR Makhoukhi

Laboratory of Separation and Purification Technologies, Tlemcen University, BP119, Algeria

benamarmakh@yahoo.fr

ABSTRACT

Industrial waste water contains many contaminating organic and inorganic materials, such as aromatic compounds, heavy metals and dyes. Colored dyes are important water pollutants which are generally present in the effluents of the textile, leather, printing, laundry, tannery, rubber, plastic, painting and other industries. The presence of very low concentrations of these dyes generates colored wastewater which produces toxicological and technical problems and environmental pollution. Anionic dyes are colored compounds that have highly soluble in water and have reactive groups which are able to form covalent bonds between dye and fiber, for that these dyes are the most widely used in the textile industry. Untreated disposal of this colored water into receiving water body causes severe damages to the human bodies and also to aquatic life. Thus, the removal of color dyes from wastewater before they are contacted with unpolluted natural water bodies are currently one of the major problems faced by the textile dyeing industry. Various physical, chemical and biological processes have been used for the removal of dye from aqueous solutions; such as adsorption, chemical precipitation, ion exchange, membrane processes, biological degradation, chemical oxidation and solvent extraction. Adsorption phenomenon in solution systems plays a vital role in many areas of practical environmental technology, which are mainly in water and wastewater treatment due to several advantages such as high efficiency, simple operation and easy recovery/reuse of adsorbent.

In this regard, montmorillonite-rich materials like bentonites exhibit highly interesting properties, e.g. high specific surface area, cation-exchange capacity (CEC), porosity, and tendency to retain water or other polar and non-polar compounds.

The aim of the present work is to investigate the possibility of new organo-bentonites as an adsorbent for removal of Bemacide dyes, which is, namely Red, Blue and Yellow, from aqueous solution by adsorption. Thus, organo-bentonites containing different organic cations (para, meta or ortho) bisimidazolium dichloride (MBIM) were prepared. The adsorption capacity of Telon dyes with modified bentonites was carried out using two kinetic models, which are the pseudo-second-order and first order. Finally, the experimental data were compared sing two isotherm equation, which are Langmuir and Freundlich.

The results show that bisimidazolium organo-bentonites could be employed as low-cost material for the removal of Bemacide dyes from effluents.

KEYWORDS : Pollution, Waste water, Dyes, Adsorption, Bentonite.

DIPHOSPHONIUM ION-EXCHANGED BENTONITE FOR BEMACIDE DYE REMOVAL FROM AQUEOUS MEDIA

BENAMAR Makhoukhi

Laboratory of Separation and Purification Technologies, Tlemcen University, BP119, Algeria
benamarmakh@yahoo.fr

ABSTRACT

Diphosphonium-intercalated bentonites (Bt) were prepared via ion exchange using para, meta and ortho bis(triphenylphosphoniummethylene)benzene dichloride (TPhPMB) in quantities not exceeding the cation exchange capacity. Adsorption tests applied to Bemacide dyes (Red, blue and yellow) revealed a significant increase of the maximum adsorption capacity from ca. 11-26 to 120-180 mg.g-1 after intercalation. This improvement was explained by an increased organophilic character towards the organic dyes investigated. The highest adsorption level was noticed for yellow dye on the p.diphosphonium organo-Bt, presumably due higher interlayer space and better diffusion. Dye adsorption turned out to strongly depend on pH, and low pH was found to increase the amount of adsorbed dyestuff. The dye adsorption was exothermal, and obeyed preferably pseudo first-order model for all three dyestuffs, but the process kinetics appeared to change over time. The adsorption isotherms were discussed in terms of Langmuir and Freundlich models.

KEYWORDS : Pollution, Waste water, textiles Dyes, Adsorption, Organo-Bentonite.

*The 5*th *Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

13

DESALINATION PLANT OF MERSA ELBREGA CHEMICAL COMPLEX: HEAT INTEGRATION LOWERING THE WATER COST FOR OVER 35 YEARS OPERATION

AL-HENGARI Salah [1],*, EL-BOUSIFFI Mohamed Ali [1], ELMOUDIR Walid [2]

[1]Libyan Petroleum Institute, P.O. Box: 6413, Tripoli – Libya, Tel. +218 92 4538805; Fax +218 21 4830031
[2]HTC CO_2 Systems Corporation, 001-2305 Victoria Avenue, Regina, Saskatchewan, Canada S4P 0S7 (306)
* Corresponding author: salah_alhengari@yahoo.co.uk

ABSTRACT

Desalination units in Area II at Mersa ElBrega Chemical Complex was constructed between 1977-1982 along with construction of the chemical facilities, which consists of two ammonia plants, two methanol plants, and two urea plants along with utilities plants and handling, storing and shipping facilities. Libyan Petroleum Institute, LPI, has carried out a study to evaluate the 7 thermal desalination units in operation. The multi stage flashing with brine circulation (MSF-BR) Germany technology is selected for these desalination units.

The plant has been satisfying the chemical complex requirements for desalinated water for industrial usage (80%) and demotic usage (20%) since they started their operation and they are still considered a reliable source in providing the water. The total water required is about 4.5 million cubic meter annually. The energy demand is met by heat integration with the urea plants in which the heating steam is generated as LP waste steam in these plants and utilized for heating in the desalination plant, lowering the cost of the processing and avoiding the need to burn fuel to generate the required heating steam.

The operating data and performance factors presented in this paper show the units are operating with very satisfactory indicators. Their cost of desalinated water has been assisted. The cost varies slightly but all units have cost below $1/m3 what is considered an international reference figure, actually the cost of water due to heat integration was estimated to be as low as $US 0.41/m^3 if the units operate at their design capacity.

KEYWORDS : Heat Integration, Desalinated water cost, multi stage flashing with brine circulation (MSF-BR)

RESPIROMETRIC EVALUATION OF THE SALT SHOCKS EFFECTS ON THE ACTIVATED SLUDGE ACTIVITY

ZAMOUCHE-ZERDAZI R.[*] , BENCHEIKH LEHOCINE M., MENIAIA-H.

Laboratoire de L'ingénierie des Procédés d'Environnement 'LIPE',
Faculté de Génie de Procédés Pharmaceutiques, Université Constantine 3, 25000 Algérie
* Corresponding author: E-mail address: docran@voila.fr

ABSTRACT

The floc formation in waste water treatment plant should be firm, dense, and mature in order to resist to shearing action and to be readily settleable in the secondary clarifier. The separation in secondary clarifiers is an important step to assure the effluent quality.

The composition of the activated sludge plays a significant role in floc formation and therefore in removal characteristics. Simultaneously, the flocculation occurrence and its properties are influenced by a series of physico-chemical factors.

The interruption of floc formation occurs whenever one of the significant components of floc formation is not properly developed or not developed in an adequate numbers or quantities. Several operational conditions are responsible for this interruption such as fluctuations in organic loading, low dissolved oxygen concentration, pH, mixing, temperature and salinity variations.

The waste water composition changed from simpler to more complex organic and inorganic compounds, the influence of the low and moderatesalt shock on the respiratory activity is detected for saltconcentration greater than 3 g NaCl L^{-1}.

Thebrusqueaddition of15 g NaCl L^{-1}ingestasignificant reductionof microbial activity, The rate reduction ofendogenous Rend% andexogenousrespiration Rexo% reached26.60% and78.96% respectively, at this levelofstress, the deflocation of aggregate is very apparent witha significantreduction offlocdiameterand an increase inthe turbidity of thesupernatant and capillary suction time(CST).

KEYS WORDS : deflocculation, respirometry, salinity, endogenous respiration, exogenous respiration

The 5th *Maghreb Conference on Desalination and WaterTreatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

15

EXPERIMENTAL OPTIMIZATION OF A SOLAR STILL USING SOLAR ENERGY

ZARZOUM K.[a], ZHANI Khalifa [b] and BEN BACHA H.[c]

[a,b]LASEM (Electromechanical Systems Laboratory), National Engineering School of Sfax, B.P. W3038, Sfax University, Tunisia
[c]College of Engineering at Alkharj, Salman Bin Abdulaziz University
BP 655-11946 – Alkharj, Kingdom of Saudi Arabia

ABSTRACT

Solar distillation is a promising method for the supply of freshwater to rural communities because water is the basic necessity for human along with food and air therefore fresh water demand is increasing continuously, because of the industrial development, intensified agriculture, improvement of standard of life and increase of the world population. The supply of drinking water is one of the major problems in developing countries. For this reason, purification of water supplies is extremely important.Solar distillation or desalination is a process to distill brackish/saline water by utilizing solar energy.Solar stills are used for solar distillation plants due to its simplicity in construction and operation, low cost and however theyield is low. Various active methods have been developed to overcome this issue. Because of its low productivity it is not popularly used. A lot of research work is undertaken to improve the productivity of the still. This paper presents the new design of solar distillation system coupled to a condenser, solar air and water collector and packed bed. This new concept of distiller solar still using humidification- dehumidification processes (HD) which is exploited for the desalination purpose. The productivity in a solar still mainly depends on the temperature difference between the evaporation tower water and the condensation tower for a given surface area.The results clearly show that the instantaneous efficiency increases with the increase of solar radiation and with the increase of feed water temperature. The obtained results were compared with those of other studies and the comparison gives a good validity of the present results. The experiment is carried out during the summer climatic conditions of Tunisia.

KEYWORDS : Solar still, solar radiation, humidification, dehumidification, desalination, condensation tower, evaporation tower.

HEAVY METALS IN SANITATION SYSTEMS

HABES Z., AMIRI R., MOKHNACHE S. Ali, CHAKRI N and MESSADI D.

Laboratory of Environmental and Food Safety, Address : University of Badji Mokhtar,
Email : zoubida.habes@hotmail.com

ABSTRACT

We seek to measure concentrations in the input and output substances in wastewater treatment plants in the city of Annaba in Algeria. This will allow us to understand their future and effectiveness of treatments performed at the levels of these waste water treatment plants. Efficient analysis techniques will be used : Chromatography, Torch Plazma and application of ionic-selective electrodes. For applications of the EIS, the analysis protocols are already developed.

KEYWORDS : chemical analysis, electrochemical method, Ionometry, waste water treatment plant, optimization

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

17

KINETIC AND EQUILIBRIUM OF PENICILLIN ADSORPTION ONTO DRIED BIOMASS

CHERIFI H. [1], BENTAHAR F. [2], HANINI S. [1]

[1]Université de Médéa, 26000 Médéa, Algérie

[2]Laboratoire des phénomènes de transfert, Université des Sciences et Technologie Houari Boumedien, Bab Ezzouar, BP 32 EL Alia, 16111 Alger, Algérie,[1,a]: E-mail : ha_cherifi@yahoo.fr

ABSTRACT

Studies carried out in several countries have showed the presence of more than 80 pharmaceuticals in urban wastewaters at concentrations ranging from the $ng.L^{-1}$ to the $mg.L^{-1}$[1-4].Antibiotics are potential pollutants being responsible for disturbing the wastewater treatment processes and the microbial ecology of surface waters. In the present work, the attention is focused on penicillin, a broad-spectrum antibiotic, widely used in human and veterinary medicine. Adsorption is a well established and powerful technique for treating domestic and industrial effluents. Activated carbon is the most widely, effectively and cost used adsorbent.

In our research, the focus is fixed on the removal of penicillin, which is one of the most widely used antibiotics in Algeria, from aqueous solution onto dried biomassto simulate the conditions of natural water. The effects of several factors including contact time, temperature, were discussed. The isotherms and kinetics of penicillin adsorption were studied to understand the adsorption mechanism of penicillin onto dried biomass.

Freundlich, Langmuir, Tempkin and Dubinin-Radushkevich (D-R) isotherms were used to analyze the equilibrium data at different temperatures. The results show that experimental data fit perfectly the Langmuir model with high correlation coefficient (R^2=0.99). The pseudo-first-order and pseudo-second-order kinetic models were applied to test the experimental data. The pseudo-second-order kinetic model provided the best correlation of the experimental data compared to the pseudo-first-order model. The thermodynamic constants of the adsorption process; $\Delta G\circ$, $\Delta H\circ$ and $\Delta S\circ$ were evaluated as -22.49 kJ mol^{-1} (at 45 $\circ$C), -41.60 kJ mol^{-1} and -64.54 kJ mol^{-1} K^{-1}, respectively. These showed that adsorption of penicillin on dried biomass was exothermic and spontaneous.

KEYWORDS : Adsorbent, antibiotic, Biomass, Adsorption, Adsorption kinetics, Adsorption isotherms

REFERENCES

Holm, J.H., Rugge, K., Bjerg, P.L., and Christensen, TH. ''Occurrence and distribution of pharmaceutical organic compounds in the groundwater down gradient of a landfill (Griendsted, Denmark)'', Environ Sci Technol, Vol. 29, No. 5, pp. 1415-20, 1995.

Ternes, TA. ''Occurrence of drugs in German sewage treatment plants andrivers'', Water Res, Vol. 32, pp. 3245-60, 1998.

Daughton, CG., and Ternes, TA. "Pharmaceuticals and personal care products in the environment: agents of subtle change?",

Environ Health Perspectives, Vol. 107, No. 6, pp. 907-38, 1999.

Hirsch, R., Ternes, T., Haberer, K., and Kratz, KL. ''Occurrence of antibiotics in the aquatic environment'', Sci Total Environ, Vol. 225, pp. 109-18, 1999.

EFFECT OF INTERNAL AND EXTERNAL PARAMETERS ON THE PERFORMANCE OF SOLAR STILL

TRAD Abderachid[a*]

Department of Climatic engineering, University of Fères Mentouri, Constantine.
[a] Laboratory of Environmental Engineering, University of Constantine 3, Algeria
E-mail : rachidtrade@yahoo.com ; Tel. +213 (0)776 08 22 42; Fax. +213 (0)32567372.

ABSTRACT

The present work isa contribution for reducing problem of luck of water by using the solar distillation means. Our study proposed a model of solar still is mainly based on the observation, under climatic conditions of the area of Constantine (Eastern Algeria).

A theoretical approach is used to simulate the behavior of some internal and external parameters related to the solar-still and as well as the temperature difference between the evaporation surface and that of the condensation, internal heat transfer, water depth, wind velocity, solar radiation, ambient temperature, external heat transfer and their change in time as well as their effects on the system performance during a sun shining period. The obtained results show that: The productivity is strongly related the solar radiation in the best direction of the still .A large temperature difference between the glass and the water surface improves the daily production; this is related to the importance of solar radiation during the day. The system gives higher productions and higher efficiencies in the case of shallow waters. The daily yield increases when the wind velocity increases until this latter reaches a critical value equals to 10m/s, where production reaches its maximum. The internal and the external heat transfers affect directly the performance of the unit of solar still in relation with solar radiation.

KEYWORDS : Solar still, internal parameters, external parameters, performance.

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet, Tunisia 21-24 December, 2015

19

STUDY OF THE COUPLING OF MULTI EFFECTS DESALINATION UNIT TO SOLAR PARABOLIC TROUGH CONCENTRATOR (MED-PT) IN THE SOUTHERN REGION OF ALGERIA

ABBAS M. [1], HAMADENE A. [2], ABURIDEH H. [1] and TIGRINE Z. [1]

[1]Unité de Développement des Equipements Solaires/UDES Centre de Développement des Energies Renouvelables/CDER, 42415.W. Tipaza. Algérie

[2]Departement de Mécanique, Université Saad Dahleb, Blida, Route de Soumaa, 9000.

E-mail : abbasdreams@gmail.com

ABSTRACT

In this paper, a mathematical model based on energy and economic analysis has been developed for modeling and simulation of the performances of a Multi Effects Distillation unit coupled to a parabolic trough solar concentrator (MED-PT) for brackish water in the southern region of Algeria. This technique provides only fresh water [1]. The MED-PT system has been divided into four main subsystems: the evaporator subsystem, the condenser subsystem, the ejector sub system and finally the parabolic trough concentrator subsystem. An economic model has been also developed in the last part of this work in order to study the economic feasibility of large scale MED-PT desalination system. A global model of the proposed system has been solved and the results have been presented and analyzed. The effects of some geometric parameters have been investigated. Comparative study between MED-PT and RO-PT (reverse osmosis coupled to parabolic trough plant which can provide fresh water and electricity) has been presented. The results show clearly that the MED-PT technology may provide a key solution for freshwater deficit in the southern area of Algeria.

KEYWORDS : Thermal desalination, Water, Evaporator, Distillation, MED, Solar energy, Environment.

[1] M.A. Sharaf, A.S. Nafey, Lourdes García-Rodríguez, Exergy and thermo-economic analyses of a combined solar organic cycle with multi effect distillation (MED) desalination process ,Desalination, Vol.272, P.135-147 (2011).

[2] I. J. Esfahani, A. Ataei b, V. Shetty K, TaeSuk Oh,J. H. Park, C. Yoo, Modeling and genetic algorithm-based multi-objective optimization of the MED-TVC desalination system, Desalination, Vol.292, P.87-104 (2012).

ADSORPTION DES MÉTAUX LOURDS PAR LA MARNE ARGILEUSE EN SOLUTION AQUEUSE

BENGUELLA Belkacem

Université de Tlemcen, Faculté des Sciences, Département de Chimie,
Laboratoire de Chimie Inorganique et Environnement
E-mail : belkacem_71@yahoo.fr

ABSTRACT

The objective of this study is the examine the clay's retention efficiency (marne) of heavy metals by non-destructive depollution methods (adsorption) and their disposal. Among the used techniques adsorption has shown a practical interest for the removal of the studied heavy metals: iron, nickel and cobalt in the marne (clay category) close to the structure of the bentonite. However its performance depends on certain factors (temperature, pH and stirring speed. The affinity of heavy metals on the marne is Fe> Co> Ni. Diffusion studies have shown the performance of the marne to remove metal contaminants.

KEYWORDS : Adsorption, iron, nickel, cobalt, marne .

POLYMERIC ANION EXCHANGE MEMBRANE MODIFIED (PAEM$_m$) AND ELECTRODIALYSIS

OUNISSI T. [a], SELMANE BEL HADJ HMIDA E. [ab], FAUVARQUE J. F. [c]

[a]*Laboratoire de Chimie Analytique et d'Électrochimie, Département de chimie, Faculté des Sciences de Tunis,Campus Universitaire, 2092 Tunis El Manar, Tunisie*
[b]*Institut Préparatoire aux Etudes d'Ingénieurs d'El Mana, Tunis*
[c]*Laboratoire d'Électrochimie Industrielle, Conservatoire National des Arts et Métiers (CNAM) de Paris, 2 rue Conté, 75003 Paris, France*
E-mail : emna.selmane-belhadj@laposte.net   ;   emnaselmane@gmail.com

ABSTRACT

Caused especially by agricultural and industrial activities, many countries confront an excess of nitrate in groundwater so they are concerned with minimizing their effects on human health and environment.

In this work, we study the possibility to eliminate this excess of nitrate by electrodialysis using a new polymeric Anion Exchange Membrane: PAEM$_m$ (modified with nitrate complexant). First, we study the influence of time of electrodialysis and current intensity on elimination of nitrate. Then, we examine the selectivity of PAEM$_m$ towards nitrate and different anions (alone and mixed with nitrate) while comparing it reaction or behaviour with PAEM (without complexant) in order to understand the role of complexant inside the membrane. Last but not least, we have applied an application of this treatment on real water from a well of Cap bon, Tunisia and we found that about 93% of nitrate was eliminated after one hour and 25 minutes.

KEYSWORDS : PAEM$_m$; Electrodialysis ; selectivity.

ANIONIC MEMBRANE MODIFIED AND BEHAVIOR WITH SYNTHETICS AND REAL WATER IN ELECTRODIALYSIS

SELMANE BEL HADJ HMIDA E.[ab], OUNISSI T. [a], REKIK M., FAUVARQUE J. F. [c]

[a]Laboratoire de Chimie Analytique et d'Électrochimie, Département de chimie, Faculté des Sciences de Tunis,Campus Universitaire, 2092 Tunis El Manar, Tunisie
[b]Institut Préparatoire aux Etudes d'Ingénieurs d'El Mana, Tunis
[c]Laboratoire d'Électrochimie Industrielle, Conservatoire National des Arts et Métiers (CNAM) de Paris, 2 rue Conté, 75003 Paris, France
E-mail : emna.selmane-belhadj@laposte.net   ;   emnaselmane@gmail.com

ABSTRACT

Alkaline solid electrolytes have been developed for many years in the Industrial Electrochemistry Laboratory of CNAM [1-2] in order to produce membranes for use in fuel cells. One of these membranes was obtain an insoluble polymeric anion exchange membrane (PAEM). The measure of its efficiency for the electrodialysis of nitrite and nitrate solutions prepared in the laboratory is tested [3]. A similar kind of membrane (PAEMM: polymeric anion exchange membrane modified) can be obtained from ERAS-Labo, a small chemical company located in Sait-Nazaire-Lès-Eymes (France).The modification consists in the introduction of a complexing of the nitrate ions in the membrane to obtain the anionic membrane with the Tris-[2-(4-tert-butylbenzoyl)aminoethyl]amine (TBBAEA) [4].

In this study, we have used the above mentioned PAEMM in order to measure its efficiency for the electrodialysis of nitrite and nitrate solutions prepared in the laboratory. Electrodialysis with our PAEMM membrane gives good results, with both nitrate and nitrite test solutions becoming depleted in the central compartment.

KEYWORDS : Electrodialysis ; membrane ; $PAEM_m$; nitrates and nitrites.

[1] J.F. Fauvarque, S. Guinot, N. Bouzir, E. Salmon and J.F. Penneau, Alkaline poly (ethylene oxide) solid polymer electrolytes, application to nickel secondary batteries. Electrochim.Acta., 40 (1995) 2449–2453.

[2] N. Vassal, E. Salmon and J.F. Fauvarque. Nickel-Metal hydride secondary batteries using an alkaline solid polymer electrolyte. J. Electrochem. Soc., 146 (1999) 20–26.

[3] E. Selmane Bel Hadj Hmida, A. Ouejhani, G. Lalléve, J.F. Fauvarque, M. Dachraoui,A novel anionic electrodialysis membrane can be used to remove nitrate and nitrite from wastewater. Desalination and Water Treatment 23 (2010) 13–19.

[4] Joaquˊın A. Ortuˇno, Rosario Expˊosito, Concepciˊon Sˊanchez-Pedreˇno,Marˊı Isabel Albero, Arturo Espinos, A nitrate-selective electrode based on a tris(2-aminoethyl)amine triamide derivative receptor. Analytica Chimica Acta 525 (2004) 231–237.

STUDY ON THE REMOVAL OF TURBIDITY AND COLOR RELATED TO THE PRESENCE OF IRON IN THE NATURAL WATER BY ADSORPTION ON COLUMN BY CHARCOAL OF ALEPPO PINE WOOD

RUITI Manel, BEN THAYER Béchir [a]

Laboratory of Chemistry and Water Quality – Department of Management and Environment
High Institute of Rural Engineering and Equipment – Medjez El Bab – Tunisia
E-mail : rouitimanel@gmail.com

ABSTRACT

The aim of our work is to minimize the concentration of iron in a natural water (spring water) to solve the major aesthetic problems associated with the presence of the metal in the water, such as turbidity and color.

In this context, we studied the removal of color and turbidity of mineral origin linked to the presence of iron by adsorption column by charcoal of Aleppo pine.

The results obtained show a decrease in the turbidity of 88.2 NTU at 33.6 NTU with charcoal powder and to the 39.6 NTU with charcoal in grain form. As well as, the reduction of color of 431pt-Co to the 56 pt-Co with charcoal powder and 52 pt – Co with charcoal in grain form.

KEYWORDS : Iron – Turbidity- color – adsorption column- Charcoal

THE ELIMINATION OF PENICILLIN V BY A MEMBRANE PROCESS
OF TANGENTIAL MICROFILTRATION

SAMAI Messaouda, CHIKHI Mustapha

Laboratory of Environmental Engineering Processes
Department of Environmenta Engineering, Faculty of Pharmaceutical Engineering Processes
University of Constantine 3. ALGERIA
E-mail : Samai.sousou@gmail.com

ABSTRACT

The elimination or the recovery of penicillin V realized by the use of a membrane process which is tangential microfiltration with a ceramic membrane which her size of pore 0.2 µm, for a constant concentration 0.5 g/L of the initial solution. The assembly carried in laboratory for recovered penicillin V, one followed the turbidity of permeate and retentate according to times for different value from pH and the transmembrane pressure. The study expresses that the turbidity of the permeate decreases with the increase in time and the reverse for retentate which means the recovery of penicillin V and turbidity becomes significant for the pH 11, the variation of the turbidity of the perméat decreases with the increase in the transmembrane pressure, and notices some the reverse for retentate.

KEYWORDS : Tangential microfiltration, penicillin V, ceramic membrane, turbidity.

*The 5ᵗʰ Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

25

REMOVAL OF TURBIDITY FROM GHDIR EL GOLLA NATURAL WATER: A COMPARATIVE STUDY BETWEEN ELECTROCOAGULATION AND CHEMICAL COAGULATION PROCESSES

ATTOUR A.[a,b], BRAIK S.[b], BEN AMOR M. [a], LAPICQUE F. [c], LECLERC J.-P. [c]

[a] Laboratoire de Traitement des Eaux Naturelles. Centre de Recherches et technologies des eaux, Technopole de Borj-Cédria, 8020 Soliman, Tunisie.
[b] Institut Supérieur des Sciences et Technologies de l'Environnement, Technopole de Borj-Cédria, Tunisie
[c] Laboratoire Réactions et Génie des Procédés, UPR3349 CNRS - Université de Lorraine, 1 rue Grandville, B.P. 20451, Nancy, France.

ABSTRACT

Experimental tests have been conducted to assess the effectiveness of electrocoagulation (EC) which has been compared with chemical-coagulation (CC) process for removal of turbidity from Ghdir El Golla natural water. To determine the most appropriate technique, we focus on turbidity removal efficiency, cost of processing and preservation of the environment. Different operating parameters such as initial turbidity of raw water, initial pH, temperature, salinity and Chimfloc flocculant concentration were successively investigated. Experiments were conducted in jar test for CC and in a small batch reactor for EC. For CC, two coagulants are tested: Aluminium Sulfate [$(Al_2SO_4)_3$, 14 H_2O] and ferric chloride [$FeCl_3$]. For EC, two types of electrodes are tested: Aluminium and iron electrodes.

It was found that for both processes, more the turbidity of water is increasing more the amount of coagulant in CC and electrolysis time in EC increase. For both processes, the optimal working pH value was found to be 7 for aluminum and 8 for iron. Effects of temperature, often disregarded in the literature shows that treatment rate is strongly increased with temperature. For EC, turbidity removal efficiency is improved when salinity (conductivity) is higher. Whereas, salinity decreases turbidity removal efficiency for CC process. The flocculant (Chimfloc) addition improves treatment with CC and EC.

For CC, the Aluminium Sulfate treatment is cheaper than ferric chloride treatment. For EC, treatment with aluminium electrodes is cheaper than treatment with iron electrodes.

A comparative study between EC and CC processes for turbidity removal efficiency shows that independently on metal used, EC treatment is cheaper than CC.

KEYWORDS : Electrocoagulation, Chemical Coagulation, Aluminium, Iron, Turbidity, optimization.

ETUDE DES AILETTES DE REFROIDISSEMENT AU NIVEAU DU DISTILLATEUR SOLAIRE À EFFET DE SERRE

SMAKDJI Nafila[1], KAABI Abdennacer Erreur ! Signet non défini.**[1], BERNARD Lips [2]**

1/Département de Génie Climatique, Université de Constantine 1, Algérie
Email: nafila_smakdji@yahoo.fr
2/Centre Thermique de Lyon, CETHIL, UMR CNRS 5008/INSA Lyon/UCB Lyon1, Villeurbanne, France

RÉSUMÉ

Depuis la création de l'univers, l'atmosphère est l'enveloppe gazeuse essentielle pour que la vie sur terre soit possible, sans elle, il ferait un froid invivable. Actuellement et depuis le dernier siècle, le monde entier a remarqué une réelle perturbation climatique, due à l'augmentation des gaz à effet de serre dans l'atmosphère, essentiellement provoquée par l'amplification des activités humaines liés à la croissance de la population mondiale, nécessitant une production alimentaire accrue qui génère une agriculture intensive exigeant l'utilisation d'engrais artificiel et de pesticide, libérant du N_2O. La révolution industrielle a également favorisé l'augmentation du CO_2 dans l'atmosphère, à cause de l'utilisation des énergies fossiles dans l'industrie d'une manière exclusive, l'excès de CO_2 et du N_2O dans l'atmosphère a provoqué un blocage de la chaleur autour de la Terre, cela a engendré une hausse de la température moyenne terrestre provoquant ainsi des émissions de gaz à effet de serre due à l'évaporation de l'eau. Toutes ces évolutions conduisent vers un réchauffement planétaire toujours croissant avec des conséquences d'ores et déjà réelles et dévastatrices, notamment, les inondations et la sécheresse. La sécheresse, ce phénomène est à l'origine de la dégradation de certaines ressources en eau douce, un rapport récent de l'UNICEF et de l'OMS indique que nombreux pays souffrent de pénurie en eau de qualité et de quantité satisfaisante. L'idée serait de réduire ce problème catastrophique par l'utilisation de la distillation solaire, qui se produit dans un distillateur solaire, afin d'augmenter le rendement de ce dernier, des ailettes de refroidissement ont été monté sur la couverture, l'étude de ce dispositif serait donc nécessaire.

Mots clés : changement climatique, stockage thermique, énergie solaire, eau saumâtre, distillation solaire, ailettes

EFFECT OF COATINGMETHODS AND CYCLIC VOLTAMMETRY ON ELECTROCHEMICAL DEGRADATION OF AMARANTH DYE USING STAINLESS STEEL/PBO$_2$ ANODE

ELAISSAOUI Ines, AKROUT Hanene, BOUSSELMI Latifa

Laboratory of Wastewater Treatment, Center of Water Research & Technology (CERTE)
Borj Cédria PB 273, Soliman 8020, Tunisia.
latifa.bousselmi@certe.rnrt.tn   ;   issaouines@yahoo.fr; hanene.akrout@yahoo.com

ABSTRACT

The main goal of the present contribution is to investigate the influence of preparation methods of PbO$_2$ anodic layer on the electrochemical activities of PbO$_2$ deposited onto stainless steel (AS30). The coating layers were electrodeposited using galvanostatic (G), pulsed current (PC) and cyclic voltammetry (CV) methods. Anodic oxidation of solutions containing Amaranth dye, was studied to evaluate the use of these electrodes as anodes in environmental issue in terms of COD and color removals. The Field emission scanning electrons microscope (FESEM) and X-Ray diffraction (XRD) were used to characterize the surface morphology and crystal structure of different electrodes with CV effect. It was found that the structural morphology of PbO$_2$ has different shape and was changed and depended on the number of CV applied. Depending on the method used, the initial ratio of α- and β-PbO$_2$ in samples will vary. As well the ratio of PbSO$_4$ increases throughout the cyclic number of CV applied. Electrochemical behavior of the prepared samples was investigated by cyclic voltammetry and Electrochemical Impedance Spectroscopy (EIS) techniques. EIS results revealed that the charge transfer resistance significantly decreased because the lead sulfate layer is more compact and the access of electrolyte ions to the internal layer is blocked. The color and the COD removals on electrode PbO$_2$ (G) with one cyclic number of CV achieved nearly to 100% and 85%, respectively, comparing to 97% and 83% using PbO$_2$ (PC) electrode with one CV at acidic pH and during 5h electrolysis.Quantitative determinations of the rate of decay of the concentration of amaranth dye were performed by High performance Liquid Chromatography (HPLC). It was concluded that preparation methods and Cyclic Voltammetry behavior could controllably affect the structure of PbO$_2$films, which further played important role in the performance on dye degradation.

KEYWORDS : Electrodeposition, PbO$_2$, Cyclic voltammetry, Stainless steel, Degradation, dye.

REMOVAL OF AMOXICILLIN AND AMPICILLIN ANTIBIOTICS FROM AQUEOUS SOLUTION USING AN ANIONIC SURFACTANT

BOUKHELKHAL Asmaa, BENKORTBI Othmane, HANINI Salah

Biomaterial and trensport phenomena laboratory, Chemical Engineering and Environment Department, Faculty of Science and Technology, University of Médéa, 26000, Medea-Algeria

ABSTRACT

In the recent years, the occurrence and fate of pharmaceutically active compounds in the aquatic environment has been recognized as one of the emerging issues in environmental chemistry. Among pharmaceuticals, antibiotics are the most widely used family of drugs for improving human health, preventing and treating animals and plants infections as well as for promoting growth in animal farming and aquaculture operations. All these applications made antibiotics to be released in large amounts in natural ecosystems. They have been detected in many environmental samples worldwide including wastewater treatment plant effluents, hospital sewage water, surface water, seawater, rivers and groundwater.

The presence of antibiotics in the environment is of concern because they could change microbial ecology, increase the proliferation of antibiotic resistant pathogens and provoke toxic effect on aquatic species and negative effect on human health. For these reasons, effluent containing antibiotics needs to be treated to prevent the adverse effects from contaminated water. Several methods have been attempted for the removal of antibiotic drugs from different water matrix. These include coagulation, biodegradation, chlorination, oxidation processes, nanofiltration, ozonation and adsorption. Out of these, adsorption processes have proved to be an effective technique because of major advantages such as applicability over a large concentration range of sorbate, effective removal efficiency, low instrumentation cost, and the presence of many rate-controllable parameters.

Surfactants are amphiphilic molecules consisting of polar (hydrophilic) and non-polar (hydrophobic) parts. These molecules are of great importance because their amphiphilic structure is responsible for causing them to concentrate at interfaces or to self-assemble to form various micellar structures. This micellization phenomenon occurs as a result of a delicate balance between various repulsive and attractive forces present in their solutions. In the past decades, micellar systems have attracted much attention as a novel method for separating many biological product.

The objective assigned to this work is a contribution to the elimination of antibiotics from a contaminated aqueous medium by using a new technique of separation by means of surfactants. For this purpose, an anionic surfactant, sodium dodecyl sulfate (SDS) was used for the treatment of a complex liquid medium composed of two antibiotics namely amoxicillin and ampicillin. The chromatographic method (HPLC) was used as a means of analysis for the treatment of the results. The main parameters influencing the process were studied such as the contact time, the agitation speed and the initial concentration of effluents. The results obtained confirm the interest of the proposed technique. Thus, a removal rate of 59.76% to 72.73% of ampicillin and amoxicillin has been reached in the optimal conditions.

KEYWORDS : Amoxicillin, Ampicillin, Antibiotic, Anionic surfactant, Sodium dodecyl sulfate, Aqueous solutions, Removal, Environment, Pharmaceutical effluent. Treatment.

ON THE USE OF SOLAR VACUUM MEMBRANE DISTILLATION AS AN INTEGRATED DESALINATION PROCESS FOR THE TREATMENT OF REVERSE OSMOSIS BRINES : A CASE STUDY FROM THE SOUTH OF ALGERIA

TRIKI Z. [a,*], BOUAZIZ M. N. [b], BOUMAZA M. [a]

[a]Laboratory of Biomaterials and Transport Phenomena, Department of Process and Environmental Engineering, University of Médéa, Médéa, Algeria
Tel. + 213 (0) 25588466, Fax: + 213 (0) 25581253 ; email: triki.zakaria@univ-medea.dz
b Department of Chemical Engineering, College of Engineering, King Saud University, Riyad, Saudi Arabia

ABSTRACT

Reverse osmosis (RO) is currently the main technology used for desalination. However, main drawbacks of this technology are the limited recovery and the environmental impact of the rejected brines. The aim of this work is to investigate the opportunity of using solar vacuum membrane distillation (VMD) in an integrated RO desalination process in order to reduce brine discharge volume and increase RO global recovery ratio. A small RO desalination unit operated by solar energy in a real site in the Algerian desert is considered for the feasibility study. The obtained results show that important permeate fluxes can be reached maintaining high salt rejection. Brine volumes can so be reduced significantly and recovery ratio increased from 37% to nearly 87.5%. Finally, VMD coupling with solar thermal collectors, in order to obtain high temperature and so high permeates fluxes, allow an important reduction of the energy requirement.

KEYWORDS : Vacuum membrane distillation, Reverse osmosis desalination, Brine disposal, Solar thermal collector, Energy saving.

STUDY OF THE EFFECTIVENESS IBN ZIAD STATION TO PURIFY URBAN AND INDUSTRIAL WATER FOR THE CONSTANTINE CITY USING ACTIVATED SLUDGE

GHIZELLAOUI Souheila [a], GHIZELLAOUI Samira*[b],

[a] Ecole Nationale Supérieure de Biotechnologie, Ali Mendjli BP.E66 25100, Constantine, ALGERIE.

[b] Department of Chemical, University des Frères Mentouri, Route de Ain El Bey 25000 ALGERIA.

Email : gsamira@yahoo.com, Tel/Fax: +213 31 81 11 77

ABSTRACT

Water is becoming increasingly important in the daily life of the human being as a result of rising living standards, rapid technological advances and a growing population. Show those important in different ways commensurate with the needs of modern man in the continuous improvement of the quality of water intended for drinking and increasingdomestic of household and industrial, as well as continued interest in and great public utilities used for waterRosarypools and stadiums ...

However, the increasing human consumption of water find the problem of pollution of surface water , and the subsequent risk to the environment and living organisms from plants and humans .So it seemed pollution with the emergence of human populations and through a household wastewater containing fats , Nitrogen materials, Carbon hydrates ... , but with the passage of time and the evolution of the industry , the back of another kind of pollution caused by industrial waste , and considered this kind of the most important and the most dangerous types of pollution in the present age and is a leftover liquid .We get them after the process of converting raw materials into materials manufacturer. what distinguishes industrial wastewater is the presence of substances with the original organic or mineral on different forms (solid , liquid, decadent, or semi- decadent (colloidal)) , as well as its presence in the form of ions for metallic materials on the one hand , the other hand can be these materials are to retreat , and be treated in this case the use of particle micro-organisms , such as plant Ibn Ziad working to purify wastewater and part of the urban industrial water as the company national rail transport and manufacturing company tractors agricultural Constantine .

And the main objective of this study is to determine the effectiveness of Ibn Ziad station that address daily about 200 L / sec and by conducting chemical analysis of raw water when entering the station , as well as water- processor to see how his approval standards for wastewater.

According to the obtained results, we conclude that the pH and the dissolved oxygen meet the standards. What is more, an important decrease of the organic matter represented by the COD and BOD_5 is to be noted.

The experiments conducted to verify the settling, by measuring the volume of muds indicator, showed that the settling is made in proper conditions, assured by controlling this indicator regularly.

KEYWORDS : Water; Urban; Industrial; Pollution; COD; BOD_5.

STUDY OF THE EFFICIENCY OF SI/BDD ELECTRODE IN NITRATE AND ORGANIC MATTER REMOVALS OF DIFFERENT REAL EFFLUENTS

GHAZOUANI Mouna [a,b], AKROUT Hanene [a], BOUSSELMI Latifa [a]

[a] Wastewater treatment laboratory, Water Research and Technologies Center (CERTE) Echopark Borj Cedria Touristic road of Soliman, BP 273, 8020, Tunisia.

[b] National Institute of Applied Sciences and Technology of Tunis (INSAT), BP 676, 1080 Tunis Cedex, Tunisia.

Abstract

Born-doped diamond (BDD) is an efficient electrode material that is able to eliminate high levels of nitrate and formed by-products, especially nitrite and ammonia, and also biorefractory and recalcitrant organic pollutants from wastewaters. In this study, four real effluents; Wadi El Bay, Aquaculture wastewater, Municipal wastewater plants and Human Urine are tested. The electrolytic cell used contains Si/BDD as anode and cathode material without any reagent addition, the treatment is performed at applied a current density of 37.5 $mA.cm^{-2}$. Effluents characterization before treatment indicates that nitrogen pollution exists as ammonium/ammonia and nitrate forms with a low level in the Wadi, average level in the STEP and Aquaculture, and a high level in the Human Urine. An important organic pollution is also found proved by the high COD and TOC values with low contents recorded for Wadi effluent (COD = 213.60 mg $O_2.L^{-1}$ and TOC = 90.40 $mg.L^{-1}$) and a highest levels for Human Urine effluent (COD = 16550 mg $O_2.L^{-1}$ and TOC = 2365$mg.L^{-1}$). Results proved the performance of BDD electrode on the removal of coexistent pollutants (nitrate, ammonium/ammonia, nitrite and organic pollutants) in four studied matrix. In the case of low and average pollution a total nitrate removal is obtained after 180 minutes of treatment with traces of nitrite and low amount of ammonia/ammonium. As well as, COD ant TOC removals are rapid and reach more than 60% after 45 minutes of electrolysis. In the case of Human urine, the pollutant removals are important but more treatment time is necessary to achieve a total elimination. The possibility of the reuse of the four treated effluents is also verified in this study by the phytotoxicity test.

KEYWORDS : BDD, real effluents, nitrate, organic pollutants, phytotoxicity.

INHIBITIONOF SCALING IN HARD WATER

GHIZELLAOUI Samira *, MENZRI Rayane

Department of Chemical, University des Frères Mentouri, Route de Ain El Bey 25000 ALGERIA.
Email: gsamira@yahoo.com, Tel/Fax: +213 31 81 11 77

ABSTRACT

The formation of compactand adherent deposits by ground water Hammain domestic and industrialinstallationsled toserious economicandtechnical consequences. These watersare very rich inbicarbonates (412mg/L) and calcium (146mg/L)witha temperatureof around 30 °C,which explains theirhighscaling power.

In this studywe usedthe controlledrapid precipitationmethod (CRP) to test the effectiveness ofQRT (inhibitor) against the formation of scalebecause thechemical inhibitionis the mostused procedureto prevent it.

The results show thatthis inhibitoris able to delayandinhibitthe formation of tartar. In fact, the germination time increasesfrom 45mintothe raw water to55 minforthe treated waterwitha concentration of0.05mg/L, so anefficiencyof about42.46%. This effectiveness increases with increasing the concentration, it reaches 100% with the addition of40 mg/L, whichgivescomplete inhibition ofthe formation of calciumcarbonate.

KEYWORDS : bicarbonate; calcium; scaling power, QRT(inhibitor);CRP.

STUDIES OF METHYLENE BLUE REMOVAL EFFICIENCIES FROM AQUEOUS SOLUTIONS THROUGH PHOTOCATALYTIC PROCESS IN PRESENCE OF HEAVY METAL

AZZAZ Ahmed Amine[1,2], ASSADI Aymen Amine[3], BOUZAZA Abdelkrim[3],

JELLALI Salah[1], BOUSSELMI Latifa [a], WOLBERT Dominique[c]

a: Wastewater treatment laboratory, Water Research and Technologies Center, BP 273, 8020 Soliman, Tunisia.

b: University of Carthage, Faculty of Sciences of Bizerte 7000, Tunisia.

c: Laboratoire des Sciences Chimiques de Rennes, Equipe Chimie et Ingénierie des Procédés, UMR 6226 CNRS, ENSCR-11, allée de Beaulieu, CS 508307-35708 Rennes, France.

ABSTRACT

The discharge of industrial effluents loaded with dyes into the environment is a huge concern due to its toxic effects on both ecosystem and human health [1]. Many techniques were tested and used for dyes removal from aqueous solution such as biological degradation, membrane filtration, and anodic oxidation. These techniques were characterized with a huge consumption of chemicals and energy [2]. In the present study, we investigated the removal of methylene blue (MB), a cationic organic dye, from aqueous solutions through photocatalysis process using TiO_2 as catalyzer in the presence of external UV under different experimental conditions of initial dye concentrations, pH of the solutions, TiO_2 doses and initial NaCl concentrations. A special attention has been paid to the treatment efficiency of a real effluent in the presence of MB and a heavy metal, namely zinc (Zn). The effect of the molar ratio Zn^{2+}/MB in the solution at different values of pH and NaCl concentrations was also followed. The experimental results showed that at low values of Zn^{2+} in the solution (30 mg/L), the kinetic of the MB removal was fastened until reaching an optimum then was slowed down at higher concentrations. This behavior could be explained by the fact that at low zinc concentrations, Zn^{2+} ions could be incorporated in the photocatalytic process because of its photonic character. At high concentrations, zinc is more susceptible of consuming radicals due to the competition effect [3]. On the other hand, it appears that the MB kinetic removal decreases with increasing salt concentration in the solution. No photocatalytic degradation of zinc ions was recorded.

KEYWORDS : Photocatalysis, combined pollution, methylene blue, heavy metal.

REFERENCES :

[1] Rafatullah, M., Sulaiman, O., Hashim, R., Ahmad, A., 2010. Adsorption of methylene blue on low-cost adsorbents: a reviewJ. Hazard. Mater. 177, 70-80.

[2] Aazam, E.S., 2014. Photocatalytic oxidation of methylene blue dye under visible light by Ni doped Ag_2S nanoparticles. J. of Industrial and Engineering Chemistry. 20, 4033-4038.

[3] Rauf, M.A., Meetani, M.A., Hisaindee, S., 2011. An overview on the photocatalytic degradation of azo dyes in the presence of TiO_2 doped with selective transition metals. Desalination, 276 (1-3), 13-27.

CORROSION AND SCALING PROBLEMS IN LIBYAN SEA WATER DESALINATION PLANTS

ELWAER Abdulhamid M., ELHAMILE Giuma M., HAKAM Ahmed A.

Planning, Studies & Development department, General Electricity Company of Libya

E-mail: a_elwaer2010@yahoo.com

ABSTRACT

Libya started to build up many desalination plants along seacoast and some interior city areas to face sacristy of pure water, which is due to, limited resources. General Electricity Company of Libya (GECOL) which is one of the biggest companies in Libya has been taking care of installing desalination plants since early seventies. The company constructed a good number of desalination plants with different capacities. Following are the gradual developments in these technologies. GECOL is the first company with fast experience in this industrial desalination plant with the main target of producing domestic water and industrial water for power generation.

The purpose of this paper is to describe complete survey of all installed desalination in Libya, and also a future plane for new desalination plants in Libya, and describes the problems associated with desalination process .

KEYWORDS : Desalination, Libya, sacristy, pure water and domestic water

IMPACT OF STARCH GLUE PRESENCE IN LIQUID PHASE ON BUBBLE HYDRODYNAMIC IN ELECTROFLOTATION PROCESS

HMIDI Khaoula, KSENTINI Issam, BEN MANSOUR Lassaad *

Laboratory of Applied Fluid Mechanics, Process Engineering and Environment,
Science Faculty of Sfax, B.P.1171, 3000 Sfax, Tunisia,
*E-mail : Lassaadbenmansour@yahoo.fr

ABSTRACT

For years, the biphasic process gas/liquid has been developed to reduce better the environmental impact of industrial effluent. This work presents the treatment of liquid effluent rich in starch glue by electroflotation process in batch mode. A gas/liquid hydrodynamic study was performed which consist to determine the diameter, the ascension velocity, the size distribution of bubbles and Reynolds in order to understand the mechanism of separation by bubbles and to improve the performance of this process.

KEYWORDS : hydrodynamic, starch glue, electroflotation

APPLICATION OF CAPACITIVE DEIONIZATION (CDI) TO NH_4^+ , PB^{++} AND CR^{6+}

POLLUTANTS REMOVAL

SENOUSSI H [1,b] and BOUHIDEL K. E. [1,a]

[1,] Laboratory of Chemistry & Environmental Chemistry LCCE , Team : Water Chemistry , Environment & Desalination .
Faculty of Sciences, University Hadj Lakhdar Batna 05000 a Algeria.
[a] Corresponding author   email : bouhidel@lycos.com
[b] Presenting author   email: hasna_senoussi@hotmail.fr

ABSTRACT

This research work deals with the removal of pollutants (NH_4^+ , Pb^{++} and Cr^{6+}) by CDI on activated carbon electrodes in a laboratory scale cell .Very important research efforts , high investments and an increasing interests are accorded to desalination by CDI and to electrosorption derived processes . This is illustrated by M.A. Anderson, P.M. Biesheuvel [1], L. Zou [2] &[3],…very recent scientific production .

Pollutants removal by electrosorption is not new . Conway & al. [4] , [5] &[6] have studied extensively the removal of organics , sulphur compounds, thiocyanate [7] and inorganics such as chromate . However the mechanisms and the electrochemical behaviour of most chemicals on activated carbon surface are not well understood. The desalination cations Na^+, K^+, Ca^{++}, Mg^{++}, HCO_3^-…are electrochemically inactive and their removal is explained by a double layer mechanism [8] which cannot be generalized to other ions with specific electrochemical and surface properties. Hexavalent chromium is a good example .This anion is expected to be removed easily on anodic surfaces in alkaline solutions by a double layer mechanism , however our test is negative : it is not removed . In acidic pH the efficiency is better . Other examples related to desalination are F^- and B . CDI is well adapted to brackish waters . Are F^- and borates removed by CDI ? The answer is not evident and needs research . These previous examples show ,both , :

An important research need to understand the CDI behaviour of a great variety of solutes , pollutants and micropollutants. Surface and interfacial (electro)chemistry , fundamental solution chemistry (hydration , polarizability ,…) are other and not easy interfacial topics .

A better fundamental understanding will open high perspectives such as selective separations and removal and very large applications.

In this research we study 3 synthetic solutions which simulate 3 industrial or domestic waste waters: The first is an ammonium NH_4^+ which is similar to K^+, however in CDI (fig.1) they differ: contrarily to Na^+ and K^+ , NH_4^+ is not removed .It is may be the $H_2\uparrow$ and NH_3 formation. The second , $PbNO_3$ (fig.2) , simalutes a lead acid battery waste water ; The test is positive in the 2 sens .We expected an electrodeposition of Pb which does not occur and shows a possible perspective in heavy metals pollution prevention . However we cannot

----

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"

Hammamet,Tunisia 21-24 December, 2015

38

predict the Cu^{++}, Ni^{++}...behaviour . A literature review on carbone electrodes (glassy , paste ,...)[9] largely used in electroanalytical chemistry may help in a better understanding .
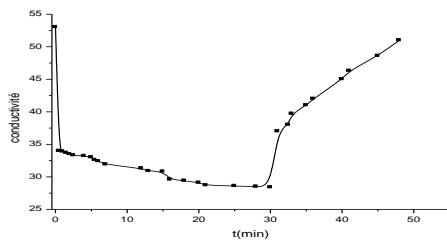
Figure 2: C = f(t) ; CDI of PbNO$_3$ dilute solution
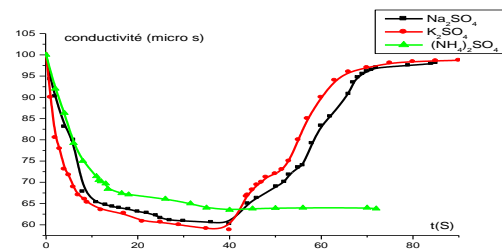
Figure 1: C = f(t) ; Comparison of Na$^+$, K$^+$ and NH$_4^+$ CDI

We were studied the PH influence on chromate electrosorpton . A conventional three-dimensional electrode system (5*5*0.2 cm) was adopted in the electrosorption. A schematic diagram of the state electrosorptionsystem is shown in (Fig.3). The initial concentration of the chromate ions in the solution is 31.5 mg/L. The pH ofthe solution was adjusted by adding of 0.1M nitric acid. The quantity of ions adsorbed per unit mass of used Activated carbon was calculated from the equation: Q = (C$_0$-C)V/m

C is the concentrations at the beginning and at anytime, respectively, V is the volume of the solution, and m is the massof the AC module.
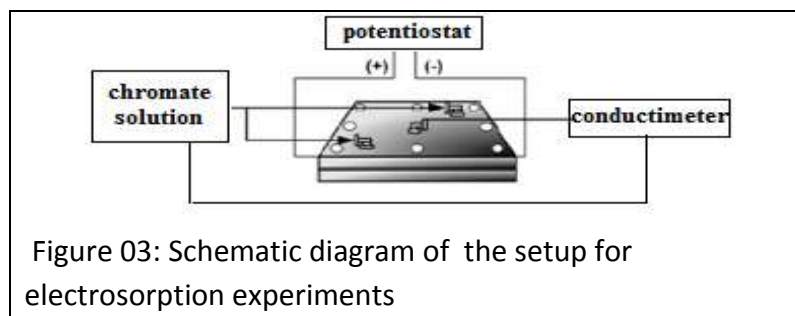
Figure 03: Schematic diagram of the setup for electrosorption experiments

Results (figure4): 100% of chromate ions are removed in PH=2. We will explain the phenomenon well later
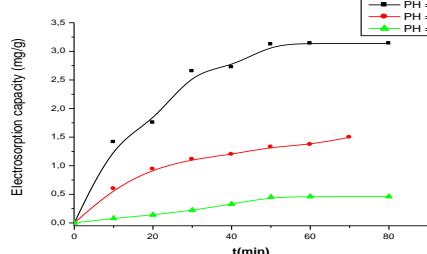
Fig 4: Effect of PH on the adsorption of Cr (VI) (31.5 mg/l) on active carbon electrode, E = 1.6 V
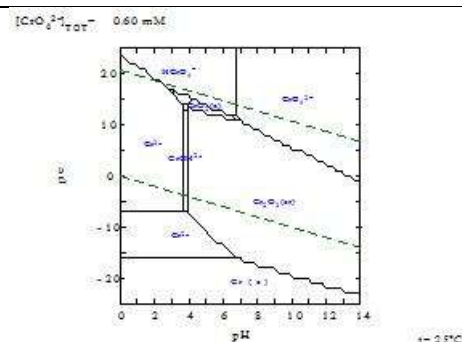
Fig5: chromium diagramE-PH

The 5th Maghreb Conference on Desalination and WaterTreatment "CMTDE 2015"
Hammamet,Tunisia 21-24 December, 2015

39

KEYWORDS : electrosorption; Cr(VI) removal ; water purification; Wastewater treatment; Deionization techniques; Activated carbon electrode.

References

[1] S. Porada, R. Zhao, A. van der Wal, V. Presser, P.M. Biesheuvel (2013); Review on the science and technology of water desalination by capacitive deionization; Progress in Materials Science.

[2] Mohamed Mossad, Wei Zhang, Linda Zou;(2013);Using capacitive deionisation for inland brackish groundwater desalination in a remote location; Desalination, Vol 308, pp 154-160.

[3] Linda Zou, Lixia Li, Huaihe Song, Gayle Morris (2008); Using mesoporous carbon electrodes for brackish water desalination ; water research 42 2340– 2348.

[4] Brian E. Conway ,ErolAyranci, Hassan Al-Maznai(2001); ElectrochimicaActa 47 705– 718.

[5] ErolAyranci, Brian E. Conway (2001); 513 100–110

[6] Abbas Afkhami, and Brian E. Conway (2002); Journal of Colloid and Interface Science 251, 248–255.

[7] Chen Rong, Hu Xien ; Electrosorption of thiocyanate anions on active carbon felt electrode in dilute solution ; Journal of Colloid and Interface Science 290 (2005) 190– 195

[8] Chia-Hung Hou, Cheng-Ye Huang (2013); A comparative study of electrosorption selectivity of ions by activated carbon lectrodes in capacitive deionization; C.-H. Hou, C.-Y. Huang / Desalination 314 124–129.

[9] Brian E. Conway , Erol Ayranci, Hassan Al-Maznai (2001); Use of quasi-3-dimensional porous electrodes for adsorption and electrocatalytic removal of impurities from waste-waters; Electrochimica Acta 47 705–718.

A DYNAMIC MODELLING APPROACHE OF A CHEMOSTAT

HMISSI Maha [a], HARMAND Jerome [b], SHAYEB Hedi

[1]Laboratory of Hydraulic and Environmental Modeling, National Engineering School of Tunis, University of El-Manar, 37 Le Belvédère, 1002 Tunis, Tunisia

[2]Laboratory of biotechnology and environment, INRA - Laboratoire de Biotechnologie de l'Environnement (L.B.E.) Avenue des étangs - 11100 NARBONNE - FRANCE – Tél. : (+33) 468.425.151 Fax : (+33) 468.425.160

ABSTRACT

In anaerobic treatment, the reactor performance is influenced by the hydrodynamic behavior since it has direct impact on the extent of contact between the substrate and the microorganisms, and also because it can influence the rates of biological reactions through changes in the rate of mass transfer and in the distribution of reactions along the reactor. In this part we will study the model of a spatial gradient bioreactor where there is a non-homogeneous spatial distribution of the components in the bioreactor. We'll take the case of a chemostat. The software COMSOL Multiphysics is taken as a resolution tool. It has been shown that the spatial gradient chemostat with high axial dispersion dispersion behaves like a perfectly mixed batch reactor.

KEYWORDS : chemostat, hydrodynamic, axial dispersion

REMOVAL OF ACID RED 336FROM AQUEOUS SOLUTION BY CONTINUOUS ELECTRO-COAGULATION: INFLUENCE OF THE TYPE OF CURRENT AND ELECTRODES CONNECTIONS

AMOUR Abdallah [1], MERZOUK Belkacem [2,3], TIAIBA Mohammed [2], LECLERCJean-Pierre [4], LAPICQUEFrançois [4]

[1] Laboratoire de Recherche en Hydraulique Appliquée et Environnement, Département Hydraulique, Faculté de Technologie, Université de Béjaia, Algérie

[2] Département Hydraulique, Faculté de Technologie, Université Mohamed Boudiaf de M'sila, B.P. 166, Ichbilia, M'sila, 28000 - Algérie

[3] Laboratoire 3BS, Université de Bejaia

[4] Laboratoire Réactions et Génie des Procédés (LRGP), UPR3349 CNRS - Université de Lorraine, 1 rue Grandville, B.P. 20451, Nancy, France

E-mail : mbelka01@yahoo.fr

ABSTRACT

Electrocoagulation (EC) is an effective treatment for highly polluted industrial wastewater. It has been used successfully for the treatment of various industrial effluents including effluents issues from food industries, tanneries wastewater, water containing metals or heavy metals, wastewater contained soluble oil issued from mechanical workshop, polymerization manufactures, and textiles industries.

The aim of this study was to investigate the effects of the operating parameters, such as initial pH, initial concentration (C_i), residence time (τ), current density (j), inlet flow rate (Q), direct/ alternating current and electrode connection systems on the removal of a red nylosan dye (Acid Red 336) by EC process using aluminum electrode in a continuous electrochemical reactor

A rate of abatement between 87 % and 96 % for color and turbidity was observed for the direct current, when the initial concentration of the dyeC_i was ranged from 100 mg/L to 1000 mg/L, current density j = 300 A/m², conductivity κ = 2. 4 mS/cm, inlet flow rate Q = 15 L/h and 26 L/h, treatment time t = 30 min and initial pH ranged from 3.46 to 9. The specific electrical energy consumptionwas 9.5 kWh per kilogramme of removed dye.

For the influence of electrodes connection modes, the results showed that bipolar connection is slightly more effective compared to monopolar connection in terms of abatement of the color and turbidity. But in terms of consumption of energy, the bipolar mode consumes more energy than the monopolar mode.

KEYWORDS : Electrocoagulation, Color, Turbidity, Red nylosan dye, Alternating/direct current.

EFFECTS OF URBAN AND INDUSTRIAL WASTE WATER ON GERMINATION AND SEEDLING GROWTH OF LAWSONIA INERMIS L.

MARZOUGUI Nidhal, REJEB Salwa and HAMMAMI Arwa

Laboratory of Development of Non-Conventional Waters in Agriculture, National Research Institute of Rural Engineering Waters and Forests, BP 2, 2080 Ariana, Tunisia

ABSTRACT

Water resources in Tunisia are becoming increasingly rare. Therefore the state has adopted the policy of economy and preservation of water by increasing efficiently the use of non conventional water in agricultural irrigation. In this context we are interested in studying the effects of various sources and treatment quality of water on the germination and seedling growth of Lawsonia inermis seeds, a medicinal plant which has also an industrial use. The seeds were used untreated or pretreated prior to germination, by immersion in water for 7 days or for a few seconds in sulfuric acid. The water used in germination tests are well water, wastewater, both urban and industrial, untreated and treated. Germination was conducted at 25 °C for 7 days under conditions of darkness and light. The measured parameters are the root length, the shoot length and the moisture content in the crossings of the sub-cited different experimental conditions (seed pretreatment / water quality / light condition). The obtained results are compared to controls made germinating seeds which were irrigated with distilled water. Lawsonia inermis has proven to have good germination performance when its seeds are pretreated by immersion for 7 days in water before setting germination and watered by treated wastewater in light condition. The treated wastewater could be considered as potential water irrigation for this species.

KEYWORDS : Untreated wastewater, treated wastewater, urban wastewater, industrial wastewater, Lawsonia inermis, germination, seedling growth.

OPTIMIZATION OF THE COAGULATION-flOCCULATION PROCESS FOR PULP AND PAPER MILL EFFLUENT TREATMENT FROM A TUNISIAN PLANT

LTIFI Abdelkader [1, 2], SAIDI Neila [1], RABHI Mokded [2], HAFIANE Amor [1], SMAOUI Abderrazak [2,], ABDELLY Chedly [2]

[1] : centre of Research and Technologies of Water in Borj Cedria (CERTE) Laboratory of Wastewater Treatment .

[2] : Centre of Biotechnology of Borj Cedria (CBBC) Laboratory of Extremophile Plants.

ABSTRACT

Pulp and Paper mills are generating millions of tons of wastewater and are major source of water pollution. In this work, pulping wastes have been characterized and found to contain very high Chemical Oxygen Demand (COD) and Turbidity (Tb).The biodegradability index determined by the biochemical oxygen demand (BOD)/chemical oxygen demand (COD) ratio was only 0.072, impling little biodegradability. The effectiveness of the coagulation-flocculation process by the use of chemical substance such as ferric sulphate and ferric chloride, and aluminium sulphate$Al_2(SO_4)_3$ was considered . The results are expressed based on both the turbidity and the COD reduction associated to pH. Ferric sulphate, aluminium sulphate$Al_2(SO_4)_3$ and ferric chloride were used as coagulant. However, anionic polyacrylamide (Paraestol) were used as flocculant. $Al_2(SO_4)_3$ proved more effectiveness in the reduction of both turbidity and COD of the wastewater. A series of jar tests were conducted considering different values of pH and followed by amounts of coagulant and flocculant analysis. After each test, the supernatant layer of treated effluent was analysed for chemical oxygen demand (COD) and turbidity. The best experimental conditions for coagulation were as follow: pH is in rang 3 - 4, concentration of alum $Al_2(SO_4)_3$ is equal to150 mg L^{-1} and the polyacrylamide concentration is equal to 15 mg L^{-1}.Results related to water quality after treatment suppose the efficiency of the method coagulation floculation for all the studied parameters (COD, BOD, Turbidity, SM...) except chlorides and sulphate saving values 1525 and 1270 mg L^{-1} relatively higher than the values raquired by Tunisian regulations 200 and 500 mg L^{-1} respectively.

KEYWORDS : Coagulation–flocculation,anionic polyacrylamide, COD and turbidity reduction. pulp and paper wastewater.

ELABORATION AND CARACTERISATION OF CARBON ULTRAFILTRATION MEMBRANE: APPLICATION TO MEMBRANE DISTILLATION

DERBEL Imen and BEN AMAR Raja

Laboratoire des sciences des Matériaux et Environnement, Faculty of Science of Sfax, University of Sfax
Road of Soukra Km 4, Sfax Tunisia

ABSTRACT

The preparation of a new tubular carbon ultrafiltration membrane was presented.Plastic paste was prepared using graphite powder mixed with organic additives and phenolic resin solution and then was shaped into a tube by extrusion molding. After curing and carbonization at 700°C under nitrogen atmosphere, the obtained support exhibits an average pore diameter and porosity of about 3 µm and 37%, respectively.

A thin film of a graphite powder with an average pore size of 0.7 µm and a thickness around 20µm was deposited by slip casting method on the inner face of the graphite macroporous support. The mesoporous top layer was then deposited by the same protocol using viscous suspension made of commercial carbon black powder of 60 nm average particle size added to an alcoholic solution of novolac-phenolic resin. The UF membrane average pore diameter measured by nitrogen adsorption/desorption method was of 5 nm and a thickness around 7µm.

Repeated curing-carbonization cycle was considered as the main approach in order to cover any defects in carbon layer and to create uniform UF layer over the entire surface.

The new UF membrane has very interesting characteristics in terms of mechanical and chemical resistances. Its application seems very efficient in the field of membrane distillation for brackish water desalination and car washing waste water treatment. High retention of salt and oil respectively of almost 99% were then achieved.

KEYWORDS : graphite ; ultrafiltration membrane; phenolic resin, membrane distillation, water treatment

EQUILIBRIUM, KINETICS AND MECHANISM FOR THE REMOVAL OF RHODAMINE B BY SORPTION ON OKOUME SAWDUST FROM AQUEOUS MEDIA

GUECHI El Khamssa*, HAMDAOUI Oualid, BEGGAS Djihed

Laboratory of Environmental Engineering, Department of Process Engineering,
University Badji Mokhtar Annaba, BP12. Annaba, 23000 Algeria
E-mail: guichi_wahida@yahoo.fr

ABSTRACT

In this study Okoume sawdustwas evaluated for its ability to eliminate of cationic dye, Rhodamine B, from aqueous media.Studies concerning the effects of contact time, initial dye concentration, ionic strength, pH and solution temperature are presented and discussed. Experimental kineticsdata at different initial dye concentrations were analyzed using Lagergren pseudo-first-order, pseudo-second-order, Elovich, intraparticle diffusion and Boyd models. The sorption kinetics of the Rhodamine B on Okoume sawdust is well described by the pseudo-second order model. However, for the mechanism sorption, the intraparticle diffusion was not the only rate-limiting step, but other processes might implicate in control the rate of sorption and this results is confirmed by Boyd's model.Equilibrium isotherm data were analyzed according to Langmuir and Freundlich equations. The characteristic parameters for each model have been determined. Furthermore, thermodynamic parameters such as $\Delta G°$, $\Delta S°$ and $\Delta H°$ were calculated.

KEYWORDS : Sorption, Rhodamine B, Okoume sawdust, kinetics, isotherm, modeling.

STUDY OF THE EARLY STAGES OF CALCIUM CARBONATE FORMATION

HAMDI Raghda, BEN AMOR Mohamed, TLILI Mohamed Mouldi

Laboratoire de Traitement des Eaux Naturelles, Centre des Recherches et Technologies des Eaux, Technopole Borj Cédria, BP 273 Soliman 8020, Tunisie

ABSTRACT

$CaCO_3$ nucleation and crystallization have been studied for more than a century. Nevertheless, the early stages of calcium carbonate formation have recently attracted attention. In the present work, a new method is presented to prove the existence of such prenucleation ion pairs, $CaCO_3°$ and $CaHCO_3^+$, by using electrical conductivity modelling applied to the FCP (Fast Controlled Precipitation) method. The tested solutions are calco-carbonic pure waters. Through resistivity vs pH curves modelling and during the nucleation stage, the process begins with the formation of $CaCO_3°$ ion pair as pre-nuclei. With pH increase, the number of these entities rises to form aggregates. The aggregation rate of these ion pairs plays a crucial role in stabilizing the formed nuclei even with a simple variation of the $Ca(HCO_3)_2$ content. In presence of antiscalants, the ion pair formation was delayed and the aggregation rate was reduced. Therefore, they inhibit the association Ca-CO_3 to form ion pairs.

KEYWORDS : Calcium carbonate ; crystallization ; prenucleation stage ; ion pairs ; conductivity ; antiscalants.

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

47

FOULING IN SEAWATER ULTRAFILTRATION PROCESS :
MECHANISMS AND SCREENING STUDIES

SLIMANE Fatima Zahra [a,b], BEN MILED Ghofrane [c], ALLOUCHE Selima, ELLOUZE Fatma [a,b],
BEN AMAR Nihel [a,b.]

a Laboratoire de Modélisation Mathématique et Numérique dans les Sciences de l'Ingénieur, ENIT, B.P 37 Le Belvédère, 1002 Tunis, Tunisia
b Institut National des Sciences Appliquées et de Technologie, B.P.676, 1080 Tunis Cedex, Tunisia
c Institut Supérieur des Sciences Biologiques Appliquées de Tunis, Tunisia

ABSTRACT

Nowadays ultrafiltration is well used in several industrials applications: food processing industries, pharmaceutical industries,… Recently, ultrafiltration has been recognized as a competitive pre-treatment for reverse osmosis system compare with conventional ones. The problem of UF applications is the fouling and the incapacity to predict it and to anticipate, avoid or inhibit its establishment by regulating the cleaning parameters. This work deals the ultrafiltration of seawater as a pretreatment of reverse osmosis in a power plant. 25 experiments were conducted on a pilot equipped with a hollow fiber membrane (100kDa, $S=4,2m^2$). Experiments are generated by an experimental design varying 5 parameters at different levels: backwash interval (30 and 60min), backwash duration (10, 20, 30, and40s), backwash pulses (1, 2, 3, 4 stops by cycle), backwash flow-rate (15, 17.5, 20, 22.5, and 25l/min) and concentration of injected hypochlorite (0, 2, 4.5, 7, and 10ppm). A screening study was first done to choose the parameters significantly influential on our responses (difference of trans-membrane pressure, time of total recovery of trans-membrane pressure, and net water production) using a simple linear regression model. Secondly, we investigated the fouling mechanism responsible of flux decline by modeling the flux behavior using the classical models of Hermia and the combined models of Bolton.

From the screening study, it was found for the two responses (difference of trans-membrane pressure and time of total recovery of trans-membrane pressure) that the regression model is statistically not significant (not valid), so, we stopped at this stage without analyzing the parameters effects. For the net water production response, the regression model was valid explaining 98.2% of her variation, so, we passed to analyzing the parameters effects. Only three parameters have significant effects on the response: backwash interval, backwash duration and backwash flow-rate.

The highest net water production is ensured with the lowest backwash flow-rate 15L/min equal to the half of the filtration flow, which is in contradiction with the supplier's recommendation to use a backwash flow 2 or 3 times larger than the filtration flow for an efficient backwash.

The modeling of flux decline shows that the classical model 'Complete blocking' is the best model to describe the fouling of seawater ultrafiltration membrane at short time, making the use of more sophisticated models as the combined models of Bolton useless.

KEYWORDS : Ultrafiltration, fouling, backwash, Hermia, Bolton, complete blocking.

MEMBRANE CRYSTALLIZATION: APPLIED TO CRYSTALLIZE SODIUM SULFATE FROM SUPER-SALINE SOLUTION

BOUCHRİT Raja [a], BOUBAKRİ Ali [a], BOUGUECHA Salah Al-Tahar [b]

[a] Laboratory of Wastewater Treatment, Center of Researches and Water Technologies, P.B 273, 8020 Soliman, Tunisia
[b] Department of Mechanical Engineering, Faculty of Engineer, King Abdul-Aziz University, P.B: 80204 Jeddah

ABSTRACT

Membrane crystallization (MC) is a promising process that has the potential to treat hyper-saline solution, in order to produce high quality pure water and crystals. In the current study, MC set-up has been implemented to crystallize sodium sulfate (Na_2SO_4) from synthetic aqueous solutions. MC lab-scale set-up using a flat sheet hydrophobic micro-porous PVDF membrane has been applied to concentrate feed solution (2M). The set-up operates in batch mode. The recovery factor has reached up to 80%. Water-vapor removing from the mother/feed solution generates the desired super-saturation level which initiates the nucleation and driven salts crystallization process. MC experiment, carried out under feed and permeate temperatures equal, respectively, to 60 and 25°C and feed and permeate flows rate fixed both to 25 L h^{-1}, showed a slow decrease in the permeate flux with the time. The flux data pointed out that no rapid flux decline happens despite crystals formation in the bulk, thinks to the Na_2SO_4 negative solubility temperature coefficient. MC presents an opportunity to generate a controlled supersaturated solution. It showed that apart the high quality of the permeate water recovery; this process promotes salt crystals formation with a well-controlled size distribution. The salt production was about 110 kg m^{-3}of Na_2SO_4 crystals, presenting an orthorhombic shape. The X-Ray diffraction analysis shows that crystals formed are the anhydrous form of sodium sulfate calledThenardite.

KEYWORD : Membrane crystallization; Na_2SO_4; DCMD; PVDF membrane; Thenardite.

DENITRIFICATION OF UNDERGROUND WATER BY ELECTRODIALYSIS : EFFECT OF CHLORIDE AND SULPHATE IONS

GMAR Soumaya, BEN SALAHIl hem, TLILI Mohamed, BEN AMOR Mohamed

laboratoire de traitement des eaux naturelles, Centre de Recherches et technogies des Eaux (CERTE) ,P.B 273,8020 Soliman, Tunisie ; E-mail : soumaya.gmar@gmail.com

ABSTRACT

In Cap Bon of Tunisia, the concentration of nitrate greatly exceeds the world health organization (WHO) standards. Then according to physicochemical analysis achieved on samples collected from several wells. It was shown that waters are contaminated by nitrate and contained high concentration of sulphate and chloride. Nitrate concentration varied between 50 and 450 mg.L^{-1}. In this study, the electrodialysis (ED) was applied to remove nitrate from waters. Experiments were carried out using a pilot unit as a conventional ED in batch recirculation mode. It was shown that ED is an efficient technique to remove nitrate and to reduce salinity of water. Considering the effect of chloride and sulphate on nitrate's removal through the anion exchange membrane, the performance of two types of ions exchange membrane (PC Cell and Neosepta) was compared. It was shown that nitrate's removal was slightly influenced by chloride and more by sulphate. The effectiveness of new type of anion exchange membrane was tested. It was shown that this membrane is efficient for reducing nitrate to values below the amounts recommended by WHO for drinking water.

KEYWORDS : Electrodialysis underground water nitrate's removal Specific Power Consumption Desalination

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet,Tunisia 21-24 December, 2015

50

MODELING AND OPTIMISATION CONDITIONS OF COBALT (II) ADSORPTION ON ALGAL BIOMASS

AID A., AMOKRANE S., MEKATEL H., BENSAFI S., and NIBOU D.

Laboratory of Materials Technology / Faculty of Mechanical and Process Engineering /
University of Science and Technology Houari Boumediene

ABSTRACT

The objective of this study is the modeling and optimization of cobalt ions recovery by an adsorbent material from abundant algal biomass on the west coast of Algeria. The modeling of the phenomenon was conducted using a full factorial design with two levels 2^K, 2 represents the number of levels, K the number of factor studied.

Successful factors are pH, initial concentration, the (Solid / Liquid) ratio and temperature.

the main effects and interactions of the parameters studied were determined, The mathematical model associated with the experimental design has been developed and validated by two static test: student test and Fisher-Snedecor test.

The search for the optimum point of the adsorption of Co (II) on the algae from the model established was made by the method of drawing iso response curves.

In a second step, the characterization of the algae by various techniques was used namely: X-ray diffraction, the thermogravimetry DTA and TG analysis, Infrared spectroscopy, scanning electron microscopy. The results of analyzes show that the algae has an interesting affinity for the envisaged application. Chemical analysis of the biosorbent is made by determining the pH point of zero.

KEYWORDS : adsorption, Cobalt (II), algae, characterization, factorial design, isorépense, pH_{pzc}.

REMOVAL OF NICKEL IONS ON STIPA TENACISSIMA L BIOMATERIAL AND MODELLING PARAMETERS FOR THE ADSORPTION PROCESS STUDIES

LADJALI Samir, AKSAS K., AMOKRANE Samira, AID Asma, MEKATEL El Hadj and NIBOU Djamel

Laboratoire de Technologie des Matériaux, Faculté de Génie Mécanique et Génie des Procédés, Université des Sciences et de la Technologie Houari Boumediene, B.P. 32, El-Alia, Bab-Ezzouar, Alger, Algérie

ABSTRACT

The adsorption of Ni from aqueous solutions on by biomaterial (Stipa tenacissima L) has been studied by a batch technique. The effects of solution pH, initial concentration C, solid/liquid ratio R and temperature T were studied. The Freundlich, Langmuir and Dubinin–Radshkevich models have been applied and the adsorption kinetics followed Langmuir adsorption isotherm, where good correlation between theoretical and experimental equilibrium concentration of Ni ions was observed. The experiments have been carried out using a 2^3 full factorial design to study the effect of the main and interaction parameters and to optimise the adsorption process. The pH is the most significant parameter affecting Ni ions distribution on Stipa tenacissima L. A comparison of kinetic models applied to the system was evaluated for the pseudo first-order, the pseudo second-order, and the intraparticle diffusion.

KEYWORDS : Removal, adsorption, Ni ions, Stipa tenacissima L, modelling, kinetic, biomaterial, thermodynamic.

KINETICS AND THERMODYNAMICS STUDIES OF TOXICELEMENTS(NI, ZNANDCU) IONS ADSORPTION ONTO FAUJASITEY FROM AQUEOUS SOLUTIONS : ENVIRONMENTAL STUDY

ACHOUR Souad [a], AMOKRANE Samira[b], CHAGROUCHE S.[a], MEKATEL El Hadj[b] and NIBOU Djamel

[a]Centre de Recherche Nucléaire de Draria, B.P.43, 16003, Draria, Alger, Algérie

[b]Laboratoire de Technologie des Matériaux, Faculté de Génie Mécanique et Génie des Procédés, Université des Sciences et de la Technologie Houari Boumediene, B.P. 32, El-Alia, Bab-Ezzouar, Alger, Algérie

ABSTRACT

Zeolites have great potentials of protection of the ecosystem. They are used in the water treatment resulting from industries, in the replacement of the poly phosphates and in the environment applications. The present work deals with the characterization of adsorbent Y faujasite and their application to the recovery of toxic elements (Ni, ZnandCu) from aqueous solutions by ion exchange reaction. The adsorbent is analyzed by different techniques in order to determine their structures, chemical compositions, morphologie and surface areas using the atomic absorption (AAS), the X-ray diffraction (XRD), infrared spectroscopy (FTIR), BET technique, scanning electron microscope (SEM), DTA and TG. Ion exchange was performed using a batch method. Themixture to be treatedis contained in adouble-walled three-necked cell connected to a thermostated bath ensuring the maintenance of the desired temperature.The parametric study of thesorptionof these cationsinfaujasiteY have helped high light the dependence of the efficiency of operating parameters (pH, initial concentration of metals, the temperature and the solid-liquid ratio). The study of sorption of these cations has shown good efficacy. Indeed, the rate brackets above 60% were obtained. Studies of adsorption isotherms, kinetic and thermodynamic were performed.

KEYWORDS : toxicelements (Ni, ZnandCu) ; zeolite ; Faujasite Y ; Characterization ; Removal ; Environment.

KINETICS AND THERMODYNAMICS STUDIES OF NICKEL AND COBALT IONS ADSORPTION ONTO ZEOLITE A FROM AQUEOUS SOLUTIONS IN BINARY SYSTEM.

BENSAFI S., AID A., MEKATEL H., AMOKRANE S. And NIBOU D.

Laboratory Materials Technology / Faculty of Mechanical and Process Engineering / University of Science and Technology Houari Boumediene

ABSTRACT

The removal of nickel and cobalt from aqueous solutions in binary system by zeolite A was investigated. The characteristics of zeolite were determined by XRD, SEM, EDS, FTIR, DTA and TG techniques. The effects of solution pH, initial nickel and cobalt concentration C in binary system, solid/liquid ratio R and temperature T were studied in batch experiments. The Freundlich and the Langmuir models have been applied and the adsorption kinetics followed both adsorption isotherms. A comparison of kinetic models applied to the adsorption of nickel and cobalt ions in binary system on the zeolite was evaluated for the pseudo first-order and the pseudo second-order kinetic models. It seems that these models were found to correlate the experimental data. Intra particle diffusion model was also used. The thermodynamic parameters namely the enthalpy $\Delta H°$, entropy $\Delta S°$ and free energy $\Delta G°$ of adsorption of Ni^{2+} and Co^{+2} ions in binary system on A zeolite were determined.

KEYWORDS : Adsorption, nickel, cobalt, binary system, zeolite A, kinetic study, thermodynamic study,

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

54

REMOVAL OF NICKEL IONS FROM WASTEWATER ON PAPER AS ADSORBENT AND MODELLING PARAMETERS FOR THE STUDY

LAIB R., AMOKRANE S., MEKATEL H., and NIBOU D.

Laboratory Materials Technology / Faculty of Mechanical and Process Engineering / University of Science and Technology Houari Boumediene

ABSTRACT

The adsorption of nickel (II) from aqueous solutions on paper as adsorbent has been studyby a batch technique. The effects of pH, concentration, solid/liquid ratio and temperature were studied. Statistical design of experiments for the adsorption of nickel (II) was an efficient technique to quantify the effect of variable parameters. The results show that the pH is the most significant parameter affecting nickel (II) adsorption, followed by initial nickel (II) concentration and time. The pseudo first order kinetic model was found to correlate the experimental data well.

KEYWORDS : Removal, nickel (II) ions, kinetic, adsorption, paper

IMPACT OF TREATED WASTEWATER USE ON SOIL SALINITY IN SEMI-ARID REGION

AZOUZI Rim [1], AYED Lamia [2], CHAREF Abdelkrim [1]

[1]Laboratory of Georessources,CERTE-UniversiteElmanar, Soliman, Tunisia, BP-273
[2]Laboratory for Analysis, Treatment and Valuation of Environmental Pollutants and Products, School of Pharmacy, University of Monastir, Tunisia BP-5000

ABSTRACT

The wastewater reuse has become an important element in water resources planning to offset water shortage especially in semi-arid region. TWW application to agricultural soil improves soil properties by increasing organic matter, fertilizers, some major and trace ions and macro and micro nutrient contents. However the salts present in the treated wastewater, affect the soil structure, permeability and aeration and may lead its salinization. Mornag and Draa Tammar perimeters which are irrigated with treated wastewater were chosen to investigate the impact of TWW on soil salinity.

The Mornag perimeter has been irrigated for over 15 years and the applied volume of TWW was about 2000 $m^3yr^{-1}ha^{-1}$. As for the Draa Tammar perimeter, localized in Kairouan city, TWW was applied for over 23 years and the applied volume of TWW was about 2590 $m^3yr^{-1}ha^{-1}$. For each perimeter, we sampled 2 control soils and 7 profiles irrigated by Treated wastewater (TWW). Based on SAR of TWW, EC (>2mScm) and FAO guidelines, this water category was considered moderate to severe, and exceeded the water quality reused in agriculture. Moreover, the combination of the electrical conductivity and the SAR of TWW according to the diagram of classification of Riverside showed that the TWW of Kairouan and Mornag had a low alkalising power and high salinity risk. Results showed that the impact of treated wastewater depends mainly on the soil properties. In irrigated soils with TWW of Draa Tammar irrigated perimeter, a decrease in soil electric conductivity (EC) values was noticed while an increase in EC values of the soil in Mornag perimeter was observed. Monitoring irrigation with treated waste water is crucial as it helps prevent soil deterioration of and crop production diminution.

KEYWORDS : Treated wastewater, electric conductivity, soil, salinity risk.

KINETICS AND THERMODYNAMICS STUDIES OF NICKEL IONS ADSORPTION

ONTO ZEOLITE A FROM AQUEOUS SOLUTIONS

BENSAFI S., AID A., MEKATEL H., AMOKRANE S. and NIBOU D.

Laboratory Materials Technology / Faculty of Mechanical and Process Engineering / University of Science and Technology Houari Boumediene

ABSTRACT

The removal of nickel from aqueous solutions by zeolite A was investigated. The characteristics of zeolite were determined by XRD, SEM, EDS, FTIR, DTA and TG techniques. The effects of solution pH, initial nickel concentration C, solid/liquid ratio R and temperature T were studied in batch experiments. The Freundlich and the Langmuir models have been applied and the adsorption kinetics followed both adsorption isotherms. A comparison of kinetic models applied to the adsorption of nickel ions on the zeolite was evaluated for the pseudo first-order and the pseudo second-order kinetic models. It seems that these models were found to correlate the experimental data. Intra particle diffusion model was also used. The thermodynamic parameters namely the enthalpy $\Delta H°$, entropy $\Delta S°$ and free energy $\Delta G°$ of adsorption of Ni^{2+} ions on A zeolite were determined.

KEYWORDS : Adsorption, nickel, zeolite A, kinetic study, thermodynamic study

REMOVAL OF Cr(VI) BY BIOMASS STIPATENACISSIMAL FROM AQUEOUS SOLUTIONS. KINETIC, EQUILIBRIUM AND THERMODYNAMIC STUDIES.

LADJALI Samir, AMOKRANE Samira, AID Asma and NIBOU Djamel

Laboratoire de Technologie des Matériaux, Faculté de Génie Mécanique et Génie des Procédés, Université des Sciences et de la Technologie Houari Boumediene, B.P. 32, El-Alia, Bab-Ezzouar, Alger, Algérie.

ABSTRACT

Chromium is a common contaminant which mainly exists in two stable states, Cr(III) and Cr(VI), in aquatic environment. Cr(VI) is of particular concern due to its high toxicity to human, animals, and plants. And the presence of Cr(VI) in wastewater in high concentration could significantly inhibit biomass growth during biological treatment processes [1].Chromium exists at high concentration in different wastes from electroplating, paints, dyes, chromium tanning and paper industries. It is also added to cooling water to check corrosion.

Overexposure of chromium workers to chromium dusts and mists has been related to irritation and corrosion of the skin and the respiratory tract and, probably, to lung carcinoma.

Chromium, especially in its VI oxidation state, is considered as a very toxic ion; thus, its elimination from aqueous solutions should be considered an environmental primary target. In other hand, chromium is generally recognized as being essential to human health. However, hexavalent chromium compounds are also known to be significantly more toxic than the trivalent ones. The recovery and separation of chromium (VI) from aqueous solutions with solvent extraction have been reported in the literature [2-3]. Despite its high toxicity, chromium (VI) has been used widely in different industrial process (e.g. electroplating),

its recovery from the corresponding wastewater being a primary target before their discharge to natural waters. Various methods of wastewater treatment were examined and adsorption emerged as one of the important promising technique [4]. Among them, supported liquid membrane technology could be competitive when the metal is present at low concentration in the aqueous solution.

The removal of Cr(VI) by various biomaterials is influenced by many factors including Cr(VI) concentration, biomass properties, pH, etc. [5–6].

The present investigation deals with the application of biomass Stipatenacissima in the removal of chromium (VI) from aqueous solutions. The amount of chromium removed was determined on the basis of the following parameters: solution pH, initial chromium concentration, solid/liquid ratio and temperature. From the obtained results, it seems that the adsorption behavior of Cr (VI) followed a second-order kinetic and the adsorption process was a chemical process.

KEYWORDS : Removal, adsorption, Cr(VI) ions, Stipa tenacissima L, modelling, kinetic, biomaterial, thermodynamic.

REFERENCES

[1]   P. Gikas, P. Romanos, Effects of tri-valent (Cr(III)) and hexa-valent (Cr(VI))chromium on the growth of activated sludge, J. Hazard. Mater. 133 (2006)212–217.

[2]   S.B. Lalvani, T. Wiltowski, A. Hubner, A. Weston, N. Mandich, Removalof hexavalent chromium and metal cations by a selective and novel carbonadsorbent, Carbon 36 (7–8) (1998) 1219–1226.

[3]   M.A. Gashgari, A. Al-Yobi, M. Ejaz, Liquid-liquid phase distribution studies of chromium(VI) between mineral acid solutions and 5-(4-pyridyl)nonane N-oxide in benzene and enrichment by extraction plant with pulsation column, Sep. Sci. Technol. 25 (7–8) (1990) 903–920.

[4]   T.C. Huang, C.C. Huang, D.H. Chen, Thermodynamic equilibria of the extraction of chromium(VI) with tri-n-octylphosphine oxide from aqueous solutions, Solvent Extr. Ion. Exch. 15 (5) (1997) 837–862.

[5]   F. Godea, E.D. Atalay, E. Pehlivan, Removal of Cr(VI) from aqueous solutionsusing modified red pine sawdust, J. Hazard. Mater. 152 (2008) 1201–1207.

[6]   S.K. Prabhakaran, K. Vijayaraghavan, R. Balasubramanian, Removal of Cr(VI) ions by spent tea and coffee dusts: reduction to Cr(III) and biosorption, Ind. Eng. Chem. Res. 48 (2009) 2113–2117.

THE REMOVAL OF Cr(VI), Co(II) AND Ni(II) IONS FROM AQUEOUS SOLUTIONS ON ALGAE BIOMASS : KINETICS AND THERMODYNAMICS STUDIES

AID A., AMOKRANE S., MEKATEL H., BENSAFI S., and NIBOU D.

Laboratory of Materials Technology / Faculty of Mechanical and Process Engineering / University of Science and Technology Houari Boumediene

ABSTRACT

Water is the major constituent of living matter, it is a vital element whose importance at the global level is constantly recalled. His pollution from industrial and agricultural activities is a major concern in our societies, thus, many researchers have focused on the reduction of pollution at source if possible or in effluent if necessary with suitable curative treatments while respecting the environment.

The scope of this study work we propose a biosorption process for the retention of ions of Cr (VI), Co (II) and Ni (II) from aqueous solutions on a biological material algae type.

The study of the removal of the metal cations was performed in batch mode, several parameters were investigated such as the pH of the metal solution, the initial concentration, the ratio (solid / liquid) and the temperature. Adsorption rate of Cr (VI), Co (II) and Ni (II) of the order of 96%, 81% and 68% were recorded, respectively.The results of the kinetics of adsorption of metal cations show three equilibrium stages after a period of 60min to Cr (VI),90min to the Co (II) and Ni (II) ions.

To understand the adsorption mechanism four models isotherms are tested ie., Langmuir, Freundlich and Dubinin Radushkevich isotherms model, the best model that adequately describes the kinetics is the Langmuir model for the three metal ions.The results of the kinetic data show that the data are well correlated with the kinetic model of the pseudo second order for the three ions.The thermodynamic parameters were determined.

KEYWORDS : Adsorption, Algae, heavy metals, isotherm, kinetics, thermodynamics.

ADSORPTION OF NITRATES, SULFATES ON AMX ION EXCHANGE MEMBRANE : EFFECT OF SURFACE MODIFICATION AND IONIC STRENGTH

LOUATI Islem, GUESMI Fatma, HARBI Soumaya, HANNACHI Chiraz, HAMROUNI Béchir*

UR11ES17 Desalination and Water Treatment, 2092 Tunis, Faculty of Sciences of Tunis,
University of Tunis El Manar, Tunisia. Tel/Fax. +216(71)871282
* Corresponding author: e-mail : bhamrouni@gmail.com

ABSTRACT

The present work is concerned with the study of the adsorption of nitrates and sulfates, presents in mixture of binary systems, on unmodified and modified ion exchange membrane at the ionic strengths of 0.1 M and 0.3 M and at constant temperature of 298 K. The modification process of the ion exchange membrane by adsorption of the polyethyleneimine on its surface was studied. In order to prove membrane modification the Fourier transform infrared (FTIR) was used and the ion exchange capacity of the modified membrane was determined. The adsorption of the studied ions is investigated through the most commonly used adsorption isotherm models such as Langmuir, Freundlich, Dubinin-Radushkevich and Redlich-Peterson. Adsorption parameters of the studied models have been determined and discussed. Obtained results at various ionic strengths using either unmodified or modified membrane were compared for highlighting the effect of the ionic strength and of the membrane modification on the nitrates and sulfates adsorption. Obtained results show that the increase of the ionic strength decreases the adsorption capacity of the nitrate and sulfate ions on the AMX membrane while the membrane modification increases the nitrates adsorption.

KEYWORDS: modification, polyethyleneimine, AMX membrane, binary system, adsorption models, ionic strength.

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

61

REMOVAL OF CADMIUM (II) FROM LIQUID PHASE USING FRUIT LUFFA AS BIOSORBENT

GUECHI El Khamssa*, BEGGAS Djihed, HAMDAOUI Oualid

Laboratory of Environmental Engineering, Department of Process Engineering, University Badji Mokhtar Annaba, BP12. Annaba, 23000 Algeria   E-mail: guichi_wahida@yahoo.fr

ABSTRACT

This work is evaluatedFruit luffa(FL) as biosorbentfor its ability for the remove cadmium ions from a synthetic aqueous solutionunder various operating conditions in a batch process. The effect of the experimental parameters such as initial cadmium concentrations, biosorbent dose, initial pH and temperature is investigated through a number of batch biosorption experiments.The biosorption kinetic uptake for cadmium onto FL at various initial pH solutions was analyzed using pseudo-first order and pseudo-second order. It was found that the pseudo-second order kinetic model was the best applicable model to describe the biosorption kinetic data.The experimental data biosorption equilibruim at 298 K and 318 K were analyzed bythe Langmuir, Freundlich, Temkin and Kiselev models. The results indicate that the Langmuir model, Freundlich and Temkin suggest that it was suitable to represent the experimental equilibrium data for the biosorption of cadmium onto FL.

KEYWORDS : Biosorption; Fruit luffa; cadmium (II); Kinetics; Isotherm; modeling.

Cr (VI) REMOVAL FROM AQUEOUS SOLUTION BY ALFA GRASS : KINETIC, EQUILIBRIUM AND THERMODYNAMIC STUDY

DJEKOUNE L, SALEM Z., CHEMINI R., BOUMEHDI L., ALLIA K.

University of Sciences and Technology of Houari Boumediene, FGMGP, LSGPI, BP 32 El-Alia. Bâb - Ezzouar, 16111. Algiers, AlgeriaEmail: zsalem141@gmail.com, djekounel@yahoo.fr

ABSTRACT

The main objective of this work is to use a raw vegetable plant; ALFA grass for the treatment of a synthetic solution containing hexavalent chromium. Alfa grass, which constitutes a natural material and widely available, could be suggested as a low cost adsorbent to removal Cr (VI) ions in wastewaters.

Several parameters effects were investigated in batch adsorption experiment (contact time, sorbent concentration, phosphates concentration, pH and the shaking rate). This study showed that 90% of Cr (VI) ions were eliminated. The maximal Cr (VI) ions removal is obtained under the following operating conditions: initial Cr (VI) ions concentration of 75 mg. L^{-1}, sorbent concentrationC_s of 5 g.L^{-1}, pH of 1.5, temperature of 292°C and shaking rate N of 300 rpm. Application of different adsorption models showed that Cr (VI) ions adsorption on Alfa grass is well described by Langmuir model. The maximal adsorption capacity of Cr(VI) obtained is 15,45 mg.g^{-1}. Pseudo second-order model provided better fitting to Cr (VI) removal kinetics. The kineticincreasedforacid pH. These results showed that using Alfa grass could be a promising solution for Cr (VI) removal in wastewater treatment.

Alfa grass in a rough state was shown to be suitable adsorbent for Cr (VI) adsorption. Moreover, the availability, and the low cost of the Alfa grass can lead this agro-industrial material to be used for metal contamined wastewaters.

KEYWORDS : Alfa grass, Sorption, Cr(VI), Wastewater, kinetics, modelisation.

USING OF A BIOADSORBANT EXTRACTED FROM A MINE FOR THE RETENTION OF PHENOL IN ENVIRONMENTAL WATER SAMPLES

KHIREDDINE H.*, TAKORABET L.

Laboratoire de Génie de l'environnement (LGE)
University of Bejaïa, Algeria Tel : +213 7 72 97 65 69 ; Khiredine.hafit@gmail.com

ABSTRACT

This study concerns utilization of batch adsorption experiments to investigate the removal of phenol from wastewater by addition an apatite extracted from a mine. The apatite powder was prepared by chemical precipitation method from the black phosphate and were used as the adsorbent for phenol in aqueous solution . This apatite was doped by the chitosan, the effect of contact time, initial phenol concentration, pH, adsorbent dosage, solution temperature and adsorbent calcining temperature on the phenol adsorption, and the adsorption kinetic, equilibrium and thermodynamic parameters were investigated. XRD spectra showed a majority phase of hydroxyapatite whatever the sintering temperature (600, 800 and 1000 ° C).

HAp-CS composite exhibited an interesting adsorption capacity for phenol, which is much higher than that of pure hydroxyapatite and other previously reported. The results reveal phenol adsorption onto HAPnatural/chitosan is spontaneous, endothermic and is followed by physisorption. The data obtained in this study suggest that the apatite is promising materials for phenol sorption

INVESTIGATION OF CHROMIUM (VI) ADSORPTION IN AGRICULTURAL SOILS USING BATCH EXPERIMENT

BENMAHDI Fatiha [*1], **SEMRA Safia** [2], **BOUHELASSA Mohammed** [2]

[*1]Department of Chemistry, Laboratory of Chemistry and Environmental Chemistry, Faculty of Sciences, University of Batna 05000, Algeria.

[2]Department of industrial chemistry, Laboratory of Innovation in Environmental Processes, Faculty of Engineering Sciences, University Mentouri of Constantine 25000, Algeria.

Corresponding author, glyben_fatiha@yahoo.fr

ABSTRACT

The soil plays an important role in contaminant migration from and to the different compartments of the environment. It also interferes in substances transformation because of its chemical and biological diversity. Consequently, prediction of water resources contamination frequently involves study of pollutant behaviour into soil matrix. One of the most used heavy metal is Cr (VI). It is a highly toxic pollutant generated from many industrial processes such as leather tanning, electroplating, manufacturing of dye, paint and paper. In the present study, we investigated the retention of Cr (VI) in three agricultural soils from different regions of Algeria. The different soils have been experimented in order to show the major parameters affecting Cr (VI) retention. Kinetic data and equilibrium adsorption isotherms were measured. The influence of different experimental parameters such as time contact, initial concentration of Cr (VI), pH and temperature on the adsorption was studied. The equilibrium adsorption was effectively described by Langmuir and Freundlich adsorption isotherms. The kinetic process was better described by pseudo second-order kinetic model. Desorption has been led bed after one day residence periods of the Cr (VI) into the medium. Immediate desorption indicates an irreversible adsorption. Variability of soil composition showed the main fractions responsible for Cr (VI) retention. Adsorption has been found low in both soils and due essentially to clays and organic matter.

KEYWORDS : chromium (VI); heavy metals; adsorption; soil; batch experiments.

STUDY OF THE ADSORPTION PERFORMANCE OF THE ALGA CORALLINA ELONGATA AS A BIOSORBENT FOR ACETIC ACID

BOUREMMAD Farida[1*], BOUCHAIR Abdennour[1], KENDOULI Leila[1], SHAWUTI Shalima [2], GULGUN Mehmet Ali [3]

[1]Laboratoire de l'interaction des matériaux et de l'environnement Université de Jijel
[2]Istanbul University, faculty of science, Department of Physics, Istanbul Turkey
[3]Sabanci University, FENS, Orhanli Tuzla, Istanbul 34956 Turkey
* Corresponding author: E-mail: bouremmad_farida@yahoo.com

ABSTRACT

In the adsorption processes, activated carbon is the best adsorbent through its pore volume and highly developed specific surface, but its main drawback is that it is an expensive material saw its production process.

The biosorbents can be an alternative to activated carbon, they come from agricultural by-products and aquatic biomass, they are cheap and they may show the same performance as the activated carbon.

In our work we focus on alga (Corallina elongata) that is found in abundance on the sides of the city of Jijel in eastern Algeria. First, we are interested in the characterization of the alga by infrared spectroscopy to detect potential sites for adsorption, and then we realized SEM images to see morphology.

After, adsorption tests were performed, using as test molecule acetic acid, kinetic study revealed that the pseudo second order model fits perfectly with adsorption; the adsorption capacity was determined by studying the adsorption isotherms at various temperatures which also allowed for a thermodynamic study.

The results are promising and the alga Corallina elongata has a high adsorption capacity.

KEYWORDS : *Biosorbents, adsorption, algae*

NUMERICAL SIMULATION OF A SIMPLE SOLAR STILL

SARRAY Yemna, HIDOURI Nejib, MCHIRGUI Ali, BEN BRAHIM Ammar *

Engineers National School, Chemical and Process Engineering Department, Applied Thermodynamics Unit, Gabes University,Omar Ibn El Khattab street, Gabes 6029, Tunisia

E-mail : yemna.sarray@hotmail.fr

ABSTRACT

This paper undertakes a numerical simulation of a simple solar distiller still. The developed numerical model allows the prediction with good approximation of the temperature in a solar pond gradient. The results obtained from the model are in good agreement with the experiments. Results are presented in terms of transient temperatures and   heat transfer co-efficients between water and glass for two different days as illustrative example.

KEYWORDS : Simple solar distiller still   Solar desalination   Numerical simulation

ANALYSIS AND OPTIMIZATION OF THE SECONDARY SETTLER OF A WASTEWATER TREATMENT VIA ACTIVATED SLUDGE

BAKIRI Zahir * , NACEF Saci

Laboratory of Chemical Process Engineering (LGPC)
Ferhat Abbas University of Setif, Algeria ; E-mail : zahir.bakiri@gmail.com

ABSTRACT

The paper presents an analysis and optimization of a secondary clarifier of wastewater treatment plant (WWTP) via activated sludge. The models of the secondary settler and the settling velocity as a function of settling velocity index (SVI) are addressed.

These models have been proposed to explain the activities of settling velocity and illustrating the relationship between settleability characteristics. The aim of this research is to present a model for new settling velocity law, as a function of settling velocity index (SVI), based on the Vesilind function, the solids flux theory and the experimental data. This allowed us develop a one-dimensional models, with dispersion based on a thorough experimental study carried out in situ and the application of online data which are the mass load flow, transfer concentration, and influent characteristic.

KEYWORDS **:** Wastewater, activated sludge, mathematical modeling, settling velocity, secondary settler, sedimentation.

EFFECT OF SURFACTANT NATURE ON THE PHYSICO CHEMICAL AND RHEOLOGICAL PROPERTIES OF MICELLAR SYSTEMS: METHOD OF DESIGN OF EXPERIMENTS STUDY

NEDJHIOUI Mohamed [1,*], MOULAI-MOSTEFA Nadji [1]

[1*] Laboratoire Matériaux et Environnement (LME), Faculté des Sciences et de Technologie. Université de Médéa 26001, Algérie,Tel/Fax: +213 25 58 12 53, Email: m_nedjioui@yahoo.fr

ABSTRACT

This work is a contribution to the study of the combined effects of systems containing (factors) an anionic surfactant: sodium dodecyl sulfate (SDS), a cationic surfactant : hexadecyltrimethyl ammonium bromide (CTAB) and a nonionic surfactant: The sorbitan -momolaureate polyoxyethylene (Tween 80) and olive oil on the physicochemical properties (responses) of these systems.

To this end, the planning method of experiments is adopted and a study of the effects of factors on the responses and realized. Finally a mathematical model gives a relationship between factors and a response is deducted.

The results show that the model chosen is not valid for the response: pH, the surfactants generally decrease the surface and interfacial tensions as expected, and the ionic surfactants strongly influence the conductivity, they increase the electrical conductivity, this result is expected since the increase of the ionic strength solutions only increases the electrostatic forces between the polar heads of surfactants.

KEYSWORDS : ionic surfactant, nonionic surfactant, design of experiments, conductivity, interfacial tension

REFERENCES :

[1] Contribution to the study of the combined effects of aqueous solution containing surfactants and biopolymers on some physical and rheological parametres
Auteurs : NEDJHIOUI Mohamed., MOULAI-MOSTEFA Nadji., Sellami Atika2, Toubal Farida 2,4ème congrès Maghrébin de Desalination et de traitement des eaux, "CMTDE 2013" HAMMAMET, TUNISIA 15-18 DECEMBER, 2013.

[2] Contribution to the study of the concentration reduction of effluent containing surfactant and biopolymer industrial waste resulting

Auteurs : NEDJHIOUI Mohamed., MOULAI-MOSTEFA Nadji., ADEM Soumia. CHAILI Khadidj, 4ème congrès Maghrébin de Desalination et de traitement des eaux, "CMTDE 2013" HAMMAMET, TUNISIA 15-18 DECEMBER, 2013.

[3] M.Nedjhioui, N.Moulai Mostefa, A.Bensmaili, A.Morsli, "Combined effects of polymer/ surfactant/oil/alkali on physical chemical properties, Desalination Vol. 185, 2005, pp. 543-550

[4] M.Nedjhioui, J.P.Canselier, N.Moulai Mostefa, A.Bensmaili, A.Skender, "Determination of micellar system behavior in the presence of salt and water soluble polymer using the phase diagram technique, Desalination, Vol.206, pp. 589-593. 2007

[5] Moulai-Mostefa N., Khalladi R., Nedjhioui, M. (2007), an investigation into the interactions between polymer and surfactant using viscosity, conductivity and surface tension measurements. Ann. Chim. Sci. Mat., 32, 421-429.

[6] M. Nedjhioui, J.P.Canselier, N. Moulai Mostefa and A. Bensmaili, "Investigation of combined effects of Xanthan gum, sodium dodecyl sulphate and salt on some physico-chemical properties of their mixtures using a response surface method. JDST, Vol. 30, 2009. pp.1331- 134.

RURAL WASTEWATER TREATMENT BY INFILTRATION PERCOLATION PROCESS ON A RECONSTITUTED SILICA SAND FILTER AND SWELLING CLAY

ETURKI Saifeddine [a], JANNÈNE Nouha [b], JEDIDI Naceur [b] et BEN DHIA Hamed.

[a]Laboratoire d'Erémologie et Lutte Contre la Désertification, Institut des Régions Arides, direction régionale de Gabès, Nahal 6051 Gabès Tunisie.

[b]Laboratoire de Traitement des Eaux Usées, Centre de Recherches et des Technologies des Eaux, BP 273, Soliman 8020 Tunisie.

E-mail : turkisaifeddine@yahoo.fr

ABSTRACT

To validate the results obtained by batch and incubation tests, a column of rural wastewater treatment by infiltration percolation through a bed of silica sand mixed with a proportion of 10% of clay and a coarse fraction of stones which represents the 1/3 of mixture weight, was installed in the laboratory regularly alimented every three days during a period of three successive months. The addition of the clay fraction in the sand filter improves the physicochemical treatment. After the period of the first five weeks of treatment, time required for installation of the biofilm, the treatment efficiency with regard to organic and nitrogen pollution is important. Stability of low levels of these pollutants in the filtrate is observed. The adsorption of ammonia on clay is very fast and this affinity will enable the attachment of small organic molecules on the ammoniated clay to lead the biofilm formation. The swelling of clay and thereafter contraction will inhibit the early clogging of the sand filter. The column is also effective for bacterial purification since it tends to stability of bacterial load of less than 10^3 CFU/100 ml. Indeed to the 10th week of operation, the load IBFC and Pseudomonas aeriginosa are lower than the unrestricted reuse standards of WHO.

KEYWORDS **:** wastewater treatment, infiltration percolation, reconstituted sand filter, column.

A CLEAN TECHNOLOGY FOR TANNERIES UNHAIRING WASTE WATERS : NEUTRALIZATION BY CO$_2$, WATER RECYCLING AND FREE AMINO ACIDS RECOVERY

TAMERSIT Sabrina*[1] , BOUHIDEL Kamel-Eddine[2]

[1,2]Laboratory of Chemistry & Environmental Chemistry LCCE , Team : Water Chemistry , Environment & Desalination .
Faculty of Sciences , University Hadj Lakhdar Batna 05000 Batna Algeria
(t-sabrina-batna@hotmail.fr, bouhidel@lycos.com)

ABSTRACT

This research work proposes a clean technology application for CO$_2$ direct capture. This gas is used to neutralize unhairing alkaline waste waters, effluent of the tanning industry .

Contrarily to the nowadays expensive capture technologies , the present application has given excellent economical and environmental experimental results :

The treated waste waters are totally recyclable : The pH (from 13 to 4.5) , conductivity (from 8000 to 2000 µS) and COD (20000-80000 to 3000 mg O$_2$/l) , are drastically reduced .

The injected CO$_2$ has permitted to precipitate selectively CaCO$_3$, then different proteins according to their pKa ; These precipitated proteins are an excellent bioressource (agriculture , …) .

The neutralization by CO$_2$ permits a smooth pH decrease ;

The treated water contains free valuable and recoverable identified collagen amino acids ;

Briefly , It is really a clean technology : Water economy , polluting by products (COD) recovery and environment protection .

This original applied study is completed by a deep theoretical chemical study : optimal pH of CaCO$_3$ precipitation , sulphide and calcium speciation (evolution , complex formation with proteins , …) , neutralization curves study (comparison of CO$_2$, HCl and H2SO$_4$, …) , free amino acids identification and CO$_2$ consumption …

This laboratory pilot scale study has used synthetic CO$_2$ and , both , synthetic and industrial waste waters from an industrial large plant .

KEYWORDS **:** Amino acids, COD, tanning industry, CO$_2$ neutralisation

ETUDE DU TRAITEMENT D'UN REJET HYDRIQUE INDUSTRIEL HAUTEMENT CHARGE EN FLUOR

BEN BELGACEM Imen [1]

Laboratoire de chimie industrielle – Université de Sfax
Adresse Email : imen_ben_belgacem@yahoo.fr

RESUME

Le travail que nous avons entrepris est le traitement d'un rejet hydrique hautement chargé en fluor généré par l'usine des industries chimiques du fluor (ICF) implanté à Gabes, par voie chimique de précipitation. Notre travail est consacrée à l'étude théorique (prédictions) et expérimentale du traitement du rejet hydrique des ICF par voie chimique de précipitation. Une caractérisation de l'agent « neutralisant » (par différentes méthodes) est exposée avant que les résultats des différents essais de défluoration soient présentés. Lesdits résultats sont enfin analysés et discutés. Cette méthode permet la défluoration du dit rejet à 99,9% au moins.

MOTS CLES : précipitation, rejet hydrique, Fluor, défluoration.

REMOVAL OF THE DYE (RED TERASIL) BY TANGENTIAL MICROFILTRATION

BALASKA Fouzia, CHIKHI Mustapha [a]

Laboratoire de l'Ingénierie des Procédés de l'Environnement (LIPE),
Département de Génie de l'environnement, Faculté de Génie des procédés pharmaceutiques,
Université de Constantine 3, ALGERIA
chikhi_fouzia@yahoo.fr   chikhi_mustapha@yahoo.fr

ABSTRACT

Our work is devoted to the elimination of a reactive and dispersed dye by a membrane process which is the microfiltration using a ceramic membrane based of zirconium oxide, this approach seems useful for remediation of wastewater from the textile industry, this part is reserved for the parametric study of the microfiltration of a synthetic solution containing a dispersed dye (red terasil); it concern the determination of the permeate flux with the trans membrane pressure (TMP) and time, also the determination of the dye concentration in the permeate and concentrate solutions, the turbidity and total organic carbon of the permeate and the concentrate are monitoring in this part . The overall results show that the microfiltration membrane can retain the dye (red terasil) according to the decrease of the permeate flux versus time, by the notable decrease of the dye concentration in the permeate, and the significant reduction of turbidity and organic carbon in the filtered solution.

KEYWORDS : microfiltration, dye, total carbon, turbidity.

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

73

SILICATES ENHANCED HEAVY METALS REMOVAL FROM AQUEOUS SOLUTIONS BY TUNISIAN NATURAL LIMESTONE

SDIRI Ali [1,*], BOUAZIZ Samir [1], JAMOUSSI Fakher [2], HIGASHI Teruo [3]

[1]Laboratory of Water, Energy and Environment, National Engineering School, University of Sfax, Sfax 1173-3038, Tunisia
[2]National Center for Materials Sciences, Borj Cedria, Soliman 273-8020, Tunisia
[3]Faculty of Life and Environmental Sciences, University of Tsukuba.1-1-1 Tennodai, Tsukuba, Ibaraki 305-8572, Japan
*Corresponding author: ali.sdiri@enis.rnu.tn

ABSTRACT

The effectiveness of Tunisian natural limestones for the removal of heavy metals in aqueous solutions was studied by evaluating various factors including limestone concentration, pH, contact time and temperature. Solutions of Pb(II), Cd(II), Cu(II) and Zn(II), prepared from chloride reagents at a concentration of 10 mg/L, were studied in a batch method. Four natural limestone samples, collected from the Campanian-Maastrichtian limestone beds in Tunisia, were used as adsorbents. Sorption experiments indicated that high removal efficiencies could be achieved. Limestone samples containing impurities, such as silica and iron/aluminum oxides, demonstrated enhanced sorption capacity, nearing 100% removal in some cases. Kinetic experiments showed that the sorption of metal ions occurred rapidly at a low coverage stage, and that solutions were nearly at equilibrium after 60 min. Data trends generally fit pseudo-second order kinetic, and intra-particle diffusion, models. The following conditions were found to promote optimum, or near-optimum, sorption of heavy metals: 1) contact time of more than 60 min, 2) pH = 5, 3) >3 g/L limestone concentration and 4) T = 35°C. The results of this study suggest that the Tunisian limestones are promising adsorbents for the effective removal of toxic heavy metals from wastewaters.

KEYWORDS : Heavy metals, Wastewater treatment, Limestone, Sorption, Precipitation

TREATMENT OF BILGE WATER BY ADSORPTIONPROCESSON PRETREATED EGGSHELL

ATMANI F. [(1)], YEDDOU-MEZENNER N. [(2)]

[(1)]Faculty ofTechnonology, University Blida 1, Algeria

[(2)] Laboratory of Reaction Genius, Faculty of Mechanical and Processes Genius, University of Sciences Technology Houari Boumediene, USTHB, BP 32 El Alia Bab Ezzouar, 16111 Algiers, Algeria

E-mail : datmani@yahoo.fr

ABSTRACT

Today, the sea pollution problem has become an increasingly important issue not only for coastal countries, but also for all societies. Ships discharge their wastes (bilge waters, ballast waters, domestic waters, sludge, slop, etc...) randomly into the seas, hence causing pollution. Bilge waters can be briefly defined as saline and greasy wastewaters. The oil and grease are mixed with the sea water, which affects many marine species. Bilge water is a complex mixture of various compounds such as solvents, surfactants, fuel, lubricating oils and hydraulic oils. It is resulted mainly by the leakage from the machinery and freshwater was downs, which are allowed to drain to the lowest inner part of the ship's hull. There are several physicochemical methods used for bilge water treatment such as biodegradation electrochemical and electro-coagulation/flotation. In this study treatability of bilge water was investigated by adsorption processes and calcined eggshells was studied as adsorbent. The influence of operating parameters as contact time, temperature and adsorbent dose (0,5 - 4g/l) on the removal efficiency of Chemical oxygen demand (COD) and turbidity was analyzed.The bilge wastewater used for this study was supplied by Harbour Bouharoune. The materials obtained by the calcination method appeared to be active in the reaction of adsorption decomposition of Chemical oxygen demand in water. Chemical oxygen demand removal increased from 46, 2% to 78, 5% as the adsorbent dose increased from 0,5 to 4 g/L . The kinetics of adsorption by eggshellswere fast, reaching 40 % of the total adsorption capacity in five minutes (T= 23°C,pH =7.6, m=4 g/L). It was found that the turbidity removal efficiency increased and 98% were achieved at the end of 60 min reaction. The adsorption processes was found to be effective for the purification of bilge water and pseudo-second-order kinetic model was fitted for COD removal.

KEYWORDS : Bilge water, adsorption, pretreated eggshells and kinetics

STUDY OF BIODEGRADABILITY EVOLUTION RATE AND OPTIMISATION OF KINETIC AND STOICHIOMETRIC PARAMETERS FROM AGRO-FOOD WASTEWATER

BEN ALAYA Saida, SHAYEB Hedi

ENIT, laboratory of Hydraulics and Environment Modeling; B.P 37, Le Belvédère, 1002 Tunis 1002 Tunis

E-mail : saidaenit@gmail.com

ABSTRACT

Waste of food industries presents diversity and seasonal variability. They consist mostly of organic waste (Orhon and al, 1999). Biological processes are the important processing step for industrial wastewater effluents and particularly the food industry. Experimental measures for understanding the biological treatment is required for industrial wastewater, because urban effluents are well studied in literature, while industrial effluents are much more complex and diversified (Insel et al 2002). A better understanding of industrial waste can guide and choose the optimal treatment faster to apply them. Van Hulle et al (2004) have used the extended ASM1 to take into account the specific chemical industry wastewater components. Lucas et al. 2005 have modified the ASM2d. They added the biological food industry wastewater reactions. Karahan et al. (2007) have used the modified ASM3. This model was adopted to evaluate textile wastewater components. Zhongda Xu et al. (2006) compared ASM1 to ASM2d model, with respect to sensitivity to various nitrogen fractions in the tomato wastewater. However, a successful application of such modelling requires the estimation of kinetic and stoichiometric parameters as well as wastewater and activated sludge characterization. It is therefore necessary to describe quantitatively the microbiological kinetics processes and to detail substrate and biomass characteristic. In this paper, the aerobic degradation kinetics parameters of agro-food wastewater organic matter will be discussed. The respirometry is a common method used to determine the wastewater characteristics (Petersen et al., 2003, Lagarde et al., 2005). The respirometry is a dominant method for kinetic and stoichiometric parameters calibration. It is based on the measurement and interpretation of the oxygen consumption rate. Several studies have shown and verified the accuracy of this methodology for ASM calibration models (Spanjers and Vanrolleghem, 1995; Pollard et al., 1998). Finally, methods based on batch respirometry experience are recommended by IWA task group (Henze et al., 2002, Petersen et al., 2003). The main objective of this work is to describe the aerobic biodegradation of organic matter and to estimate kinetic and stoichiometric parameters from Tunisian agro-food wastewater using respirometry methods.

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"

Hammamet,Tunisia 21-24 December, 2015

76

EFFECT OF BIOPOLYMER ADDITION ON SOME PHYSIC-CHEMICAL PROPERTIES OF ANIONICS SURFACTANTS /OIL/ WATER SYSTEMS

NEDJHIOUI Mohamed [1,*], MOULAI-MOSTEFA Nadji [1], BELHADJ Yamina [1],

TIR Mohamed [1], SKENDER Abdelhak [1]

[1*] Laboratoire Matériaux et Environnement (LME), Faculté des Sciences et de Technologie. Université de Médéa 26001, Algérie,Tel/Fax: +213 25 78 52 53, Email: m_nedjioui@yahoo.fr

ABSTRACT

This work is a contribution to the study of the behavior of polymer/ surfactant system.To this end, we conducted a study on the interactions between systems containing anionic surfactant : Sodium Dodecyl Benzene sulfonate (SDBS) and cationic surfactant : hexadecyltrimethylammonium bromide (CTAB) and a biopolymer polysaccharide (starch), andtheir effect onphysic-chemical properties of these systems. The measurement results show the existence of the strong interactions between the various components of the polymer/surfactant systems.

The results show a decrease in the surface tension, surfactants used significantly contribute to the decrease in surface tension. The addition of a polymer contributes to the reduction of the surface tension, in fact, the curves show a decrease in the surface tension in function of the concentration. Finally, the curves giving the turbidity show that the latter increases with the increase of the concentration of polymer or surfactant, and a large increase with the addition of oil.

KEYWORDS : ionic surfactant,polymerinteraction, olive oil, surface tension, interfacial tension, turbidity.

REFERENCES

[1] Nedjhioui Mohamed, Moulai-Mostefa Nadji. Tir Mohamed , EFFECT OF SOME PHYSICAL AND CHEMICAL PROPERTIES ON THE INTERACTIONS BETWEEN BIOPOLYMERS AND ANIONIQUES SURFACTANTS. Desalination and Water Treatment: (2015) 1–9

[2] NEDJHIOUI Mohamed., MOULAI-MOSTEFA Nadji., SELLAMI Atika, TOUBAL Farida, Contribution to the study of the combined effects of aqueous solution containing surfactants and biopolymers on some physical and rheological parameters, 4ème congrès Maghrébin de

Desalination et de traitement des eaux, "CMTDE 2013" HAMMAMET, TUNISIA 15-18 DECEMBER, 2013.

[3] NEDJHIOUI Mohamed., MOULAI-MOSTEFA Nadji., ADEM Soumia. CHAILI Khadidja, Contribution to the study of the concentration reduction of effluent containing surfactant and biopolymer industrial waste resulting, , 4ème congrès Maghrébin de Desalination et de traitement des eaux, "CMTDE 2013" HAMMAMET, TUNISIA 15-18 DECEMBER, 2013.

[4] M.Nedjhioui, N.Moulai Mostefa, A.Bensmaili, A.Morsli, "Combined effects of polymer/ surfactant/oil/alkali on physical chemical properties, Desalination Vol. 185, 2005, pp. 543-550

[5] M.Nedjhioui, J.P.Canselier, N.Moulai Mostefa, A.Bensmaili, A.Skender, "Determination of micellar system behavior in the presence of salt and water soluble polymer using the phase diagram technique, Desalination, Vol.206, pp. 589-593. 2007

[6] Moulai-Mostefa N., Khalladi R., Nedjhioui, M. (2007), an investigation into the interactions between polymer and surfactant using viscosity, conductivity and surface tension measurements. Ann. Chim. Sci. Mat., 32, 421-429.

[7] M. Nedjhioui, J.P.Canselier, N. Moulai Mostefa and A. Bensmaili, "Investigation of combined effects of Xanthan gum, sodium dodecyl sulphate and salt on some physico-chemical properties of their mixtures using a response surface method. JDST, Vol. 30, 2009. pp.1331-134.

REMOVAL OF SAMARIUM (III) FROM AQUEOUS SOLUTIONS BY POLY(SODIUM 4-STYRENESULFONATE) AND POLY(ACRYLIC ACID) ASSISTED-ULTRAFILTRATION

HAMMAMI Mahria *, JELLOULI ENNIGROU Dorra, HORCHANI NEIFER Karima, MOKHTAR Ferid

Laboratoire Physico-chimie des Matériaux Minéraux et leurs Applications,
Centre Nationale des Recherches en Sciences des Matériaux,Tecnopole Borj cédria,
BP 73, 8027 Soliman, Tunisie
Corresponding author: Mahria Hammami ; Tel: +216 79325470; Fax: +216 79325802
E-mail address:mahriahammami@yahoo.fr

ABSTRACT

Rare earth elements (REE) comprise the fifteen elements of the lanthanide series and may be found in over 250 different minerals. These elements are gaining increasing importance, both in terms of research activity, and in terms of commercial products. They are often used in industry for the production of glass additives, fluorescent materials, catalysts, supra-conductors, magnets.

Polyelectrolyte assisted ultrafiltration (PAUF) process has been shown to be promising for retention of rare earth by the addition of water soluble polymers.

The polyelectrolyte-assisted ultrafiltrationtechnique was investigated for the retention of samarium (III) ions from aqueoussolutions with two anionic polyelectrolyte used as complexing agents, which are poly(acrylic acid) (PAA) and poly(sodium 4-styrenesulfonate) (PSS). The effects of transmembrane pressure, concentration of polyelectrolyte, pH and ionic strength on samarium retention and permeate flux were evaluated. For the both polymers, it can be seen thatthe better retention was obtained at $2 \cdot 10^{-4}$ mol L^{-1} polyelectrolyte concentration and 3 bars transmembrane pressure.It is observed as the pH increases, retention increases.Comparing the two anionic polyelectrolyte, it can be seen that the retention of samarium reaches 95% using PSS and 80% using PAA as the complexation agent.

KEYWORDS : Samarium (III); poly(acrylic acid) (PAA); poly(sodium 4-styrenesulfonate) (PSS); retention; polyelectrolyte enhanced ultrafiltration.

KINETICS STUDY OF THE PHOTODEGRADATION OF NYSTATIN

BOUCENNA A.[a], BOUAFIA-CHERGUI S[a]., CHABANI M.[a], AMRANE A.[b,c*] ,BENSMAILI A.[a]

[a]Laboratoire de Génie de la Réaction, Equipe Les procédés durables de la dépollution, Faculté de Génie Mécanique et Génie des Procédés ; U.S.T.H.B. BP 32, El Allia, Bab Ezzouar, Algérie

[b]Université de Rennes 1, Ecole Nationale Supérieure de Chimie de Rennes, CNRS, UMR 6226, Avenue du Général Leclerc, CS 50837, 35708 Rennes Cedex 7, France

[c]Université européenne de Bretagne

ABSTRACT

The problem of pharmaceutical products in the waters presents an interest, not only for the scientific community, but also as a major public concern. The use of technologies based on photochemistry has proved to be an excellent tool for the decontamination of waters and effluents which contain micro organic pollutants in general and pharmaceutical products in particular.

This work was within the framework of the cleanup of contaminated waters by pharmaceutical residues. Photolysis has been applied to the degradation of a pollutant medicated, Nystatin, in aqueous media. This study has for purpose the search for optimization of operating parameters such as the pH of the medium as well as the initial concentration of the pollutant. The best performances have been obtained with a very acid pH (0.85) leading to 95% degradation yield within 20 min only. Experiments also showed increasing degradation yields at low initial pollutant content, since up to 97% and 96% degradation yields were achieved for concentrations of 10 and 15 ppm.

KEYWORD : photolysis, UV irradiation, Nystatin, photochemistry,

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

80

POTENTIAL OF H$_2$SO$_4$ PRETREATED CUPRESSUS SEMPERVIREN FOREST WASTE BIOMASS FOR THE REMOVAL OF METHYLENE BLUE FROM AQUEOUS SOLUTIONS

REFFAS Abdelbaki [a], BOUGUETTOUCHA Abdallah[b], CHEBLI Derradji [b] and AMRANE Abdeltif [cd]

[a] Laboratoire des matériaux inorganiques, Département de Chimie, Faculté des sciences, Université Mohamed Boudiaf M'sila, Algérie

[b] Laboratoire de Génie des Procédés Chimiques, Département de Génie des Procédés, Faculté de Technologie, Université Sétif-1, Elbez, 19000 Sétif, Algérie. Email: abd_bouguettoucha@yahoo.fr

[c] Ecole Nationale Supérieure de Chimie de Rennes, Université de Rennes 1, CNRS, UMR 6226, 11 allée de Beaulieu, CS 50837, 35708 Rennes Cedex 7, France

[d] Université européenne de Bretagne, Bd Laënnec, 35000, Rennes, France

ABSTRACT

Results of studies carried out for the removal of cationic dye methylene blue (MB) by using pretreated forest waste biomass Cupressus semperviren with H$_2$SO$_4$ explain the potential of this material for adsorption in order to removal cationic dye.The adsorption characteristics of this dye by C. semperviren were found dependent on pH, initial concentrations of the dye and time. The maximum dye removal was 550 mg/g at pH 12. The adsorption process can be well described by means of a pseudo-second-order kinetic model showing that boundary layer resistance was not the rate-limiting step, as confirmed by intraparticle diffusion. In addition, experimental data were accurately expressed by the Sips model if compared with the Langmuir and Freundlich isotherms.

KEYWORDS : Forest waste biomass; Dye adsorption; Characterization; Kinetics; Isotherms.

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet,Tunisia 21-24 December, 2015

81

SOFTENING OF THE HARD WATERS FOURCHI BY CHRONOAMPEROMETRY

RHOUATI Salah

Department of Chemical, University des Frères Mentouri, Route de Ain El Bey 25000 ALGERIA.
Email: salah.rhouati@yahoo.comTel/Fax: +213 31 8111 06

ABSTRACT

The formation of scale on the surface of the drinking water pipes or in industrial installations would induce obstruction in the pipes and cause a decrease of thermal exchanges.

The water of Fourchi which supplies the city of Ain Mlila of Algeria in drinking water is defined as a hard water, it presents a hardness of 87 ºF. In this work we have used the technique of electrochemical chronoamperometry with imposed potential which allows to character the power water of Fourchi. According to the study chronoamperometry of raw water of Fourchi characterized by the time of scaling (te) is 23.5min and an index of scaling (ie = 42.5). Therefore, we can classify the water of Fourchi as a very scaling water. The increase in the temperature decreases the value of the time of scaling.

The method of Chronoamperometry also allows to study the inhibition of the formation of scale by the compounds of the family of inorganic phosphate K_2HPO_4 and K_3PO_4. In the presence of the inhibitor, the risk of scaling is reduced and the effective concentration for inhibition of scaling formation by water of Fourchi for each compound is 3.5 mg/L of K_2HPO_4 and 2mg/L of K_3PO_4.

KEYWORDS : Scaling, calcium carbonate, inhibition, K_2HPO_4, K_3PO_4.

REMOVAL OF NICKEL IONS ONTO NAY ZEOLITE :
CHARACTERISTICS, KINETIC AND THERMODYNAMIC STUDY

MEKATELEI hadj [1], AMOKRANE Samira [1],AID Asma [1], KERBACHENE Nadia [1],

TRARI Mohamed [2] and NIBOU Djamel [1]

[1]Laboratory of Materials Technology, Faculty of Mechanic and Engineering Processes (USTHB),
BP : 32, 16111 Algiers, Algeria
[2]Laboratory of Storage and Valorization of Renewable Energies, Faculty of Chemistry (USTHB),
BP : 32, 16111 Algiers, Algeria
Presenting author: hmekatel@yahoo.fr

ABSTRACT

The removal of nickel ions from aqueous solutions onto NaY zeolite was investigated in batch. The NaY zeolite was characterized by X-ray powder diffraction, Infrared spectroscopy, Scanning electronic microscopy, Differential thermal and gravimetric analysis and Nitrogen adsorption technique for specific area surface and porous volume. The various parameters such as contact time, adsorbent dosage, and concentration of nickel solution, initial pH and temperature on the adsorption of nickel were optimized. The nickel adsorption equilibrium was reached after 150 min of contact time. Removal of nickel is better at neutral pH than in acidic solutions. Among tried models, the equilibrium adsorption data were well described by the Langmuir isotherm. The adsorption kinetics were best described by the pseudo-second order. The thermodynamic parameters indicated that the adsorption of nickel on NaY was an endothermic and spontaneous process. The activation energy (Ea) was found to be 56.22 kJ/mol indicating a chemical adsorption

KEYWORDS : NaY Zeolite; adsorption; nickel, removal, kinetics.

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

83

VALORIZATION OF AN FOREST WASTE, MODIFIED P-BRUTIA CONES, BY BIOSORPTION OF METHYL GEEN

REFFAS Abdelbaki [a], CHEBLI Derradji *[b], BOUGUETTOUCHA Abdallah [b],

GUEDIRI Khalil [b], AMRANE Abdeltif [c,d]

[a]Faculté des sciences, Département de Chimie, Universite Mohamed Boudiaf, M'sila, Algeria,email: abdelbakireffas@gmail.com

[b]Laboratoire de Génie des Procédés Chimiques (LGPC), Faculté de Technologie, Département de Génie des Procédés, Université Sétif-1, Elbez, 19000 Sétif, Algeria, Tel./Fax: +213 36 92 51 21;

emails: derradji_chebli@yahoo.fr (D. Chebli) ; abd_bouguettoucha@yahoo.fr (A. Bouguettoucha)guediri-mdkhalil91@outlouk.fr,

[c]Ecole Nationale Supérieure de Chimie de Rennes, Université de Rennes 1, CNRS, UMR 6226, 11 allée de Beaulieu, CS 50837, 35708 Rennes Cedex 7, France, email: abdeltif.amrane@univ-rennes1.fr

[d]Université européenne de Bretagne, Bd Laennec, 35000 Rennes, France

ABSTRACT

The removal of Methyl Green dye (MG) from aqueous solutions using modified P-brutia cones (PBH and PBN), has been investigated work. The physical parameters such as pH, temperature, initial MG concentration, ionic strength are examined in batch experiments on the sorption of the dye. Adsorption removal of MG was conducted at natural pH 4.5 because the dye is only stable in the range of pH 3.8 to 5. It was observed in experiments that the P-brutia cones treated with NaOH (PBN) exhibited high affinity and adsorption capacity compared to the MG P-brutia cones treated with HCl (PBH) and biosorption capacity of modified P-brutia cones (PBN and PBH) was enhanced by increasing the temperature. This is confirmed by the thermodynamic parameters (ΔG^0 and ΔH^0) which shows that the adsorption of MG was spontaneous and endothermic in nature. The positive values of ΔS^0 suggested an irregular increase in the randomness for both adsorbent (PBN and PBH) during the adsorption process. The kinetic model pseudo-first order, pseudo-second order, and intraparticle diffusion coefficient were examined to analyze the sorption process;they showed that the pseudo-second-order model is the one that best describes the adsorption process (MG) on PBN and PBH with a correlation coefficient $R^2 > 0.999$. The ionic strength has shown that it has a negative impact on the adsorption of MG on two supports. A reduction of 68.5% of the adsorption capacity for a value Ce=30 mg/L was found for the PBH, while the PBN did not show a significant influence of the ionic strength on adsorption especially in the presence of NaCl.Among the tested isotherm models, the Langmuir isotherm was found to be the most relevant to describe MG sorption onto modified P-brutia cones with a correlation factor $R^2 > 0.999$. The capacity adsorption of P-brutia cones, was confirmed for the removal of a dye, MG, from aqueous solution. We note also that P-brutia cones is a material very available in the forest and low-cost biomaterial

KEYWORDS: Adsorption, P-brutia cones, forest wastes, dyes. Isotherm.

STUDY OF AMOXICILLINE INHIBITORY EFFECT ON BIOMASS ACTIVITY USING CONTINUOUS AERATION RESPIROMETRY

SAKHRAOUI Mahfoud [1], ZAAMOUCHE-ZERDAZI R. [1], BENCHEIKH LEHOCINEM. [1]

[1]Laboratory of the Engineering of the Processes of Environment (LIPE)
Faculty of Genius of the Pharmaceutical Processes
University Constantine 3.mahfoudsakh@yahoo.com

ABSTRACT

The presence of the biologically resistant substances, such as antibiotics which are considered inhibitors, in the Wastewater deteriorate biological treatment systems (activated sludge) by reducing microbial activity which in turn impacts negatively carbonaceous treatment, solid- liquid separation etc.

In this work, experimental inhibition evaluation and definition, of Amoxicilline trihydrate, on activated sludge were undertaken using continuous aeration respirometric technique. This is based on monitoring oxygen uptake rate of samples containing the inhibitor and others without inhibitor.

he level of inhibition as a percentage was evaluated using EC index. Amoxicilline concentrations of 0.3 to 25 mg/l were used. Inhibition starts to appear at a concentration of less than 01 mg/l and attain 18 % at a concentration of 1.5 mg/l for however a low S/X ratio. Furthermore, the EC index attained 83 % for a concentration of 7 mg/l and decreases thereafter. It should be underlined that the results can be considered as preliminary. Further work is needed in order to evaluate the exact concentration in the low range.

KEYWORDS : activated sludge, respirometry, inhibition, antibiotic Amoxicilline, oxygen uptake rate, Growth kinetics.

WASTE WATERS FROM A LEAD ACID BATTERIES MANUFACTURING PLANT :
Pb++ ELIMINATION AND RECOVERY BY A CaCO$_3$ PRECIPITATING PROCESS

LALMI Afaf *, BOUHIDEL Kamel-Eddine *

Laboratory of Chemistry and Environmental Chemistry LCCE, Team: Water Chemistry,
Environment & Desalination. Faculty of Sciences, University Hadj Lakhdar Batna 05000 Batna Algeria
* afaf-eau@hotmail.com   * bouhidel@lycos.com

ABSTRACT

This research work investigates the waste waters problem of a large lead acid batteries manufacturing plant (Algeria). It aims to apply a clean technology: water recycling, pollution prevention, lead and sulphuric acid recovery.

The used conventional treatment is a neutralization by Ca (OH) $_2$ followed by a coagulation – decantation operation. This process presents these major drawbacks:

Polluted CaSO$_4$ sludge by Pb++. Its management (deshydration by filter press, transport …) is not easy. In spite of a careful neutralization the rejected treated waters contain always an unacceptable Pb++ concentration (3 to 10 mg/l).
Absence of any water recycling.

…

This present paper focuses only on the Pb++ elimination from the rejected waters. A tertiary final treatment by CaCO$_3$ is proposed. Does this chemical treatment by CaCO$_3$ eliminate the remaining Pb++? The exchange Pb++/ Ca++ has been deeply studied on synthetic lab. Solutions to confirm the theoretical prevision and this reaction efficiency:

$$CaCO_3\downarrow \ + \ Pb^{++} \ \rightarrow PbCO_3\downarrow \ + \ Ca^{++}$$
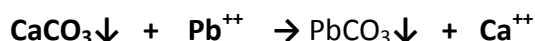
The soluble Pb++ polluting ion is recovered as a carbonate precipitate. This reaction has been deeply studied. The influence of pH, Pb++ concentration…has been particularly investigated.

The main findings of this research are:

The elucidation of the high concentration (3 to 10 mg/l) origin of Pb++ by a theoretical, numerical and software (Hydra -Medusa) study.

The feasibility, efficiency, simplicity and inexpensive precipitation method by CaCO$_3$.

The possibility to recover entirely and cleanly the rejected Pb++ cations.

KEYWORDS : Lead recovery ; Heavy metals ; lead-acid battery ; calcium carbonate.

APPLICATION OF CENTRAL COMPOSITE DESIGN AND ARTIFICIAL NEUROL NETWORK FOR SIMULTANEOUS ADSORPTION OF Cr(VI) AND PHENOL FROM AQUEOUS SOLUTION USING ION EXCHANGE RESIN DOWEX 1X8

HARBI Soumaya, TABASSI Dorra, GUESMI Fatma*, HANNACHI Chiraz and HAMROUNI Béchir

U.R Traitement et Dessalement des Eaux (UR11ES17), Faculté des Sciences de Tunis,
Université de Tunis El Manar, 2092 Manar II – Tunisie
*Tel/Fax. +216(71)871282 ; E-mail : *guesmi_fatma@yahoo.fr

ABSTRACT

In this study, Response Surface Methodology and Artificial Neural Network (ANN) were used to optimize the simultaneous adsorption of Cr(VI) and phenol from aqueous solution using ion exchange resin Dowex 1×8. The sorbent was characterized using Fourier Transformation Infrared Spectroscopy (FTIR). The batch experiments revealed that 50 min of contact time was enough to achieve adsorption equilibrium of both Chromium (VI) and phenol. Central Composite Design (CCD) was chosen for the Response Surface Design to examine the prominent effects affecting simultaneous adsorption of Cr(VI) and phenol and their interactions. Initial pH, adsorbent dose, concentration of Cr(VI) and Phenol were considered as independent experimental factors. Resin dose and concentration of Cr(VI) and Phenol were found to be the most influent factors. Optimal conditions were found with desirability function (DF). The experimental data from CCD were utilized for modeling the adsorption by Artificial Neural Network (ANN). Both of model (CCD and ANN) were statistically compared by the coefficient of determination, root mean square error and absolute average deviation. The influence of ionic strength on adsorption process was investigated separately. Under real environmental conditions, this study shows that Dowex 1×8 resin offer good potential for adsorption of chromium ions and phenol in real wastewater samples at optimum conditions.

KEYWORDS : Adsorption, Artificial Neural Networks, Central Composite Design, Wastewater treatment.

WATER TREATMENT WITH CLAY-CARBON ADSORBENT

MEZITI Chafika [a,b]**, BOUKERROUI Abdelhamid** [a]**,CAGNON Benoît** [b]

[a] Laboratoire de Technologie des Matériaux et de Génie des Procédés (LTMGP), Université Abderrahmane MIRA 06000 Béjaia, Algérie

[b]Interfaces, Confinement, Matériaux et Nanostructures (ICMN-UMR 7374), 1b rue de la Férollerie 45071 Orléans, France

chafikah@yahoo.fr

ABSTRACT

The refining process of crude edible oil comprises four main operations: degumming, neutralization, bleaching and deodorization. The most critical and also the most important step is bleaching, as it helps to improve the appearance, odor, taste and stability of the final products. During this step, the oil is put in contact with acid-activated clay, called bleaching earth. This material has a large capacity to adsorb undesirable elements such as pigments (α-chlorophyll and β-carotene) and other residues (free fatty acids, phosphatides, soap residues and traces of heavy metals) that can be present in the crude oil.

After having been used for the oil treatment, the bleaching earth loses the adsorption properties acquired during acid activation. Therefore, it becomes a waste called spent bleaching earth (SBE). These solid wastes containing up to 40% (w/w) of oil associated with other impurities, are generally disposed of in a landfill near the factory. As they are not treated, they may cause several environmental problems, such as SBE management and storage, as well as the unpleasant odors that can be produced.

The main objective of this study is to contribute to reducing the pollution risk generated by these industrial wastes. The regeneration method used is based on a heat treatment of the SBE followed by cold washing with a molar hydrochloric acid solution. The material obtained was a mixture of clay and coal and was then characterized by several techniques, namely: TGA-DTA, N_2 isotherm at 77K, FTIR, SEM / EDX and XRD. Its adsorption performance was estimated through kinetic and adsorption isotherms using a basic dye. In order to enhance the results, its adsorption capacities were then compared with those found in unused bleaching earth and in L27 activated carbon (purchased from PICA JACOBI).

KEYWORDS : Solid waste, Clay-carbon adsorbent, Characterization, water treatment, comparison.

OPTIMIZED EXPERIMENTAL CONDITIONS AND NEW KINETIC PARAMETERS FOR IRON REMOVAL FROM WATER USING CALCITE AS REMOVAL AGENT.

HAMDOUNI Afef *[a], MONTES-HERNANDEZGerman [b], TLILI Mohamed[a]

[a]Natural Water Treatment Laboratory, Water Researches and Technologies Center (CERTE),Technopark of Borj-Cedria PO Box 273 Soliman 8020Tunisia
[b]CNRS, Isterre,F-38041 Grenoble,France.
hamdafef@yahoo.fr

ABSTRACT

In the present study, the oxidation reaction of Fe (II) followed by its precipitation as Fe (III) was experimentally investigated in the presence and the absence of calcite particles using a simple agitated system. In fact, we have optimized experimental conditions to which Fe (II) can be efficiently removed from drinking water by using calcite mineral as removal agent. In effect, our results suggest that low dose of calcite (0.4 g/L) is enough to remove successfully high concentrations of Fe (II) (up to 50 mg/L) , in the short reaction time (<15min), leading acceptable pH and water chemistry for drinking. Moreover, various kinetic and equilibrium parameters for iron removal from water using calcite were determined using kinetic pseudo-second-order and Langmuir models.

KEYWORDS :   Removal of Fe (II); Adsorption; Catalytic oxidation; Iron ferrous; Calcite.

ÉTUDE DE LA DÉGRADATION DU P-NITROPHÉNOL PAR LES PROCÉDÉS D'OXYDATION AVANCÉE EN MILIEU HOMOGÈNE

TOUMIK.H., CHEBLID., MEKHALIF T., NACEF S.

Laboratoire de Génie des Procédés Chimiques (LGPC), Université Ferhat ABBAS, Sétif
E.mail : toumi.hanane@yahoo.fr

RESUME

Les procédés dits d'oxydation avancée (POA) permettent la dégradation en milieu aqueux des molécules organiques toxiques pour l'homme et pour l'environnement. Les procédés Fenton et photo-Fenton solaire qui font partie des POA sont appliqués dans ce travail pour suivre l'évolution de la dégradation du p-Nitrophénol. Cette dégradation a été suivie par spectrophotométrie UV-visible.

Dans le cas de la dégradation photochimique (irradiation UV solaire), la vitesse de dégradation est très faible. Pour ce qui est du procédé Fenton, la cinétique de dégradation dépend des paramètres expérimentaux tels que la concentration initiale des réactifs et du polluant ainsi que le pH du milieu. Le pH optimal de la dégradation du p-Nitrophénol est égal à 3. La vitesse de dégradation du p-Nitrophénol croit avec l'augmentation des concentrations des réactifs (Fe^{2+}, H_2O_2) jusqu'à des valeurs optimales. Au delà de ces valeurs devient piégeant.

La vitesse de dégradation du p-Nitrophénol peut être significativement augmentée par le procédé photo-Fenton solaire (Fe^{2+}/ H_2O_2/solaire).

Une comparaison de la cinétique de dégradation par les deux procédés étudiés a montré que le procédé photo-Fenton solaire permet d'atteindre des rendements de dégradation important (de l'ordre proche de 80%).

MOTS CLES : p-Nitrophènol, Procédé d'oxydation avancée (PAO), Fenton, Photo-Fenton solaire, Cinétique, Radicaux hydroxyles.

IRON REMOVAL FROM WATER BY ELECTROCOAGULATION

ATTOUR A. [a,b], BEN KHEMIS Y.[b], BEN AMOR M. [a], LAPICQUE F. [c], LECLERC J.-P. [c]

[a] Laboratoire de Traitement des Eaux Naturelles. Centre de Recherches et technologies des eaux, Technopole de Borj-Cédria, 8020 Soliman, Tunisie.

[b] Institut Supérieur des Sciences et Technologies de l'Environnement, Technopole de Borj-Cédria, Tunisie

[c] Laboratoire Réactions et Génie des Procédés, UPR3349 CNRS - Université de Lorraine, 1 rue Grandville, B.P. 20451, Nancy, France.

ABSTRACT

In natural waters, iron can exist in different forms: dissolved (Fe^{2+} and Fe^{3+}), complexed or solid (iron oxides and hydroxides) forms. Although it is not harmful to human health, there is no guarantee that iron remains in the ionic state. In contact with the oxygen of the air, in accordance with conditions of pH and composition of water, iron (II) oxide to form oxyhydroxides. Thus, beyond 0.3 mg/L, the presence of this ion causes aesthetic and organoleptic problems such as rust coloration of water that can stain clothing and sanitary products. Furthermore, iron solids present a potential risk of clogging of the membranes in desalination plants by membrane processes. In Tunisia, a lot of water treatment stations are faced to a dramatic increase in the mineral turbidity due mainly to the presence of iron which can reach 4 mg /L.

Electrocoagulation (EC) is a water treatment technology based on anodic electrodissolution. This study examines the influence of various parameters of EC (current density, electrode gap, NaCl concentration, temperature and initial pH) on iron removal efficiency of synthetic water in a batch reactor. Our study showed that precipitation of iron is a parallel reaction to EC reaction and is increasingly competitor for more basic solutions. A comparative study of iron removal by simple precipitation by oxidation and by EC showed that the use of EC technology remarkably improves the efficiency of iron removal. The study of the presence of other ions effect on the process of EC efficiency showed that nitrates have no effect on the process. In the case of carbonates, the rate of iron removal is better but the electrolysis time required for complete elimination of iron is the same. Iron removal kinetic increases with the current density. For low densities, at the end of the experiment, water is cloudy containing colloidal particles of very small diameter making coagulation flocculation very slow. The study of initial pH over a wide range from 2 to 9 shows that basic initial pHis better for iron removal kinetic. The optimum operating conditions for maximum removal of iron at concentrations of 25 and 100 mg Fe /L, respectively, are : current density = 2 and 10 mA /cm² respectively, electrolysis time=80min, electrode gap=0.5 cm, NaCl concentration =16.24 mM, temperature=30°C and initial pH=5. The present work has proved that the EC is a promising technique for the iron removal from water.

KEYWORDS: Electrocoagulation, iron removal, iron precipitation, aluminum electrodes.

A COMPARATIVE STUDY BETWEEN CHEMICAL COAGULATION AND ELECTROCOAGULATION BY TREATMENT OF LANDFILL LEACHATE EFFLUENT

RABAHI Amel[a], BENCHIKH ELHOCINE Mossaab[a]

[a]Laboratory of engineering and environmontal process (LIPE), Faculty of engineering of pharmaceutical processes, university Constantine3, Algeria.
E-mail : rabahiamel@yahoo.com

ABSTRACT

The objective of the present study is to compare between traditional physicochemical process such as chemical coagulation and electrocoagulation process treating a Landfill Leachate effluent.

As it's known Leachate is difficult to treat to meet to the discharge standards for its variable composition and proportion of refractory materials.

We used Jar test experiments for chemical coagulation, Aluminium sulphate ($Al_2(SO_4)_3$,18 H_2O) as a coagulant, we also perform to compare the removal efficiencies of phenol, nitrate and Toc for each method.

Experimental results of electrocoagulation using an aluminum electrode with a current density of 166.6 A/m^2 and a residence time of 150 min have shown its important removal capacity as COD and turbidity were 90.8% (whichisequal to 268 mg/L of O_2) and 98 % consecutively, who were better than chemical coagulation results.

Furthermore, it can be concluded that the electrocoagulation technique is rapid since the active agents of coagulation are produced as the experiment proceeds.

KEYWORDS :Landfill Leachate,electrocoagulation, chemical coagulation.

ETUDE DE PROCESSUS DE DESORPTION DE PRODUIT 2-4D DANS LE SOL

KOLLI Mounira[1], BENMAHDIFatiha, SEMRA Safia, BOUHELASSA Mohammed

[1] Laboratoire de l'Ingénierie des Procédés d'Environnement, Département de génie de l'environnement,UniversitédeConstantine 3, Algérie,
E-mail : kollimounira@gmail.com

RESUME

L'étude de phénomène de désorption, phénomène inverse de l'adsorption, constitue un aspect primordial pour comprendre le comportement d'un herbicide dans le sol et estimer sa disponibilité dans l'eau. Cette étude est donc importante car elle permet d'obtenir des informations sur la réversibilité de l'adsorption. L'objectif de cette étude est de réaliser une étude détaillée de phénomène de désorption du 2,4-D (herbicide) sur un sol agricole algérien en utilisant la technique en colonne et qui est basée sur la méthode de chromatographie éluto-frontale. Ces colonnes contiennent un sol saturé par le 2-4D avec dans lequel circule en permanence une solution de fond ($CaCl_2$) avec un débit constantégalau débit utilisé dans le procédé d'adsorption, on obtient ainsi le front de désorption du l'herbicide. La rétention a été étudiée au laboratoire par l'intermédiaire du tracé d'isotherme de désorption à l'équilibre. Les différents modèles d'isotherme d'équilibre appliqués montrent globalement que les observations faites sur les courbes de percée permettent de conclure à désorption de type non linéaire et non réversible. L'étude de la désorption du 2,4-D à partir du sol, nous a confirmé la difficulté de libérer cette molécule dans la solution des sols.

MOTS CLES : Herbicide, 2 ,4-D, Adsorption-désorption en colonne, la rétention, capacité d'adsorption, Sol.

PRODUCTION OF DRINKING WATER BY MICROFILTRATION

KHETTAF Sami and BOUHIDEL Kamel-Eddine Erreur ! Signet non défini.
Laboratory of Chemistry and Chemistry of the Environment / Team: Chemistry Water & Desalination.
Dpt .MS / Chemicals Fac of Science. University Hadj Lakhdar Batna Algeria
E-mail : khettaf@hotmail.fr   bouhidel@lycos.com

ABSTRACT

Through this research we are studying the possibility of using the microfiltration membrane technology; to produce drinking water from dam Timgad (Koudiet Lemdaouar). It is a new dam it was began in service in 2005. It has a total capacity of 69.10 million m3. The drinking water treatment plant uses conventional treatment and feeds 1 million inhabitants.

Therefore it is a strategic dam and little studied. The raw water of the dam shows evidence o flow turbidity (5-10 NTU) and is treated by a conventional multi-step process (coagulation - flocculation - sedimentation - sand filtration ...).

Is it possible to replace this processing chain by microfiltration and obtain a water with very low turbidity (<1NTU) and high quality?

The design and installation of an MF pilot research, from commercial products, is one of the original features of this work. Indeed this   driver   was used to compare the frontal and tangential modes and Membrane fouling. These are two important aspects of research on the MF.

We studied the influence of the following parameters:

The effect of initial turbidity.
The effect of the nature of the turbidity.
The difference between frontal and tangential modes.
Membrane fouling

And we obtain the following results. –

The turbidity of treated water less than 1 NTU
The turbidity of the water dam after treatment is 0.2 NTU
Whatever the initial value of the turbidity the membrane always reset efficient and removal
Efficiency went up to 95%
The membrane has not been able to remove artificially turbidity of metals oxides
Tangential filtration allowed cleaning surface of the membrane Constantly

----
*The 5th Maghreb Conference on Desalination and WaterTreatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

94

Filtration de l'eau de barrage

Les conditions : P = (1.2-2) bar, Ti = 24.7 (NTU)
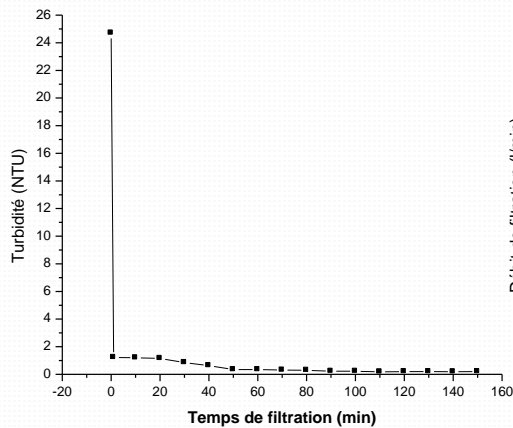
*Variation du turbidité
en fonction du temps*
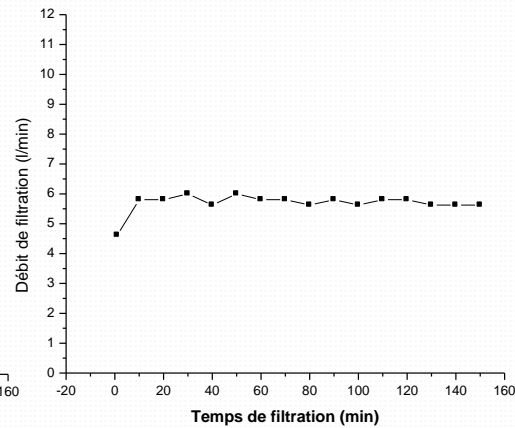
*Variation du débit de
filtration
en fonction du temps*

REFERENCES

[01] Erich Wittmann, Annie Tazi-Painb, Thierry Chanussotc, Alexandra Pattersond, Robert Niay", Abdelkader Gaidf, FrtdCric CantoC, Clarification of a highly turbid karstic water by microfiltration, Desalination 145 (2002) 309-3 13

[02] Jean-Marc BERLAND et Catherine JUERY, Les procédés membranaires pour le traitement de l'eau (12/ 2002)

[03 D. Vial, G. Doussau , The use of microfiltration membranes for seawater pre-treatment prior to reverse osmosis membranes , Desalination 153 (2002) 141-147

[04] Xia Shengjia, Li Xingb,Yao Jic, Dong Bingzhia, Yao Juanjuana, Application of membrane techniques to produce drinking water in China , Desalination 222 (2008) 497–501]

[05] K.V. Plakas , A.J. Karabelas a, T. Wintgens b, T. Melin A , study of selected herbicides retention by nanofiltration membranes—The role of organic fouling , Journal of Membrane Science 284 (2006) 291–300

[06] nilaksh kothari a, j.s. taylor b, pilot scale microfiltration at manitowoc, desalination 119 (1998) 93-102

OPTIMIZATION OF ELECTROCHEMICAL ZINC RECOVERY PROCESS :
EFFECT OF THE PRESENCE COPPER AND SURFACTANT IN CHLORIDE MEDIUM OF PH=3

TOUABI Noura [1, 2],BOUNOUGHAZ Moussa [1], MARTINEZ Sanja [2]

[1]University M'Hammed Bougara Boumerdes/Teamelectro polymerization & Corrosion, Laboratory of Forming and Treatment off fibrous polymers, UMBB, Boumerdes, 3500, Algeria.

[2]University of Zagreb, Faculty of Chemical Engineering and Technology, Department of Electrochemistry, Marulićev trg 19, Zagreb, Croatia.

ntouabi86@yahoo.fr

ABSTRACT

The wastewater pollution by heavy metals remains today one of the important problems to solve in the industrialized countries. Various conventional methods are used to remove these metals. In the present work, the effect of the presence of surfactant and copper on zinc recovery by electrodeposition from synthetic medium of pH=3 has been studied. Zinc was deposited potentiostatically at -1300mV on a graphite electrode with graphite auxiliary electrode and saturated calomel electrode as a reference.

Cyclic voltammetry, electrochemical impedance spectroscopy and chronoamperometry were used to characterize the kinetics of nucleation and electroplating of Zinc deposits. The experimental data shows that the presence of surfactants affects the zinc deposition process. The study of the effect of the scanning rate and the concentrationofZinc in solution on cyclic voltammograms in the presence and absence of surfactant shows that the copper was deposited under diffusion control. Chronoamperometry and impedance spectroscopy shows a significant increase in the process of deposition in the presence of 0.01M of copper and 40ppm of surfactant.

Structural and morphological characteristics of the deposits formed at different concentration of surfactant have been investigated by scanning electron microscopy (SEM) and X-ray diffraction (XRD).Deposits are mainly composed by Zn and ZnO with different texture, crystal shape and size. The deposit with surfactant was more compact.

DEPOLLUTION OF INDUSTRIAL WATERS LOADED IN HEXAVALENT CHROMIUM BY ELECTROSORPTION / CDI: OPTIMIZATION OF TREATMENT PROCESS (pH, FLOW, VOLTAGE, CONTACT TIME)

SENOUSSI H. [1,b],BOUHIDEL K. E. [1,a]

[1,] Laboratory of Chemistry & Environmental Chemistry LCCE, Team : Water Chemistry , Environment & Desalination . Faculty of Sciences, University Hadj Lakhdar Batna 05000 a Algeria.
[a]bouhidel@lycos.com [b] hasna_senoussi@hotmail.fr

ABSTRACT

This research work deals with the removal of pollutants Hexavalent chromium by CDI on activated carbon electrodes in a laboratory scale cell .Very important research efforts, high investments and an increasing interests are accorded to desalination by CDI and to electrosorption derived processes. This is illustrated by M.A. Anderson, P.M. Biesheuvel, L. Zou],…very recent scientific production .

Pollutants removal by electrosorption is not new. Conway & al. have studied extensively the removal of organics, sulphur compounds, thiocyanate and inorganics such as chromate. However the mechanisms and the electrochemical behaviour of most chemicals on activated carbon surface are not well understood. The desalination cations Na^+, K^+, Ca^{++}, Mg^{++}, HCO_3^- …are electrochemically inactive and their removal is explained by a double layer mechanism, which cannot be generalized to other ions with specific electrochemical and surface properties. Hexavalent chromium is a good example. This anion is expected to be removed easily on anodic surfaces in alkaline solutions by a double layer mechanism, however our test is negative: it is not removed. In acidic pH the efficiency is better. Other examples related to desalination are F^- and B. CDI is well adapted to brackish waters. Are F^- and borates removed by CDI? The answer is not evident and needs research. These previous examples show both:

An important research need to understand the CDI behaviour of a great variety of solutes, pollutants and micropollutants. Surface and interfacial (electrochemistry, fundamental solution chemistry (hydration, polarizability,…) are other and not easy interfacial topics .

A better fundamental understanding will open high perspectives such as selective separations and removal and very large applications.

We were studied the PH, flow rate… influence on chromate electrosorpton . A conventional three-dimensional electrode system (3*2*0.3 cm) was adopted in the electrosorption. A schematic diagram of the state electrosorptionsystem is shown in (Fig1). The initial concentration of the chromate ions in the solution is 31.5 mg/L. The pH ofthe solution was adjusted by adding of 0.5 M sulfuric acid. 100% of chromate ions are removed in PH=2. We will explain the phenomenon well later
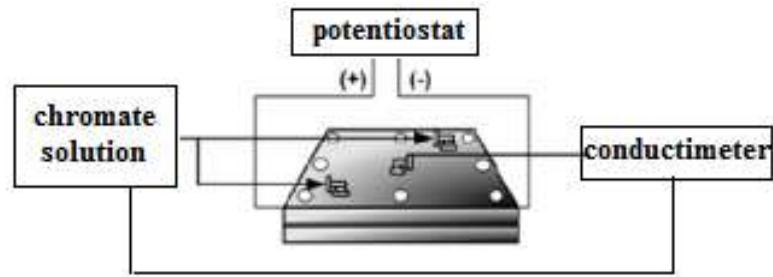
Fig1: Schematic diagram of the setup for electrosorption experiments

KEYWORDS: Electrosorption, capacitive deionization, activated carbon, hexavalent
chromium, depollution.

NITRIC ACID – METALS WASTE WATERS FROM A BRASS PICKLING USED BATH: SEPARATION, PURIFICATION AND RECYCLING BY AN HYBRID PROCESS DIFFUSION DIALYSIS – SELECTIVE PHYSICO - CHEMICAL METHODS

AMRANE Chahrazad * [1], LALMI Afaf [1] , BOUHIDEL Kamel-Eddine [1]

[1,] Laboratory of Chemistry & Environmental Chemistry LCCE, Team: Water Chemistry, Environment & Desalination. Faculty of Sciences, University Hadj Lakhdar Batna 05000 Batna Algeria *bouhidel@lycos.com

ABSTRACT

This research work applies a clean technology to treat the concentrated waste waters of a brass pickling bath. This last contains high concentration mixture of nitric acid and dissolved metals (Cu^{++}, Zn^{++} and Pb^{++}). Now the studied industrial plant neutralizes HNO_3 and precipitates the metals with these 3 major drawbacks:

Loss of an expensive acid (50 % of the initial quantity) ;

Pollution of the treated and rejected effluents by nitrates ;

Production of a problematic (filtration , storage , fate …) metal hydroxides sludge ;

To solve these problems we apply a clean hybrid technology:

The diffusion dialysis with anion exchange membranes AMX; the result is excellent. We separate and purify HNO_3 with a high efficiency.

The remaining metals mixture contains Cu^{++} , Zn^{++} and Pb^{++} which are processed by chemical (selective precipitation) and physico – chemical (cementation ,…) methods .

EXPERIMENTAL

Nitric acid analysis and dialysis control : pH and titration ;

Metal analysis : Atomic Absorption and Visible Spectroscopy ;

Dialysis : A two compartment cell separated by an AMX anion exchange membrane ;

Selective precipitation by different chemicals: phosphate, NaOH…

RESULTS AND DISCUSSION

Diffusion Dialysis of nitric acid of the brass pickling used bath gives an excellent efficiency of recuperation (approximately 50%).

Separation by selective separation and cementation made it possible to recover the three metals of brass pickling bath.

CONCLUSION

The objective of our work is the study of possibility of valorization of bath brass pickling by selective precipitation, cementation and dialysis.

The experimental study that we carried out allowed us to note the following results:

Diffusionnel dialysis give a very important rendement (47.86%) of nitric recovery of acid of brass pickling.

Selective precipitation by phosphates leads of the excellent outputs of recovery: 100 % of Pb^{++}, 91.275 % of Cu^{++} and 86.61% of Zn^{++}.

The test of copper cementation by powder of the zinc excess showed that the reaction gives an excellent output (74.32%) of copper recovery.

The results obtained, seem that selective precipitation by phosphate, cementation and dialysis are effective and economic techniques for recovery and recycling metals and acid of brass pickling bath thus to eliminate the problem from sludge of this industry.

KEYWORDS : diffusionnel dialysis, brass pickling bath, recovery of metals, cementation.

ELECTROPLATING SLUDGE LIXIVIATION :

----

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*

Hammamet,Tunisia 21-24 December, 2015

99

RECOVERY OF ACIDS, BASES AND METALS BY DIFFUSION DIALYSIS

AMRANE Chahrazad * [1] , BOUHIDEL Kamel-Eddine [1]

1, Laboratory of Chemistry & Environmental Chemistry LCCE, Team: Water Chemistry, Environment & Desalination. Faculty of Sciences, University Hadj Lakhdar Batna 05000 Batna Algeria *bouhidel@lycos.com

ABSTRACT

Diffusion dialysis by proton or hydroxyl leakage, through an ion exchange membrane, is a well known and largely used process. It is applied in hydrometallurgy and metal pickling to separate and recover acids and alkali from metal mixtures. It is an elegant and simple method to prevent pollution and to recycle valuable materials. In this research we apply the same idea to solve two original problems. We recover:

- The excess of acid or alkali issued from the selective lixiviation of the electroplating sludge;

- The excess of alkali issued from the separation of metals (Fe, Ni, Co) by selective precipitation.

Application of dialysis to the electroplating sludge leaching

In the electroplating industry, the conventional treatment of waste waters is based on detoxification (cyanide and chromates), followed by a precipitation of metals. The resulting electroplating sludge, a mixture of metal hydroxides, constitutes a serious environmental problem. What generates two major pollution prevention challenges:

- The substitution of CN- and Cr (VI) and the minimization with a zero discharge objective;

- The management of the hazardous metal sludge accumulated during the last decades;

The selective recovery of metal values from this sludge constitutes an economic and environmental solution. In most cases an acidic, alkaline, complexing…leaching is a necessary step where the excess of lixiviant constitutes a problem. We propose a diffusion dialysis to separate solubilized metals from sulphuric acid. Sludge utilize is a reel sludge of a electroplating industry.

EXPERIMENTAL

The experimental is composed of a cell plexiglas to two compartments (figure 1, separated by an anion exchange membrane (AMX) of the active surface 1 cm^2. The temperature is of 30°C.

sulphuric acid and Sodium hydroxide analysis and dialysis control : pH and titration ;

Metal analysis : Atomic Absorption and Visible Spectroscopy ;

Selective precipitation by different chemicals: phosphate, NaOH…

RESULTS AND DISCUSSION

The laboratory scale results are promising:

- In a free convection two compartments cell, the efficiency of acid recovery is 45 % after 48 hours.

- In the same agitated cell the efficiency increases to 95 % in less than 14 hours, successive dialysis is also to study with the influence of agitation end co – ion

- We separate cobalt from nickel by an alkaline sludge lixiviation. The recovery of sodium hydroxide, with a high efficiency, is obtained with a cation exchange membrane. This method, for cobalt recovery, is quite new.

We recall that the recovery by dialysis of acid bains worn stripping is well known and already being applied. However this application is completely original.

Conclusion

These studies we have led to examine the possibilities to recover excess acid at step of leaching of metals sludge.

-The diffusionnelle dialysis gave excellent yields of recovery of acids and bases of leaching which can be easily recycled. In our conditions, one may recover the following percentages:

- 43.60 % of sulfuric acid without agitation after 48 hours

- 42.05% by successive dialysis without agitation after 14 hours.

- 90.21 % with agitation after 48 hours.

 - 85.42 % by successive dialysis with agitation after 14 hours.

This operation allows us to recycle that excess acid therefore, to reduce the cost of treatment of sludge and avoid the stage of neutralization by a basis.

KEYWORDS: acid dialysis, recovery of sulphuric acid, basic dialysis, electroplating sludge.

ANALYSE ET SPECIATION DES METAUX LOURDS DANS LE BARRAGE DE TIMGAD (BATNA)

AMRANE Chahrazed , BOUHIDEL Kamel-Eddine

Laboratoire de Chimie et Chimie de l'Environnement / Equipe : Chimie de l'Eau & Dessalement
Dpt. SM / Chimie Fac. des Sciences Université Hadj Lakhdar Batna Algérie
[*]amcha82_ya@hotmail.fr[*] bouhidel@lycos.com

I) INTRODUCTION

Le but de notre recherche est d'analyser les métaux lourds dans le barrage de Timgad (Batna), de déterminer leur spéciation et leur éventuelle remobilisation si la chimie de l'eau du barrage change. Ces analyses combinées aux puissants outils de la chimie analytique moderne (logiciels, calculs,…) vont permettre de prévoir le devenir de ces métaux. Outre la SAA nous avons utilisé l'Anodic Stripping Voltammetry pour la détection des traces.

Les analyses des éléments suivants ont été effectuées : cuivre, zinc, nickel, plomb, cadmium, chrome et fer. Les lieux d'échantillonnage sont : eau de surface (brute), eau filtrée, eau de lavage des filtres, eau de fond de barrage, eau traitée et les eaux de décanteur. On a aussi analysé 4 échantillons des sédiments et la boue du décanteur. La fréquence des prises est mensuelle de décembre 2012 à juillet 2013. Après préparation des échantillons, on a appliqué deux processus d'extraction : extraction totale pour déterminer la quantité de métal et l'extraction séquentielle pour la spéciation de ces métaux.

II)MATERIELS ET METHODES :

- Autolab (PGZSTAT 30) ECO CHIMIE.
- pH-mètre modèle : WTW series inolab pH 720 avec une électrode WTW pH électrode Sent Tix 21
- Spectrophotométrie d'absorption atomique (SAA) SHIMADZU AA-6800

III) RESULTATS :

La courbe suivante représente l'analyse séquentielle du cuivre dans deux échantillons de sédiment du barrage.
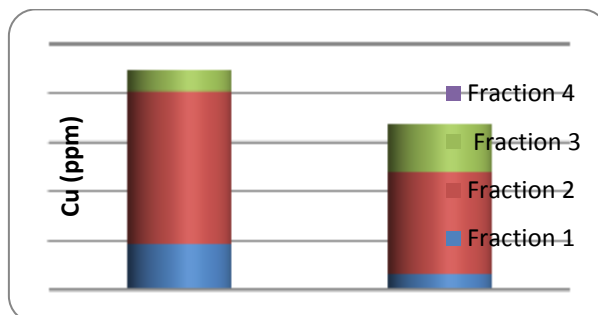
Figure (1) : analyse de cuivre dans les sédiments

Conclusion :

Les sédiments de barrage sont chargés en métaux lourds. L'attaque séquentielle nous donne une idée très claire sur la spéciation de ces métaux. Les résultats montrent que la quantité et la forme des métaux des boues de décanteur est similaire à celle des sédiments.

REFERENCES:

[1] : Keivan Nemati, Nor Kartini Abu Bakar, Mhd. Radzi Abas, Elham Sobhanzadeh; Speciation of heavy metals by modified BCR sequential extraction procedure indifferent depths of sediments from Sungai Buloh, Selangor, Malaysia; Journal of Hazardous Materials 192 (2011) 402– 410.

[2] : M.L. Alonso Castillo, E. Vereda Alonso , M.T. Siles Cordero, J.M. Cano Pavón, A. García de Torres; Fractionation of heavy metals in sediment by using microwave assisted sequential extraction procedure and determination by inductively coupled plasma mass spectrometry; Microchemical Journal 98 (2011) 234–239.

CONDENSATE RECOVERY IMPROVEMENT BY INSTALLATION A HEAT EXCHANGER

CHEMINI R., SADOUNI K., MENOUN A.

Faculté de Génie Mécanique et de Génie des Procédés, Université des Sciences et de la Technologie
Houari Boumediene, BP 32 El Alia Bab Ezzouar 16111 Alger-Algérie

ABSTRACT

The conservation of energy remains the essential preoccupation of the oil industry. Several studies were elaborated in order to reduce the energy losses and gas evacuation in the atmosphere.

The objective of our work is to study the section of condensate recovery which has a problem in the separator, because the gas temperature at the exit of air cooler is high, especially during summer period when the airtemperature exceeds 50°C. The system of refrigeration is not enough to reach the optimal temperature of 30°C in the separator. The quantity of heat exchanged in the air cooler is insufficient, because the temperature of gas at the exit cannot be decreased less than 43°C.

The proposed solution is to install aheatexchangerwhich uses condensate recovery to cool gas at 30°C. The condenser has 148.25 m^2 of exchange surface and the cost is estimated at 1 370 250 Dollars which could be paid at the end of 87 days. The profit generated by the sale of the crude oil will be 34 125 892 Dollar per year.

KEYWORDS : condensate, energy, recovery, heat exchanger

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

103

CONCENTRATION EFFECT ON THE BIO DETERIORATION OF THE NONSTOP PARA-CRESOL

SEMSSOUM A. *[1], YENNOUNE A.[1], BENDJAMA Z. [1], REBAI F. [1], BRAHMI L., BOUAKAZ N.[1],NOURI L.[1]

[1]Laboratoire des sciences de génie des procédés industriels
Faculté de Génie Mécanique et Génie des Procédés
Université des sciences et de technologies Houari Boumediene
[*]semakila@yahoo.fr ; zbendjama@yahoo.fr ; aki_yen55@yahoo.fr

ABSTRACT

The development accelerated by the industry generated for decades more and more important chemical pollutants of which the accumulation is harmful to the environment.

These products can drive to toxic effects towards the man, some fauna and towards the flora. In order to protect the fragile aquatic ecosystems and the quality of the resource, several methods of treatment were proposed in the literature.

The bio deterioration with fixed culture lives the classic most employed technique. The objective of this work is the study of the biodeterioration of the p-cresol by a bacterial consortium fixed to elaborated mineral support.

A parametric study concerning the flow rate of power supply, the height of the bed and the initial concentration by polluting, was made with the aim of inspecting process of biodeterioration.

The major results obtained showe that for a concentration of 100 mg. L-1, a flow rate of 1 mL.min-1 and a 12 cm height, the rate of elimination of the p-cresol was 99,88 %.

With these results we can conclude that the biomass fixed to the elaborated support presents a remarkable potential for an application in the treatment of waters use continuously, in particular in the detoxification of the phenolic effluents.

ETUDE CINÉTIQUE DE L'ADSORPTION DYNAMIQUE D'UN POLLUANT ORGANIQUE PAR LE PHOSPHATE ALGÉRIENNE

SOUADEK Rachida, RIDA Kamel

Laboratoire Interaction Matériaux-Environnement (LIME)
Université Mohamed Seddik Ben Yahia, Jijel Algérie,
rida_kamel2001@yahoo.fr

RÉSUMÉ

Dans cette étude nous nous sommes intéressées à l'étude de l'adsorption dynamique d'un polluant organique (l'acide acétique) par le phosphate naturel de Tébessa (Algérie). La caractérisation physico- chimique a été réalisée par diffraction des rayons X (DRX), spectroscopie FTIR et l'analyse de la surface spécifique par BET. L'effet de la concentration initiale de l'adsorbat, la hauteur de lit ont été étudies en mode dynamique, la cinétique d'adsorption dynamique de l'acide acétique vérifie le modèle de pseudo-seconde ordre avec la contribution de la diffusion intra- particulaire.

MOTS CLÉS : Adsorption, acide acétique, phosphate naturel, étude cinétique.

STUDY OF THE FORMATION OF A HETEROPOLYANIONIC COMPLEX $(P_2W_{15}Mo_2\,PbO_{61})^{8-}$ AND REGENERATION BY EMULSIFIED LIQUID MEMBRANE

Zabat Nacéra *, ABBESSI Mostefa

Laboratory of Environmental Engineering, Department of Process Engineering, Badji Mokhtar-Annaba University, P.O. Box 12 ,23000 Annaba ,Algeria. e-mail: (zabatnassira @ yahoo.fr)

ABSTRACT

This study focused primarily, on the complexation of a toxic metal, a lead in aqueous solution (Pb^{2+}), by a mixed incomplete heteropolyanion (HPA) of DAWSON type $(P_2W_{15}Mo_2O_{61})^{10-}$. Then it was proceeded to recover this formed complex $(P_2W_{15}Mo_2PbO_{61})^{8-}$ using the technique of extraction by the emulsified liquid membrane (ELM). Through the study of the parameters influencing the formation of this complex and determining the constant of stability, it was deduced that the formed complex is very stable in aqueous medium. The stability constant found is $\beta=2,5.10^6$.

The regeneration of the formed complex $(P_2W_{15}Mo_2PbO_{61})^{8-}$ by (MLE), required optimization of the main parameters influencing the extraction namely :

- PH of the external phase to extract

- The membrane composition (extractant, thinner, surfactant)

- Organic phase to aqueous phase ratio (O / A)

- Report volume of the organic phase on the volume of the emulsion (Vext / Vemul)

- Stirring speed

- Initial concentration of the external phase to be extracted.

The extraction yield of the formed complex $(P_2W_{15}Mo_2PbO_{61})^{8-}$ is 90%.

KEYWORDS: heteropolyanion; lead; complexation; extraction; emulsified liquid membrane.

DEGRADATION OF TIEMONIUM METHYL SULPHATE BY ADSORPTION ON LICHENS

AGUENIOU Fazia, BOUGUETTOUCHA Abdallah, CHEBLI Derradji

University of Ferhat Abbas, Setif Algeria

ABSTRACT

An antibiotic (Tiemonium methyl sulphate) is eliminated with coupling from two processes; adsorption and phtotcatalysis. First, the antibiotic is adsorbed on a local biomass (lichens), the adsorbing material is prepared by treatment of the lichens with hydrochloric acid (1M) follow-up of a calcination in a furnace with 500°C. The follow-up of the kinetics of adsorption for various antibiotic concentrations enabled us to determine the time of balance which is estimated at 2h. Thereafter the influence of temperature was examined. In a second stage we exploited the capacity photocatalytic of oxide of zinc grafted on the lichens. The analysis by Infrarouge spectroscopy enabled us to determine the operative functional groupings at each stage of handling.

***KEYWORDS* :** Tiemonium methyl sulphate, adsorption, metallic oxide, photocatalysis.

TREATMENT OF CONCENTRATE SANITARY LANDFILL LEACHATE BY ANODIC OXIDATION AND ELECTRO-FENTON COMBINED PROCESSES (CALIBRI, BOLD, SIZE 13)

LABIADH L. [a,b], FERNANDES A. [a], CIRÍACO L. [a], PACHECO M. .J. [a], GADRI A. [b], AMMAR S. [b,c] and LOPES A. [a]

[a]FibEnTech Unit and Department of Chemistry, University of Beira Interior, 6201-001 Covilhã, Portugal;
[b]Dép. de chimie, Faculté des Sciences de Gabès, Université de Gabès, Cité Erriadh, 6072 Gabès, Tunisie;
[c]Dép. de chimie, Faculté des Sciences de Bizerte, Université de Carthage, 7021 Jarzouna Tunisie
E-mail : *analopes@ubi.pt

ABSTRACT

Sanitary landfills are the simple procedure to discharge the huge amounts of municipal solid wastes produced daily. Although this is a low cost process, it presents as main disadvantage the formation of leachate as a result of rainwater percolation through the wastes. These leachates are very complex wastewaters containing several types of pollutants, such as all types of organic and inorganic compounds, some of them refractory and toxic, and heavy metals [1]. Biological reactors, with nitrification/denitrification steps, followed by membrane technologies, namely reverse osmosis, are commonly used to treat sanitary landfill leachates, remaining a concentrate, very difficult to treat. Electrochemical treatments have been showing high efficiency in the elimination of persistent pollutants and several studies have described the application of these methods in the treatment of complex effluents [2,3]. The objective of this work was to study the application of combined anodic oxidation, with a BDD anode, and electro-Fenton, with a carbon-felt cathode, to treat a concentrate obtained in the reverse osmosis of a leachate from a municipal sanitary landfill. In the electro-Fenton process, the influence of the iron content, the applied current intensity and the initial pH were studied.

The anodic oxidation was used in the first place to reduce to half the initial organic load of the concentrate, since this electrochemical process presents higher current efficiency for high organic content. During the application of the electro-Fenton process, it was found that organic load removal was very sensitive to initial pH, being pH of 3 the most adequate value, was also very dependent on the applied intensity, increasing with it, and only slightly dependent on the added iron.

KEYWORDS : Anodic oxidation, electro-Fenton, landfill leachate, BDD, carbon felt.

REFERENCES
[1] Eggen, T., Moeder, M., Arukwe, A., 2010. Municipal landfill leachates: A significant source for new and emerging pollutants. Science of the Total Environment 408 (21), 5147-5157.
[2] Anglada, A., Urtiaga, A., Ortiz, I., 2009a. Contributions of electrochemical oxidation to waste-water treatment: fundamentals and review of applications. Journal of Chemical Technology and Biotechnology 84 (12), 1747-1755.
[3] Fernandes, A., Pacheco, M.J., Ciríaco, L., Lopes, A. (2015). Review on the electrochemical processes for the treatment of sanitary landfill leachates: Present and future. Appl. Catalysis B: Environ. 176–177, October 2015, 183–200. DOI:10.1016/j.apcatb.2015.03.052.

WATER RECYCLING AND FREE AMINO ACIDS RECOVERY FROM WHEAT WASHING WATERS BY AN HYBRID PROCESS : BENTONITE / MICROFILTRATION / ELECTRODEIONIZATION

AOUN Saad [2] , BENZEDIRA Tewfik[1], BOUHIDEL Kamel-Eddine [1]*

[1,] Laboratory of Chemistry & Environmental Chemistry LCCE , Team : Water Chemistry , Environment & Desalination .
Faculty of Sciences , University Hadj Lakhdar Batna 05000 Batna Algeria e-mail : *bouhidel@lycos.com
[2]UFA University of Setif Algeria

INTRODUCTION : The raw wheat processing needs important volumes of water for washing (1 to 2 m^3/ton) and a very short contact time (7 s) .The resulting waste waters are polluted by BOD, COD, bacteria . A conventional treatment is not adapted : salt accumulation , chlorine organic by products are serious drawbacks .

In this research work we propose to apply a clean membrane technology based on water recycling, valuable by products recovery (free amino acids, natural wheat salts,…). An hybrid process is proposed :

The bentonite eliminates suspended and colloidal matter by coagulation floculation ;

The microfiltration : after a bentonite pretreatment to remove colloids , the MF eliminates the micro organisms and remaining turbidity . The EDI (research work in progress) concentrates natural salts, free amino acids and separates neutral organic molecules (saccharides).

MATERIALS : The following materials and equipments have been used :

A laboratory scale frontal MF cell with a 0.45 µm polycarbonate membrane .

Activated bentonite ;

Amino acids has been identified by ninhydrine ,TLC and planar electrophoresis.

Natural salt content has been evaluated by conductimetry .

Selected wheat have been washed with distilled water in respect to washing time and ratios.

RESULTS AND DISCUSSION : We present briefly the different analytical and micropilot plant runs :

Analytical : The washing waste waters are highly turbid, yellowish, with a 450 µS conductivity, 350 mg/l of COD, a 6 to 7 pH. TLC and electrophoresis permit to separate 4 amino acids (2 acidic and 2 basic). Ion exchange separations confirm these results.

Bentonite/Micro filtration (1) treatment ::frontal MF of waste waters gives severe fouling (filtrate-time measurements) . A pre-treatment by coagulation – flocculation improves strongly the filtrate flow rate .

Ion Exchange: The micro filtered water is successfully treated by an IEX mixed bed. Free amino acids and natural salts are entirely fixed . The resulting water conductivity is very low with a low COD of neutral saccharides easily fixed on activated carbon. The IEX needs chemical for regeneration. The low conductivity of washing waters is well adapted to the EDI process which may replace the IEX mixed bed.

The EDI process : It is a well known success for demineralization of low conductivity waters. Runs with NaCl and KCl are promising **(2)**. Nextly we experiment real solutions with EDI .

CONCLUSION : The hybrid process bentonite coagulation – microfiltration has been tested successfully to treat and recycle the wheat washing waste waters . It can be generalized to other agro-food industries . The use of IEX or EDI permits to recover valuable amino acids (4 in this case: 2 acidic and 2 basic) and improves strongly the water quality.

REFERENCES

1 - Kamel-eddine Bouhidel & Saad Aoun ICOM96 Poster session Yokohama (Japan) .

2 - Kamel-eddine Bouhidel & Aicha Lakehal desalination volume 193 (2006) 411-421

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet,Tunisia 21-24 December, 2015

109

PARAMETRIC STUDY ON THE EFFECT OF THE RATIOS [H₂O₂]/ [Fe³⁺] AND [H₂O₂]/[SUBSTRAT] ON THE FENTON DEGRADATION OF OXYTETRACYCLINE

EL KHIR W.[a], BOUAFIA-CHERGUIS[a]., CHABANI M.[a], AMRANE A.[b,c*] ,BENSMAILI A.[a]

[a]Laboratoire de Génie de la Réaction, Equipe Les procédés durables de la dépollution, Faculté de Génie Mécanique et Génie des Procédés ; U.S.T.H.B. BP 32, El Allia, Bab Ezzouar, Algérie

[b]Université de Rennes 1, Ecole Nationale Supérieure de Chimie de Rennes, CNRS, UMR 6226, Avenue du Général Leclerc, CS 50837, 35708 Rennes Cedex 7, France

[c]Université européenne de Bretagne

ABSTRACT

An experimental parametric study was realized to investigate the effects of $[H_2O_2]/[Fe^{3+}]$ and $[H_2O_2]/[OTC]$ ratios on the Fenton degradation of the antibiotic oxytetracycline (OTC) at different pH values in aqueous solution.

Particular emphasis was given to the kinetics and mechanism during this process.

The kinetics study of the reaction between OTC and hydroxyl radicals showed that the degradation of OTC follows a first-order kinetic. It was found that the concentration of H_2O_2 and ferric iron as well as their ratio $[H_2O_2]/[Fe^{3+}]$ are key factors governing the removal of OTC in acid solution and that the optimal ratio

$[H_2O_2]/[Fe^{3+}]$ is equal to 20 for 0.15 mM Fe^{3+} concentration. The initial OTC concentration and the $[H_2O_2]/[OTC]$ ratio were also found as significant operating parameters on the mineralization efficiency. The optimization of the operating conditions permitted to obtain a quasi-total mineralization (93%) of synthetic OTC aqueous solutions.

KEYWORD : Fenton, UV irradiation, oxytetracycline, photocatalysis, H_2O_2

KINETIC AND THERMODYNAMIC STUDY OF THE AMOXICILLIN ELIMINATION ON ACTIVATED CARBON OF VEGETABLE ORIGIN

BENREDOUANE S. [1], BERRAMA T. [1]*, DOUFENE Nassim[1], DADOU Salima[1]

[1]Laboratoire des sciences de génie des procédés industriels - Faculté de Génie Mécanique et de Génie des Procédés - USTHB - BP 32, El-Alia, 16111, Bab-Ezzouar, Alger (Algérie)
* E-mail- tarek_ber@yahoo.fr

ABSTRACT

The aim of this work is to study the kinetic and thermodynamic of adsorption Amoxicillin, from aqueous solution, on activated carbon prepared from precursor of vegetable origin (pedicels dates), that is a very abundant material in Algeria. The precursor is treated with phosphoric acid (H_3PO_4) and then submitted to carbonization operation during 2h at 500°C.

The kinetic and thermodynamic study of amoxicillin adsorption was carried out in the conditions under free-pH values and various initial concentrations of pollutant. Several kinetics equations were applied to model results, ie, pseudo-first order, pseudo-second order, intra-granular diffusion and pore diffusion. The linear form of each model has been plotted. The transfer of external mass can be represented favorably by the pseudo-second-order model. The intraparticle model gives an idea about the rate of adsorption reaction during the diffusion in the macropores. The pore diffusion, according to Bangham model is one of the steps to consider in the adsorption process.

The value of the enthalpy ($\Delta H° > 0$) indicating that the amoxicillin adsorption process on activated carbon is endothermic.The value of the free energy ($\Delta G °$) is positive for low temperatures, this indicates the feasibility of the adsorption process and not spontaneous nature, thermodynamically possible (energetically impossible), and negative for higher temperatures, therefore the adsorption process and thermodynamically feasible spontaneous nature.

KEYWORDS: Adsorption, Amoxicillin, pollutant emerging, water pollution

DIMETHYL PHTHALATE DMP REMOVAL FROM AQUEOUS SOLUTION BY ACTIVATED CARBON PREPARED FROM A HIGH BIOMASS PRODUCTIVITY: ISOTHERM EQUILIBRIUM STUDY

DOUFENE Nassim[1], BERRAMA T. [1]*, BENREDOUANE S. [1], NEKAA Chakib[1]

[1]Laboratoire des sciences de génie des procédés industriels - Faculté de Génie Mécanique et de Génie des Procédés - USTHB - BP 32, El-Alia, 16111, Bab-Ezzouar, Alger (Algérie)
* E-mail: tarek_ber@yahoo.fr

ABSTRACT

The aim of this work is the study of the removal of dimethyl phthalate (DMP), regarded as representative molecule of pollutant emergent, by adsorption on activated carbon prepared from a renewable biosource. The precursor used for activated carbon preparation has a high biomass productivity and ability to intensive cultivation, and is also very abundant in Algeria. The precursor is treated with phosphoric acid (H_3PO_4) and then submitted to carbonization operation. Isotherm equilibrium study of DMP adsorption was carried out in the conditions for free-values of pH and at various initial concentrations of pollutant. Several isothermal equations were applied to model results, ie, Langmuir, Freundlich, Temkin. The linear form of each model has been plotted. They show that the Temkin equation is the most favorable to represent the results with a determination coefficient > 0,98.

KEYWORDS: adsorption, pollutant emergent, isotherm, dimethyl phthalate.

SULFAMETHOXAZOLE DEGRADATION BY CONVENTIONAL FENTON AND MICROWAVE-ASSISTED FENTON REACTION

CHEBLI Derradji, BOUGUETTOUCHA Abdallah, MANAA Zoubir, AMRANE Abdeltif

Laboratoire de Génie des Procédés Chimique (L.G.P.C.), Département de Génie des Procédés de Technologie, Université Ferhat Abbas, Sétif 19000, Ageria

E-mail : derradji_chebli@yahoo.fr

ABSTRACT

Pharmaceutical products, such as sulfamethoxazole (SMX) are rejected in the environment at trace level by human and animals (ng/L to mg/L), in their original form or as byproducts. Antibiotics are toxic contaminants for the aquatic environment, owing to their adverse effects on the aquatic life and humans. Even at low concentrations they can negatively impact biological water treatment leading to the proliferation of antibiotics-resistant pathogens. It is therefore of major importance to develop efficient methods to limit their presence in the aquatic environment. In this aim, advanced oxidation processes (AOP) appear relevant compared to other methods, since they are based on the production of highly reactive free radicals, and especially $^\bullet OH$.

The objective of this work was to evaluate the degradation of SMX by microwave-assisted Fenton reaction ($MW/Fe/H_2O_2$). Hydrogen peroxide and ferrous ions concentrations, as well as the microwave power were optimized. The results showed that the SMX degradation by $MW/Fe/H_2O_2$ followed a pseudo-first order kinetic. The treatment of 20 mg/L initial SMX by the Fenton reaction in the presence of microwave showed the positive impact of this latter owing to the higher degradation yields observed in a reduced reaction time if compared to the conventional Fenton reaction, less than 5 min for a total degradation. In addition, increasing microwave power increased the degradation kinetics. Irrespective of the application of microwave, the optimal pH for the Fenton reaction remained 3. Examination of the impact of the ionic strength showed that carbonate and sulfate anions increased the rate of SMX degradation.

KEYWORDS: Microwave; Degradation; Fenton; Antibiotic.

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"

Hammamet,Tunisia 21-24 December, 2015

113

SULFAMETHAXOZOLE REMOVAL BY MICROWAVE-ASSISTED HETEROGENOUS FENTON REACTION INVOLVING SYNTHETIC CLAY

CHEBLI D. [a], BOUGUETTOUCHA A. [a], MANAA Z. [a], NACEF S. [a], AMRANE A. [b,c]

[a] Laboratoire de génie des procédés chimiques LGPC, Département de Génie des Procédés Faculté de Technologie, Université Ferhat Abbes, SETIF-1

[b] Ecole Nationale Supérieure de Chimie de Rennes, Université de Rennes 1, CNRS, UMR 6226, Avenue du Général Leclerc, CS 50837, 35708, Rennes Cedex 7, Rennes, France

[c] Université Européenne de Bretagne, Bd Laënnec, 35000 Rennes, France

E-mail : derradji_chebli@yahoo.fr

ABSTRACT

Antibiotics are major pollutants of wastewater not only due to their stability in biological systems, but also due to their impact on public health. Their degradation by means of hydroxyl radicals generated through the application of microwave in the presence of hydrogen peroxide and two solid catalysts, iron-based synthetic clay (LDHs) and goethite (FeOOH) have been examined. A drastic reduction of the degradation yield was observed above pH 4, and hence the optimal conditions were found to be a pH of 3, 0.1 g/L of clay, a somewhat low amount of H2O2 (1.74 mmol/L) and a microwave intensity of 850 W. It should be observed that to maintain an almost constant temperature, a cooling with cold water was always applied between two microwaves running; and hence the ratio between microwave heating time and cooling time was 1. The obtained SMX degradation was 98.8 ± 0.2% after 30 min microwave treatment. It should be observed that in absence of the solid catalyst, LDHs, no SMX degradation was observed. From this, the used of microwave in the presence of a solid source of iron (LDHs) appears to be an efficient solution for the treatment of wastewater containing SMX.

KEYWORDS: Microwave ; Fenton ; Heterogenous Fenton ; Degradation ; Oxidation ; Antibiotics

SELECTIVE RECOVERY OF HEAVY METALS FROM ELECTROPLATING SLUDGE: EXPERIMENTAL AND MODELING

SENOUSSI H. [*,1], BOUHIDEL K. E.[*,2]

[*] Laboratory of Chemistry and Environmental Chemistry LCCE Department of Chemistry ; Faculty of Science ; University Hadj Lakhdar 05000 Batna   ALGERIA

[1] Presenting author   e-mail: hasna_senoussi@hotmail.fr

[2] Corresponding author   e-mail :bouhidel@lycos.com

ABSTRACT

This research work aims to recover selectively metal values from an electroplating sludge produced , until today , by an important industrial plant. This hazardous solid waste is a complex mixture of 8 metal hydroxides issued from the conventional waste waters treatment : detoxification (cyanide and chromate), IEX regeneration and finally a precipitation of metals. In spite of "waste minimization" politics this sludge constitutes , until now , a serious environmental problem in many countries (storage and fate).

This research has studied the following methods and steps :

 The alkaline selective lixiviation of Zn and Pb, we studied the pH and temperature effect on leaching rate;

The ammoniacal leaching of the remaining sludge to dissolve Cu and Ni by NH_3 (5M) and pH = 9.35. The optimal pH is $\approx$ pKa of NH_4^+/NH_3 .

An excellent selective precipitation by PO_4^{3-} or $CO_3^=$ complete the 2 previous steps . This constitutes the originality of this investigation, with the corresponding numerical/modeling support . This choice is guided by the excellent previous studies of Twidell & al. in Montana Tech.

Different types of investigations are carried out:

The sludge analysis and characterization ;

Theoretical and numerical plotting of species distribution diagrams; HydraMedusa software and our specific calculations methods are used. Ionic strength is neglected .

Experimental lixivation on synthetic metal hydroxide sludge . Simple , binary , ternary…mixtures are studied .

Experimental lixivation on industrial metal hydroxide sludge .

Comparison of computer prevision and laboratory scale experimental results.

Optimization of the experimental conditions (pH range , leaching chemicals concentration.

Metal Efficience (%)	Ni	Cu	Zn	Pb
Table 1: The experimental results for metals recovery from a real electroplating sludge				
Efficience of Alcaline leaching	ND	ND	97,77	94,84
Efficience of ammoniacal leaching	33,62	85,82	ND	ND
Recovery Efficience at pH = 11.5	ND	ND	5,096	96,04
Recovery Efficience at pH = 9	ND	ND	95,86	/
Recovery Efficience at pH = 8.5	95,6	3,15	ND	ND
ND : Not Detected				

CONCLUSION : Accumulation of thousands of tons of metallic sludge constitute a serious environmental problem in many countries . The main solution is clean technology at the source point (IEX , RO , ED , Evaporation ,…) with a zero discharge aim . However existing sludge needs a suitable processing . This research work demonstrates the faisability of an hydrometallurgical processing with modellisation of optimal conditions.

*KEYWORDS***:** sludge , electroplating , metal hydroxide , leaching , selective recovery .

----
*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

116

THE EQUILIBRIUM AND KINETICS STUDIES OF DICLOFENAC SODIUM ONTO ORGANOPHILIC K10 MONTMORILLONITE (MK10-C16)

BOUKHALFA Nadia, BOUTAHALA Mokhtar

Laboratoire de Génie des Procédés Chimiques, Université Ferhat Abbas Sétif 1, 19000 Sétif, Algérie ;
E-mail : **nadouchette2011@hotmail.fr**

ABSTRACT

Theglobal concernabout the presence of pharmaceutical compoundsin water has increased significant lyin recent years. In many water resources, in fact, awide variety of pharmaceutical compounds such as antibiotics, analgesics, anti-inflammatories, has recently been demonstrated. In this context,the objective of the work under taken in the laboratory on this topic was to evaluate the presence of pharmaceutical type of emerging pollutants, in steps of decontamination of water intended for human consumption by the adsorption. In this study, a pharmaceutical compound responded very use (diclofenac sodium) selected from the most frequently encountered in the environment, was selected.

The best-known adsorbents are : activated carbonand clays.In this study we are interested ina cationic clay organophilic K10 montmorillonite for the removal of diclofenac sodium. K10 Montmorillonite used in this workis commercial, it has a large surface ($S = 220\text{-}270 m^2/g$). The organophilic K10 montmorillonite was made by a simple exchange reaction for exchanging hydrophilic cinorganic cations by organic cations.

The adsorption was carried out according to the following parameters: pH, initial concentration, contact time and temperature. The pseudo-second-order model is better suited for modeling the kinetics with a correlation coefficient of 0.99. The adjusted parameters common that the adsorption rate increases with increasing concentration of diclofenac and decreases with increasing temperature while the pH has no significant effect on the adsorption. For the modeling of isotherms, Langmuir model describes best the isotherm, with an adsorption capacity $q_{max}= 63.33$mg /g.

The free Gibbs energy standard of adsorption obtained are -1.954, -1.906, -1.780 and -1.495 (kJ/mol) at 298,305, 318 and 328 K, respectively. The negative value of $\Delta G°$at various temperatures indicates that the adsorption is spontaneous. The negative value of $\Delta H°$(-6.647 kJ/mol) indicates the exothermic nature of the process. The standard enthalpy is less than 40(kJ/mol). Indicating that adsorption is physical. The negative value of $\Delta S°$(-15.20J/molK) reflects the low affinity of the adsorbent to diclofenac sodium.

The results revealed that the clay has a potential to be used as economic adsorbent for the removal of micropollutants like diclofenac sodium romaqueous solution with a very fast elimination rate and are moval rate of 90.9% at a concentration $C_0 =20$ mg / L.

*The 5th Maghreb Conference on Desalination and WaterTreatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

117

STUDY OF THE CORROSION BEHAVIOR OF ZINC AND ZN–CO ALLOY ELECTRODEPOSITS IN WEAKLY ACID BATH CONTAINING SACCHARINE

HAMOUCHE Karima, REHAMNIA Rabah

Laboratoire d'Electrochimie, Département de Chimie, Faculté des sciences, Université Badji Mokhtar Annaba, Algérie

ABSTRACT

Co-deposition of Zn–Co alloy coatings that were electrodeposited from weakly acid bath containing saccharine on vitreous carbon has been studied by cyclic voltammetry, chronopotentiometry, ALSV analyses were used to study The influence of cobalt concentration, scan rates and current density of déposition on chemical composition, and phase structure of the coatings. Corrosion behavior of the coatings was also studied using potentiodynamic polarization tests in 0.5M of NaCl solution.Voltammetric and stripping results on vitreous carbon show that co-deposition of the two metals takes place under these conditions. Electrodeposition leads to the formation of a solid solution of cobalt in zinc, detected by only one oxidation peak that shifts from the zinc to the cobalt position as the applied current density – applied potential is made more negative. The corrosion resistance of the deposits was also highly influenced by the composition of the coatings. Overall, Zn–Co deposit elaborated at -7A/dm^2 showed that the highest corrosion resistance among the coatings.

KEYWORDS : Electrodeposition; Zn-Co Alloys; Saccharine; ALSV; chronopotentiometry;

PERFORMANCES OF THE MSF PLANT IN TERMS OF MAINTENANCE AND RELIABILITY

FRIOUI Salah

Laboratoire LAIGM, Département de Génie des procédés, Faculté de Sciences et de la Technologie, Université 8 Mai 1945 de GuelmaB.P. 401, 24000 Algérie
Fax: + 213 37 20 72 68; e
E-mail: Salaahdz@yahoo.fr

ABSTRACT

Over the past years, the multistage flash evaporator is the most commercially important technology in sea water desalination and has been subject of a great deal of research and development (R&D) in efforts funded by different companies and agencies.

This effort has been directed toward to constantly improve the technology by reducing the amount of the equipment and the cost of energy while increasing the size of individual units. Besides energy consumptions and costs, the maintenance and reliability are considered as main parameters which affect considerably the operating and efficiency of this desalting system and can play an important role in process operability and productivity.

The paper describes a rigorous and practical procedures of operate and maintenance for MSF plant able to meet or at least be close to the original performance specifications of the unit. The model incorporates a high number of practical and engineering schedules for maintenance.

KEYSWORDS : MSF desalination plant ; Availability ; Maintenance ; Operability ; Optimal design; Reliability.

ENHANCED REMOVAL OF BISPHENOL A BY LOW COST ALGINATE/ORGANO ACID ACTIVATED BENTONITE COMPOSITE BEADS : EQUILIBRIUM ISOTHERMS, KINETIC AND THERMODYNAMIC STUDIES

DJEBRI Nassima [1*], BOUTAHALA M. [2], CHELLELI N. [1]

1 LMSE University of Bordj Bou Arreridj, El Annasser, 34000 BBA, Algeria e-mail : *nessmadjebri@yahoo.fr
2 LGPC, University of Setif 1, 19000 Sétif, Algeria

ABSTRACT

The aim of the present work concerns the feasibility of using Algerian clay through encapsulation with alginate for the removal of water pollutants e.g. bisphenol A.

Inthis paper, the preparation, characterization and adsorption properties of composite beads (calcium alginate-organo-acid activated bentonite (CA-OAB)) were investigated. Results were compared to those obtained with rawbentonite (RB), acid activated bentonite (AAB) and organo-acid-activated bentonite (AOB). A new composite beads consisting of alginate and organo-acid-activated bentonite was prepared according to the ionic gelation method. Physical characteristics of RB, AAB, OAB and CA-AOB were studiedusing X-ray diffraction (XRD), infrared spectrophotometery (IR), thermal gravimetric analysis (TGA), scanning electron microscopy (SEM) and the corresponding Specific surface area (BET). Bisphenol A (BPA), one of endocrine disrupting compounds (EDCs), was used as model water organics pollutants. Factors affecting BPA sorption, such as pH, sorbent concentration and temperature of eachBPA solution were extensively investigated. It was found from the study that the sorption of BPA by the composite beads is pH-dependent, concentration and temperature of solution. The adsorption mechanism of BPA onto OAB and CA-AOB were evaluated in terms of kinetics, equilibrium and thermodynamics. The data obtained from the batch sorption experiments were fitted to pseudo-first-order, pseudo-second-order and intraparticle diffusion models. The Langmuir and Freundlich isotherm models were used to describe equilibrium data. Adsorption of BPA was in the following order: composite beads CA-AOB >OAB > RB.

In conclusion, this work has developed a simple, eco-friendly and practical method for the production of a low cost composite Algerian bentonite/alginate beads which can be used for the removal of organic pollutants.

KEYWORDS : adsorption, organo-acid activated bentonite, composite beads, bisphenol A.

USE OF WATER DEASALINATION IN AGRICULTURE :
CASE OF SIMAR MEDENINE

SAHAL Samir [a], MHIRI Ali[b]

a: Ministry of Agriculture Water Resources and Fishers, CRDA Medenine
b: Sahara and Sahel Observatory

ABSTRACT

Water resources in the Southern East of Tunisia are very limited and widely exploited especially in Medenine Governorate which 2/3 of exploitable groundwater salinity exceeding 5 g /L and the remaining 1/3 is operated in the 81% by the company "SONEDE" of drinking water.

According to the exploitable water resource scarcity and increasing salinity of these resources, and in the context of recovery of such resources, the preservation of olive groves in the region during periods of drought and promotion intensive irrigated agriculture in the region the Regional Commissionership for Agricultural Development of Medenine in collaboration with the Sahara and Sahel Observatory and the Institute of Arid Regions have installed the proposed desalination of salted water for irrigation in the Smar region in southern Medenine delegation to study the technical and economic viability and environmental impact of such a project.

This pilot project is located in the eastern part of the "Oued Smar" basin. This part is operated by 478 wells with surface by pumping units that capture groundwater Mio-Plio-Quaternary with salinity varying on average between 3 and 8 g / l.

Funded by the OSS, the acquisition cost of the station, which produces $20m^3$ /day amounted to 19700 TND. The salinity of desalinated water is equal to 0.049g / l. Mixing with salted water allows to obtain different concentrations suitable for cultivation.

Profits were 10000DNT for one year and 01 fixed job post and 324 working days per crop year.

The salt balance to suggest that the salinity problems have faded. Brines are evacuated to the nearly river (a discharge permit has been obtained from the authorities);

For the profitability of the desalination system has been shown that the cost of pure water with consideration of the reduction of the desalination system is 1.1 DNT / m^3 and 0.6 DNT / m3 pure water without taking into account the amortization of the desalination system.

The difficulties encountered in the maintenance of the desalination system (cost) and the unavailability of qualified staff.

Hence the idea of Replicate the culture system in various pilot production systems that could be adopted by farmers and able to monetize the high cost of desalination of salted water...

KEYWORDS : *salted water desalinization system Sahara and Sahel Observatory*

INHIBITION OF CALCIUM CARBONATE SCALE BY USING AN AQUEOUS EXTRACT OF OLIVE LEAVES

KAHOUL A., AIDOUD R.

Laboratoire d'Energétique et d'Electrochimie du Solide, Département de Génie des procédés, Faculté de Technologie, université F. Abbas- Sétif 1, Sétif-Algérie. **E-mail : kahoulabdelkrim@yahoo.fr**

ABSTRACT

Scale causes severe economic loss, since it limits heat exchange and can reduce tube diameter causing a significant decrease in water flow. In order to solve this problem many scale inhibitors have been used in cooling water systems [1]

The used inhibitors were found to reduce the scale growth. Nevertheless, the use of chemical inhibitors has been limited because of the environmental threat. Recently, natural compounds such as herb plants are again employed as inhibitors in order to develop new cleaning chemicals for green environment. Several studies have been published on the use of natural products as corrosion inhibitors in different media [2, 3].

Thedrinking water networkfrom a sourceat AinKébirain the areaof the cityof Sétif knows some scaling problems. It should be noted that the hard water of Ain kebira is naturally rich in minerals, such as calcium and magnesium. To reduce calcium carbonate scale formation on the network surfaces, this research focuses on the use of a new green inhibitor "aqueous extract of olive leaves ".

The antiscaling properties of this inhibitor have been evaluated using chronoamperometry method, Impedance spectroscopy and and the scale deposits were characterized by scanning electron microscopy. It was found that the extract acts as a good antiscalantfor the tested system. The inhibition efficiency increases with increasing extract concentration. A concentration of 220 ppm was found to be an optimal concentration for preventing completely $CaCO_3$ deposit. The inhibitive action of the extract is discussed with a view of inhibtor adsorption onto the steel surface, making a barrier to scale deposit.

KEYWORDS : Calcium carbonate, olive leaf extract, scaling

REFERENCES

[1] D.-j. Choi, S.-J. You and J.-G. Kim, Mat. Sci. Eng., A 335 (2002) 228.
[2] A.M. Abdel-Gaber, Int. J. Appl. Chem. 3 (2007) 161.
[3] S.A.A. Abd El-Maksoud, J. Electroanal. Chem. 565 (2004) 321.

RECOVERY OF PENICILLIN V BY FRONTAL MICROFILTRATION

SAMAI Messaouda, CHIKHI Mustapha [a]

Laboratoire de l'Ingénierie des Procédés de l'Environnement (LIPE),
Département de Génie de l'environnement, Faculté de Génie des procédés pharmaceutiques,
Université de Constantine 3, ALGERIA
samai.sousou@gmail.comchikhi_mustapha@yahoo.fr

ABSTRACT

The frontal microfiltration of water containing an antibiotic (penicillin V) was studied using a cellulose acetate membrane of 0.2 μm and a constant pH of the solution. A frontal microfiltration apparatus was used to achieve the recovery operation of penicillin V; knowing that the frontal microfiltration can generate a significant deposition of the solute on the surface of the medium (membrane), the plot of t/V (time/volume) versus the volume of permeate quantifies the resistances of the cake and the membrane, and this for different concentrations and transmembrane pressures; the effects of filtering time and transmembrane pressure on the permeate flux are also presented in this study, the overall results show that the resistance of the cake (deposit) becomes more important when the transmembrane pressure increases, and the permeate flux decreases considerably over time and increases with increasing transmembrane pressure.

KEYWORDS : frontal Microfiltration, penicillin V, cellulose acetate membrane, clogging.

CuBi$_2$O$_4$/ZnO NOVEL HETERO-SYSTEM FOR THE CHROMATE REDUCTION (WATER DEPOPULATION) UNDER SOLAR LIGHT

LAHMAR H. [1], KECITA A.[1], TRARI M.[2]

[1]*Departement of Chemistry Jijel university Bp Oulad Aissa Algiers, Algeria*
[2]*Laboratory of Storage and Valorization of Renewable Energies*
Faculty of Chemistry (USTHB), B P 32; 16111 Algiers, Algeria
E-mail : lahmarhicham18@gmail.com

ABSTRACT

Self driven chromate photoreduction and oxalic acid oxidation were concomitantly achieved over the novel hetero-system CuBi$_2$O$_4$/ZnO. The absorption of light promotes electrons in the sensitizer conduction band (CuBi$_2$O$_4$-CB) with a potential (-1.46 V$_{SCE}$), too negative to be involved in an electron exchange with HCrO$_4^-$ species [1]. However, we have taken advantage of its pH-insensitivity and the improved activity is due to the electron injection from activated CuBi$_2$O$_4$, ZnO-CB (-0.72 V$_{SCE}$) resulting in the Cr(VI) reduction. The nitrate route is convenient for preparing active ZnO on which the dark adsorption occurs. A reduction of more than 60% of HCrO$_4^-$ was achieved in air equilibrated solution under optimal conditions (pH~3.5, 1 mg catalyst mL^{-1}, 25 °C). The chrono-potentiometry shows that the adsorption equilibrium is reached after ~ 40 min for an initial concentration of 30 ppm. The photo activity is strongly enhanced in presence of oxalic acid as holes scavenger which hinders the recombination of electron/hole pairs.

KEYWORDS : Chromate, photoreduction, spinel CuBi$_2$O$_4$, ZnO, solar Light

Bibliography

[1] Lahmar, H., Kebir, M., Nasrallah, N., & Trari, M. (2012). Photocatalytic reduction of Cr (VI) on the new hetero-system CuCr 2 O 4/ZnO. *Journal of Molecular Catalysis A: Chemical*, *353*, 74-79.

BREWERY INDUSTRIAL WASTEWATER CHARACTERIZATION IN SAHEL REGION: THE CASE OF BRAKINA IN BURKINA FASO

SAWADOGO Boukary [a], KONATE Yacouba [a], LESAGE Geoffroy [b], HERAN Marc [b] and MAIGA Amadou Hama [a]

International Institute of Water and Environmental Engineering - 2iE Foundation – 1 Rue de la science - 01 BP 594 Ouagadougou 01 - Burkina Faso
Institut Européen des Membranes IEM- UMR 5635 – Université de Montpellier Sciences et Techniques du Languedoc-34090 Montpellier – France
E-mail : boukary.sawadogo@2ie-edu.org

ABSTRACT

Water is rareandprecious in Sahel region, adeserticarea in the heartofWest Africa, and its preservationbecomes animperiousnecessity. As a result/consequently/therefore, its management puts up a good show in the policies. The food industryis characterized by large quantities of waterconsumedand a good knowledgeof these dischargescouldcontribute to a betterdevelopment ofeffective treatment techniques and then a best water management. Brakinais anagro-industrialunit producing soft and alcoholic drinks located in Ouagadougou, the capital city of Burkina Faso. Its discharges represent more than half treated wastewater by the city's wastewater treatment plant. This studyaims tocontribute to a better management of this industry wastewater throughthe characterization ofeffluent discharged. It was conducted in December duringone of the most important production week. An automatic sampler was used and an average sample on the twenty four hours was formedfor analysis. The results how agreat heterogeneity of discharges coming from the different out falls. The pH values are between 5.4 and 12.7 but most of them are alkaline. An electricalconductivity values ranging from0.92 to 20.20 mS/cmand temperature from22.2 to 28.7°C were recorded. For pollutionparameters the obtained averagevaluesof COD,BOD5 and TSS are 5,233.85 mg/L, 232.83 mg/L and 0.42 mg/L respectively. High sodium levels were also observed with values between 1,137.98 and 237.08 mg/L

KEYWORDS : brewery, industrial wastewater, wastewater characterization, Sahel climate, Brakina

EFFICIENTLY MONITORING CORROSION INHIBITORS OF CARBON STEEL IN SEAWATER

HABIB Khaled

Materials Science and Photo-Electronics Lab., IRE Program, EBR Center
KISR, P.O.Box 24885 SAFAT, 13109 Kuwait Fax: 965-2543-0239, Tel:965-25430-238, Mobile:965-97956-296 E-mail: khaledhabib@usa.net

ABSTRACT

A criterion of the efficiency evaluation of corrosion inhibitors of metallic samples in aqueous solutions was proposed for the first time. The criterion was derived based on calculating the limit of ratio value of the resistivity of carbon steel sample in inhibited seawater (ρ_{ins}) to the resistivity of the carbon steel sample in blank seawater (ρ_s).   In other words, the criterion; lim (ρ_{ins}/ρ_s) =1 will determine the efficiency of the corrosion inhibitor in the seawater when ρ_{ins} becomes equal (decreases) to ρ_s as a function of time of the exposure of the sample to the inhibited seawater.   This criterion is not only can be used to determine the efficiency of different corrosion inhibitors, but also, the criterion can be used to determine the efficiency of   corrosion inhibitors with a wide range of concentrations in different aqueous solutions. In addition, the criterion can be applied under diverse test conditions with a predetermined period of inhibitor's dosages.

KEYWORDS **:** Efficiency of corrosion inhibitors; Resistivity; Carbon steel; Seawater.

SYNTHESIS AND CHARACTERIZATION OF ORGANOPHILIC CLAY MATERIALS FOR THE REMOVAL OF BENZOIC ACID & SALICYLIC ACID IN AQUEOUS SOLUTIONS

DAAS Nihed[1]*, Dr. ZAGHOUANE – BOUDIAF H.[1]

[1] Laboratoires de Génie des Procédés Chimiques, Département de Génie des Procédés, Faculté de Technologie, Université de Ferhat ABBAS Sétif-1, Cité Maabouda 19 000 Sétif, Algérie

ABSTRACT

Industrial wastewater contains many contaminating organic and inorganic materials, such as aromatic compounds. Many organic compounds have been classified as hazardous pollutants because of their potential toxicity both to human health and environment. Benzoic acid, as a major kind of chemical preservatives, is one of the most important additives in the food industry. Also, Salicylic acid is an important intermediate that is widely used in pharmaceutical industry.

There are many methods for the removal of organic pollutants from aqueous solutions, such as adsorption, chemical precipitation, ion exchange, membrane processes, biological degradation, chemical oxidation and solvent extraction. Adsorption is the most popular method in which activated carbon or ion exchange resins are usually applied. Activated carbons have the advantage of high adsorption capacity for organic compounds. However, because of its relatively high cost, there have been attempts to utilize low cost, naturally occurring adsorbents, to remove contaminants from wastewater. Recently, the usage of natural mineral sorbents for wastewater treatment is increasing because of their abundance and low price.

In this work organobentonites (Mt16-1CEC, Mt16-2CEC) were synthesized using hexadecyltrimethyle ammonium bromide (HDTMAB) by the cation exchange method. To identify these clays we have characterized theme by X-ray diffraction, by BET and FTIR analysis.

The adsorption was carried out according to the following parameters: pH, initial concentration, contact time, temperature and mass. Several kinetic and equilibrium models were used to determine the parameters of the adsorption of benzoic acid and salicylic acid by the two organobentonites. Also, the thermodynamic parameters and the nature of the mechanism governing the adsorption of the two acidic pollutants were estimated.

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet, Tunisia 21-24 December, 2015

127

ANTI-SCALE MAGNETIC METHOD AS A PREVENTION METHOD
FOR CALCIUM CARBONATE SCALING

SALMAN ATALLAH Maha

Kuwait Institute for Scientific Research, Water Research Center, P.O. Box 24885,
Safat 13109, Kuwait. Tel. +965-24878124 ; Fax: +965-24879238
Email: matallah@kisr.edu.kw

ABSTRACT

The effect of anti-scale magnetic method (AMM)in retarding scaling deposition is confirmed by many researchers, to result in new crystal morphology, crystal which has the tendency to remain suspended more than precipitated. AMM is considered as an economic method when compared to other common methods used for scale prevention in desalination plant as acid treatment and addition of antiscalant. The current project was initiated to evaluate the effectiveness of AMM in preventing calcium carbonate scaling. The AMM was tested at different flow velocities (1.0, 0.5, 0.3, 0.1, and 0.003 m/s), different operating temperatures (50, 70 and 90°C), different feed PH and different magnetic field strength. The results show that AMM is effective in retarding calcium carbonate scaling deposition, and the performance of AMM depend strongly on the flow velocity. The scaling retention time was found to be affected by the operating temperatures, flow velocity and magnetic strength (MS), and in general it was founded that as the operating temperatures increases the effectiveness of the AMM in retarding calcium carbonate ($CaCO_3$) scaling increases.

KEYWORDS : Calcium Carbonate ($CaCO_3$), magnetic field strength, flow velocity and scale retention time.

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

128

OPTIMIZATION OF A CLOUD POINT EXTRACTION PROTOCOL FOR HEXAVALENT AND TRIVALENT CHROMIUM SEPARATION AND SPECIATION IN AQUEOUS SAMPLES

NAFTI Mariem [a,b*], HANNACHI Chiraz [b], CHAKROUN Radhouane [a], HSEINI Jaber [a,b], NOUAÏGUI Habib[a], HAMROUNI Béchir [b].

[a] UR11ISST01 Laboratoire de Toxicologie Professionnelle, Institut de Santé et de Sécurité au Travail, Tunis, Tunisie.
[b] UR11ES17 Unité de Recherche Traitement et Dessalement des Eaux, Faculté des Sciences de Tunis, Université de Tunis El Manar, Tunis, Tunisie.
[*] Corresponding author. Tel.: +216 21 141 099; fax: +216 71 571 902
E-mail address: nafti_mariem@yahoo.fr

ABSTRACT

The toxicity of metals and especially chromium (Cr) depends on several factors like dose, solubility and chemical form. The valence state (+VI) is known to be the most toxic specie of chromium since it is considered as carcinogen for human. Therefore, Cr speciation is of a great importance.

In this paper, a new approach of cloud point extraction (CPE) was applied as a separation step before quantification with electro-thermal atomic absorption spectrometry (ET-AAS) for Cr speciation in industrial effluents. CPE procedure is based on the use of Triton X-114 as surfactant and 1-(2-pyridylazo)-2-naphthol (PAN) as a complexing agent.

The separation was carried out in a temperature bath. All the optimal extraction conditions (pH, surfactant mass, equilibrium parameters…) were studied and optimized.

The mean parameters of validation were verified. Detection and quantification limits were respectively as low as 1.13 and 3.77 $\mu g.L^{-1}$. The linearity was verified in the range from 1.13 to 60 $\mu g.L^{-1}$ with a regression coefficient exceeding 0.999. The method was applied for chromium speciation in real tannery waste water samples. Concentrations of total chromium and hexavalent chromium were ranged between 0.7 and 1.6 $g.L^{-1}$ with a mean of 1.4 and between 0.018 and 0.042$g.L^{-1}$ with a mean of 0.029$g.L^{-1}$, respectively.

***KEYWORDS* :** Chromium speciation, wastewater, cloud point extraction.

GLUTAMIC ACID INHIBITOR FOR CALCIUM CARBONATE SCALING

NAMOUNE F., KARAR A.

Department of Process Engineering, Faculty of Technology, University of Sétif 1, Sétif, Algeria

E-mail : fnamoune@yahoo.fr

ABSTRACT

The formation of calcium carbonate in water has some important implications in geoscience researches, ocean chemistry studies, CO_2 emission issues and biology. In industry, the scaling phenomenon may cause technical problems such as reduction of heat transfer efficiency in cooling systems and obstruction of pipes.This paper focuses on the study of the glutamic acide (GA) for reducing calcium carbonate scale formation on metallic surfaces using the water of region of Bir Aissa, Chemical and electrochemical study of this water shows a high calcium concentration and characterization of formed deposit reveals the formation of calcite. The effects of temperature on the efficiency of the inhibitor were investigated. Their anti-scaling properties have been evaluated by the chronoamperometry method and electrochemical impedance spectroscopy (EIS) in conjunction with a microscopic examination. A complete scaling inhibition was obtained with a concentration of 18 mg/L of GA at 30 and 40ºC with efficiency rate of 90.2 %. However, its efficiency was decreased at 50 and 60 ºC.

KEYWORDS: Glutamic acid, inhibitor, scale, efficiency rate, calcite.

APPLICATION OF DOEHLERT MATRIX TO DETERMINE THE OPTIMAL CONDITIONS OF BROMOTHYMOL BLUE DEGRADATION WITH FENTON PROCESS

MAAMAR Malak [a,b,*], **FEZEI Radouanne**[c], **SOUISSI Nebil**[a] **and BELLAKHAL Nizar** [a]

[a] Unité de Recherche de Catalyse, d'Electrochimie, de Nanomatériaux et leurs Applications et de Didactique (CENAD), Institut National des Sciences Appliquées et de Technologies (INSAT), Centre Urbain Nord BP 676, 1080 Tunis, Tunisie
[b] Département de Chimie, Faculté des Sciences de Bizerte (FSB), 7021 Zarzouna, Tunisie
[c] Laboratoire de Valorisation des Matériaux Utiles (LVMU), Centre National de Recherches en Sciences des Matériaux (CNRSM), Technopole Borj Cedria, BP 73, 8027 Soliman, Tunisie
[*] E-mail: malakmaamar@hotmail.fr

ABSTRACT

The degradation of Bromothymol Blue (BTB), a textile dye derivative, in aqueous solution with Fenton process (FP) has been studied. The performance of the FP depends on various operating parameters such as the initial concentration of hydrogen peroxide $[H_2O_2]_0$, the initial ferrous ion concentration $[Fe^{2+}]_0$ and the pH of the reaction medium. The optimal conditions of these variables, for the degradation of BTB with FP, have been investigated by the use of Doehlert matrix. It has been demonstrated that under the optimal conditions, FP leads to a maximum degradation rate of BTB (67.58 % ± 4.39) after 1 h of electrolysis. This result was also experimentally validated and has given a degradation rate of 70.4 %. After 6 h of treatment of BTB in aqueous solution by FP, the color removal achieved 91.54 % and the chemical oxygen demand (COD) removal reached 63.64 %.

KEYWORDS : Bromothymol Blue, Fenton process, degradation, experimental design methodology, Doehlert matrix

The 5th *Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

131

REMOVAL OF TETRACYCLINE FROM SYNTHETIC SOLUTION BY AN ELECTRO COAGULATION / ACTIVATED CARBON ADSORPTION PROCESS: KINETIC AND EVALUATION COST OPERATING

AIT OUAISSA Y. [1, 2], CHABANI M. [1], AMRANE A. [3,4], BENSMAILI A. [1]

[1]Laboratoire de Génie de la Réaction, Faculté de Génie des Procédés et Génie Mécanique
U.S.T.H.B. BP 32, El Allia, Bab Ezzouar, Algérie
[2]Centre de Recherche Scientifique et Technique en Analyses Physico-chimiques BP 248, CRAPC, Alger, Algérie
[3]Université de Rennes 1, Ecole Nationale Supérieure de Chimie de Rennes, CNRS, UMR 6226, Avenue du Général Leclerc, CS 50837, 35708 Rennes Cedex 7, France
[4]Université Européenne de Bretagne
E-mail : abdeltif.amrane@univ-rennes1.fr

ABSTRACT

 The aim of this study was the removal of tetracycline from synthetic solution by an electro coagulation / activated carbon adsorption process. Adsorbent concentration was studied in an attempt to identify the most appropriate dose for enhancing water treatment and to model kinetics. The operating cost of the E C/ACA coupling process was also evaluated. Results obtained show a remarkable increase in the removal rate and a considerable reduction in the contact time, compared to the conventional simple EC process. The coupling process provided the best rate constants. The results obtained also show low energy consummation when the coupling process was applied. Based on these results, we can say that the EC/AD coupling process can be used instead of the conventional simple EC.

KEYWORDS: Tetracycline ; Electro-coagulation; Adsorption; Activated carbon; Hybrid processes.

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

132

CONTROL OF RECYCLE SLUDGE IN ACTIVATED SLUDGE PROCESS USING ADAPTIVE NEURO-FUZZY LOGIC CONTROLLER (ANFIS)

MAACHOU R. [1], **LEFKIR A.** [2], **BERMAD A.** [3], **KHOUIDER A.** [4]

[1,4] USTHB, laboratory of faculty of chemistry, electrochemistry-corrosion, metallurgy and mineral chemistry, bp 32 el-allia, pc 16111, (algeria)

[2] ENSTP, laboratory of TPiTe Kouba (algeria)

[3] ENP, laboratory of construction and environment (algeria): bermad_61@yahoo.fr

ABSTRACT

Activated sludge process is usually difficult to operate and control because of its complex operational behavior and of its complex nature. The optimization and further process development of this technology go the availability of fuzzy logic model, this model is powerful because it can learn to represent complicated data patterns or data relationships between input and output variables of the system being studied.

The objective of this study is to determine the amount of sludge necessary to be recycled in the aeration tanks to allow the attainment of a good quality of effluent wastewater and to minimise the excess sludge, a fuzzy control model of activated sludge process was developed. The detailed information on development of fuzzy model was addressed based on collecting and analyzing previous experimental data.

Neuro-fuzzy modeling should be able to determine the amount of recycle sludge necessary to treat an activated sludge treatment plant. The input parameters used in this study include the removal yields of organic pollution parameters such as COD and BOD, SS and recycle sludge as a decision parameter with respect to the discharge standards.

The historical values of the observed yields associated with the recycle sludge during the study learning period enable the prediction of the recycle sludge needed for a validation period.

Satisfactory results were obtained during the study and validation periods, revealing the advantages of fuzzy logic and justifying the predictive power of the model.

KEYWORDS: activated sludge process, simulation fuzzy logic, recycles sludge.

ENDOCRINE DISRUPTING COMPOUNDS IDENTIFICATION IN WATER MATRICES_CASE STUDY IN TUNISIA

ETTEIEB Selma [a], KAWACHI Atsushi [b,c], HAN Junkyu [b,c], TARHOUNI Jamila [a], ISODA Hiroko [b,c]

[a] *Water Science and Technology Laboratory (LSTE), National Agronomic Institute of Tunisia INAT, 43 Charles Nicolles street, Mahrajène, 1082 Tunis, Tunisia, selmaetteieb@yahoo.fr*
[b] *Graduate School of Life and Environmental Science, Univ. of Tsukuba, Japan*
[c] *Alliance for Research on North Africa, Univ. of Tsukuba, Japan*

ABSTRACT

Pollution of river systems in Tunisia by endocrine disrupting compounds (EDCs) is due to anthropogenic impacts through non-treated industrial wastewater and municipal treated wastewater discharge. The aim of this study was to assess the estrogenic activity of environmental matrices involving raw industrial wastewater (WW), surface water (SW) and treated wastewater (TWW). A modified E-screen assay was used to evaluate estrogenic activity of the samples in MCF-7 breast cancer cells. Western blotting and real-time PCR molecular approaches were applied to investigate the mechanism of EDC-induced MCF-7 breast cancer cell proliferation which interferes with estrogen receptor alpha (ER_α) and c-Jun. Our results revealed a dose-dependent estrogenic activity reaching an optimal level at a concentration of 0.01% for industrial WW and SW and 10% for TWW. Monitoring ER_α protein and c-Jun gene expression levels after 1, 6, 24 and 48 h of treatment showed a correlation in the overexpression of ER_α and c-Jun most of the time. In fact, ER_α and c-Jun correlated up-regulation began after 1 h of treatment for industrial WW, TWW and one SW sample. For the other SW samples, this correlated up-regulation started after 6 to 24 h of treatment. Results emphasized the estrogen-like effect of our contaminated samples on MCF-7 cells which facilitate a cross-talk between ER_α and c-Jun factor, thereby directly regulating the expression of estrogen-induced genes to mediate breast cancer cell growth.

KEYWORDS : Biomarkers;Endocrine disrupting compounds;MCF-7 breast cancer cells; Modified E-screen assay.

ALFA STEMS (STIPA TENACISSIMA L) AS SUBSTRATE FOR WATER DENITRIFICATION

BENRACHEDI K ; SELATNIA A.; BENRACHEDI L.A.

Department of Environmental Science. Laboratory of Food Technology. University of Boumerdes, 35000, Algeria

benrachedik@yahoo.fr

ABSTRACT

Biological denitrification of drinking water was studied in up-flow laboratory reactors packed with alfa stems (stipa tenacissima l) which served as the sole carbon source as well as the only physical support for the microorganisms. The highest rates of denitrification were observed in fresh reactors during their first week of operation and the efficiency of the process declined thereafter. The addition of fresh alfa stems brought about a temporary improvement of the denitrification performance and a regime of one weekly addition prevented the deterioration of a reactor which was operated for 5 months. The rate of denitrification was affected by the water velocity and decreased at velocities above 0.054 $m.d^{-1}$ .Colour and soluble organic carbon associated with fresh alfa stems removed by adsorption on powdered activated carbon.

KEYWORDS : alfa stems, denitrification, valorisation, water

AN HETEROTROPHIC /AUTOTROPHIC DENETRIFICATION APPROACH FOR NITRATE REMOVAL FROM DRINKING WATER BY ALFA STEMS

BENRACHEDI K ; SELATNIA A. ; BENRACHEDI L. A.

Department of Environmental Science. Laboratory of Food Technology. University of Boumerdes, 35000, Algeria,
E-mail : benrachedik@yahoo.fr

ABSTRACT

Biological denitrification of drinking water was studied in up-flow laboratory reactors packed with alfa stems served as the sole carbon source as well as the only physical support for the microorganisms. The highest rates of denitrification were observed in fresh reactors during their first week of operation and the efficiency of the process declined thereafter.

In the first part, we have analysed the influence of hydrolyc and volumic load to value the capacity of nitrate purification in a down flow submerged bio filter. Then with an experimental design approach, we have analysed the qualitative and quantitative aspects of the effects of some factors: concentration of nitrate (80 - 200 mg l^{-1}) and velocity (0.3 - 1 m.h^{-1}) on different responses like the apparent rate of denitrification, as well as concentration of nitrite, nitrate and chemical demand on oxygen in the reactor outlet.

KEYWORDS : nitrate contamination, Biological water Treatment, denitrification, alfa stems, biological reactor, denitrifying bacteria.

AQUEOUS PROCESSING OF INSECTICIDE BY ELECTROCHEMICAL ADVANCED OXIDATION PROCESS "ELECTRO-FENTON":
THE DEGRADATION AND THE MINERALIZATION OF PROMECARB

BAKHTI Hayet [a], BEN HAMIDA Najib, HAUCHARD Didier

Ecole Nationale Supérieure de Chimie Rennes, 11 allée Beaulieu, CS 50837, 35708 Rennes Cedex 7,
Université Européenne de Bretagne.
Laboratoire de Chimie Analytique et d'Electrochimie, Faculté des Sciences de Tunis, 2092 Manar II-Tunis,
Université de Tunis El Manar.

Email: bakhti.hayet@yahoo.com

ABSTRACT

Remediation of contaminated water by persistent organic pollutants and in particular pesticides has become a major environmental concern. Among the more recent advances in the treatment of water, Advanced Oxidation Processes (AOP) provides a solution by proving their effectiveness; allow the mineralization in aqueous medium of toxic organic molecules to humans and environment. This study focuses on the application of a main POA: electro-Fenton for treatment of insecticide: the Promecarb. The feature of this process lies in the generation in the middle of highly reactive oxidizing entities, hydroxyl radicals ($^\bullet$OH) which are capable of oxidizing any organic or organometallic pollutant to the ultimate oxidation stage, that is to say the mineralization (CO_2 and H_2O conversion). The Promecarb (3-isopropyl-5-methylphenyl N-methyl carbamate) is a carbamate insecticide, is used for the cultivation of tropical and subtropical plants (rice and cotton), fruits such as citrus and potatoes. Chromatographic analysis allowed us to qualitatively follow the chemical evolution of the carbamate aqueous solutions during processing by Electro-Fenton process. The disappearance of the starting insecticide after the oxidizing action of hydroxyl radicals is accompanied by aromatic intermediate formation. The shape of the kinetic curves show that the destruction of this pesticide by hydroxyl radicals generated electrochemically follows pseudo first order kinetics. Promecarb absolute constant was determined by competitive kinetics method using benzoic acid as the standard competitor (k_{abs} = 10.88 × 10^9 M^{-1} s^{-1}). The mineralization of the pesticide by hydroxyl radicals consists in its transformation into mineral products. The evolution of the mineralization during Promecarb treatment by the electro-Fenton process was followed by analysis of Total Organic Carbon (TOC). Thus, after 3 hours of electrolysis, and at I = 800 mA, more than 50% of the organic carbon originally present in the solution is mineralized. The carboxylic acids formed during Promecarb mineralization were identified and followed during electrolysis duration of 90 minutes. Also, we realized the measurement of the Biochemical Oxygen Demand (BOD_5) of the insecticide solution after treatment by electro-Fenton process, to evaluate its biodegradability.

KEYWORDS : Promecarb, electro-Fenton, oxidation, hydroxyl radicals, degradation, mineralization.

STUDY OF THE DEGRADATION AND THE MINERALIZATION OF ISOPROCARB INSECTICIDE IN AQUEOUS MEDIUM BY THE ELECTRO FENTON PROCESS

BAKHTI Hayet [a], BEN HAMIDA Najib, HAUCHARD Didier

*Ecole Nationale Supérieure de Chimie Rennes, 11 allée Beaulieu, CS 50837, 35708 Rennes Cedex 7,
Université Européenne de Bretagne.
Laboratoire de Chimie Analytique et d'Electrochimie, Faculté des Sciences de Tunis, 2092 Manar II-Tunis,
Université de Tunis El Manar.*
Email : bakhti.hayet@yahoo.com

ABSTRACT

During the past two decades, new regulations for toxic products have become necessary, given the increasing of risks to human health and the environment. Among the treatment technologies that have been developed in order to cope with these problems, there is the Advanced Oxidation Process (AOP). The advanced oxidation processes are processing techniques using very reactive radical intermediates, especially hydroxyl radicals (OH$^\bullet$) at room temperature. These radicals can oxidize nearly all organic pollutants, because their oxidation potential is 2.8 V / ENH. Hydroxyl radicals are used to degrade oxidatively organic pollutants contained in the water, to biodegradable by-products or lead to the mineralization (transformation into water, carbon dioxide and inorganic ions).

In this work we studied the degradation of carbamate insecticide: Isoprocarb (2-isopropylphenyl N-methyl carbamate) in aqueous sulfuric medium by electrochemical oxidation method ''electro-Fenton''. Indeed, the Electro-Fenton process is based on the continuous production of H_2O_2 in the solution by reduction of molecular oxygen at 2 electrons on a cathode (graphite, reticulated vitreous carbon, mercury ply ...). The hydrogen peroxide thus formed reacts with ferrous iron present in the solution for generate OH$^\bullet$. The Isoprocarb is used in the fight against a variety of defoliators organisms that attack many fruit and vegetable crops by inhibiting acetylcholinesterase. Initially, the degradation products (aromatic compounds, carboxylic acids and inorganic ions) have been highlighted. Thus, changes in the chemical composition of the Isoprocarb and its reaction intermediates were monitored by chromatographic analysis HPLC / DAD and LC / MS. The efficiency of the mineralization was evaluated by the measurement of Total Organic Carbon (TOC). After 180 minutes of electrolysis, and at I = 800 mA, more than 40 % of the organic carbon originally present in the solution is mineralized. The Isoprocarb absolute constant ($k_{abs} = 3.32 \times 10^9$ M^{-1} s^{-1}) is determined by competitive kinetics method using benzoic acid as the standard competitor. In order to evaluate the biodegradability of the Isoprocarb, we performed the measurement of the Biochemical Oxygen Demand (BOD$_5$) of the insecticide solution after its treatment by the electro-Fenton process.

KEYWORDS : *Isoprocarb, degradation, mineralization, electro-Fenton, hydroxyl radicals, aqueous medium.*

ELECTROCHEMICAL IMPEDANCE SPECTROSCOPY STUDY OF BARIUM SULFATE SCALE FORMED FROM MIXTURE OF INCOMPATIBLE WATERS

LABRAOUI-DJALLAL Karima [0], BOUNOUGHAZ Moussa [0]

0 FibrousPolymerstreatment and formingLaboratory,
University of M'Hamed Bougara, Boumerdes, Algeria.
Email: karimalab@yahoo.fr

ABSTRACT

Pressure maintaining in oil fields is generally provided by water injection. Nevertheless, often, the injected water is incompatible with the formation water.The contact between the injection water rich in sulfates (SO_4^{2-}) and the formation water containing barium ions Ba^{2+}, calcium Ca^{2+} and strontium Sr^{2+} causes a dangerous degradation by encrusting deposits of $BaSO_4$, $SrSO_4$ and $CaSO_4$. The barium sulfate scale cause severe degradation in the oil production facilities by the clogging of the tubing and pipelines, use of the most effective scale inhibitors remain the only alternative.

The objective of this work is to evaluate the electrochemical impedancespectroscopy (EIS) parameters ofbarium sulfate scaleformed frommixtureof Incompatiblewaters. To that end, the deposits are obtained by immersion of API 5L X70 carbonsteel electrodes in solutions of mixtures of two incompatible waters, one containing sulfates and the other barium ions.

The immersion of the working electrodes in the injection and formation waters mixture solution, leads to the barium sulfate $BaSO_4$ deposit formation on the surface of the substrate detected by diffraction X rays (XRD).

The electrochemical impedance spectra recorded on these electrodes have three loops corresponding to the capacitive charge transfer resistance, deposit resistance and pores resistance respectively. Increasing of this resistance reveals the evolution of layers deposition on the surface of the electrodes, taking into account the immersion duration. The image taken by scanning electron microscopy MEB, supports this hypothesis. The equivalent circuits reflecting the properties of the interface metal / deposit/ electrolyte was developed.

KEYWORD: Barium sulfate, Injection water, Formation water, Incompatible water, Electrochemical Impedance Spectroscopy EIS.

ADSORPTION OF ANIONIC DYE "METHYL ORANGE" ON THE PREPARED ACTIVATED CARBON FROM PINE CONE

REFFAS A. and DUCLAUX L.

a LCME, Polytech'Savoie, Université de Savoie, 73376 Le Bourget du Lac Cedex, France
b LMI, Département de Chimie, Faculté des Sciences, Uniersité de Mohamed BOUDIAF-M'sila; 28000 Algerie
E-mail : abdelbakireffas@gmail.com

ABSTRACT

Activated carbons (referred to PAC : produced activated carbons) were fabricated by thermochemical activation of the pine cone (impregnated with phosphoric acid and heated in an oven at 450 ° C) for different impregnations ratios 30, 60, 100 and 150 mass%. The materials were characterized for their surface chemistry, by selective titrations, point of zero charge measurements and their porous structure by methylene blue adsorption. The impregnation ratio governs the porous structure of the produced activated carbons. A low impregnation ratio (≤ 30% by mass) essentially leads to a microporous activated carbons and slightly acidic ($pH_{PZC} \sim 6$) with low mesoporous surface ($S_{BM} \sim 485$ $m^2.g^{-1}$) while a high ratio (≥ 60 %) produces essentially a mesoporous activated carbon ofneutral surface which mesoporous surface reaches 957 m^2 g^{-1} for an impregnation ratio equal to 150%. Methyl orange dye adsorption experiments on the produced activated carbons were performed as a function of pH (3 to 10), the contact time and the concentration of Methyl orange. We showed that the adsorption capacity of the dye (at pH = 3) was correlated with the mesoporous surface area of activated carbons. The Langmuir model, typical of a monolayer adsorption, provides the best simulations of the isotherms for systems PACs / acid dye compared to the Freundlich model at the studied temperature (20 ° C) for all activated carbons. The negative values of the free enthalpy (ΔG) of methyl orange dye adsorption indicates the spontaneous nature of adsorption.

The second-order pseudo equation provided the best model for kinetics simulation for PACs systems / acid dye. The adsorption amount of the produced activated carbons was not affected by the variations of the pH of the reaction medium.

KEYWORDS: pine cone; H_3PO_4 activated carbons; surface chemistry; mesoporosity; adsorption of anionic dye.

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet,Tunisia 21-24 December, 2015

140

REMOVAL OF LPS ENDOTOXIN FROM RECLAIMED WASTEWATER THROUGH ADSORPTION USING SOIL

GUIZANI Mokhtar[a], KATO Hideyaki[a], FUNAMIZU Noyuki[a]

Faculty of engineering, Hokkaido University,
Kita 13-jo, Nishi 8-chome, Kita-ku, Sapporo, 060-8628, Japan

ABSTRACT

The removal of LPS endotoxin from reclaimed wastewater using four different type of soils were studied at ambient temperature. The results from this study show that the endotoxin adsorption by soil fitted to the Freundlich adsorption isotherm. Moreover, the data show that the endotoxin adsorption was affected by the particle size of soil. Indeed, the amount of endotoxin adsorbed to the different soils (large sand, medium sand, fine sand and slit) obtained from Freundlish isotherms exhibited the better performance for silty soil and fine sand. These results explained why the fine sand and silt soils columns showed a better removal efficiency of endotoxin than large and medium sands as reported in earlier study. Not only that, but the endotoxin adsorption was also affected by the freshness of the soil. Fresh soil has a higher adsorption capacity as compared to soils extracted from water columns where reclaimed wastewater was running for a period of one year. It is deduced that soil can be used to remove significant amount of LPS endotoxin from reclaimed wastewater for safer potable reuse.

KEYWORDS : LPS endotoxin, adsorption, isotherm, potable reuse

DEVELOPMENT OF AN INDUSTRIAL UNIT PILOT DESALINATION OF SEA WATER USING HEAT FROM SULFURIC UNITS OCP JORF AL ASFAR MOROCCO

SAIFAOUI D.[1], AAROUSSY Y.[1-2], HASSOUN H.[2]

1-Université Hassan II Casablanca Maroc

2- Groupe OCP Jorf Alasfar EL Jadida Maroc

Dennoun Saifaoui: Fax: +21222230674   Email: ddsaifaoui@gmail.com

ABSTRACT

Access to water is a vital issue for the realization of the industrial strategy of the OCP The effort to increase the production capacity is naturally accompanied by increased water requirements ranging from 73 Million m3 / year currently to over 177 million futures. Which is equivalent to the consumption of 5 million inhabitants [afd].The largest thermal desalination is unbecoming of relatively high energy costs in the heat necessary for the evaporation of sea water. But this advantage may become unsuitable for the Jorf Lasfar site cases where a very large amount of water sea is pumped continuously to ensure the cooling of the sulfuric acid; condensing steam exhaust from the central ... more losses arising from such operations :

o sensible and latent heat

o potential and kinetic energy

In a sulfuric unit of rated capacity 2650TMH / J as units and sulfuric MPIII MPIV, the amount of sea water is used for cooling the sulfuric acid and about 4400m3 / h / unit. This water undergoes a sensible heat increase of about 15 ° C (.DELTA.T = (TS-TE) = (34 ° C-19 ° C), measured temperature) following a cooling rate of about 2750m3 acid / h to a temperature of 115 ° C at an average temperature of 74 ° (T = 36 ° C) The water and returned to the sea (loss in sensible heat). The principle of HRS is to recover all of the energy dissipated in the sea water in a hot water loop to produce a low pressure steam that is useful for desalination of sea water. The project may involve all units and all the sulfuric acid coolers (6 units of capacity 2650TMH / h / unit Recovering the heat dissipated in the sea water will allow us to produce 52T / h of saturated steam BP (T = 155 ° C, P = 5.5bars) and that for each of sulfuric acid production unit. Thus the total production of units HRS be equivalent to 52 * 6 = 312T / h steam BP (T = 155 ° C, P = 5.5bars) .We adding steam cycle end produced at thermal power (90T / h steam BP) total steam capacity becomes available 402T / h .this significant amount of energy will be used for desalination identified a portion of the total flow of seawater used for cooling acid, allowing us both significantly reduce the energy cost of pumping and enjoy all the sensible heat dissipated in cooling sea water

KEYWORDS : Heat,desalination water, evaporation, condensation ,renewable energy, coogeneration

----
The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"

Hammamet,Tunisia 21-24 December, 2015

142

HIGH CONDUCTIVITY INDUCED SOLUTE LEAKAGE IN SEED IMBIBED WITH WASTEWATERTREATED WITH LAGOONING TREATMENT

MISSAOUI Takwa [1] , SMIRI Moêz[1, 2,*] , HAFIANE Amor[1]

[1]Laboratory of Wastewater Treatment, Center of Researches and Water Technologies, PB 273, 8020, Soliman, Tunisia.
[2]Department of Biotechnology, Higher Institute of Sciences and Technology of Environment, University of Carthage, Technopole of BorjCedria - B.P. n° 1003 - HammamLif -2050 – Tunisia.
Phone: +216-97-542791; Fax: +216-79-325333 e-mail: smirimoez@yahoo.fr

ABSTRACT

The study aimed to determine the impact of domestic wastewater on seed germination and reserve mobilization of *Trigonellafoenumgraecum* under laboratory conditions. Seeds were germinated by soaking in distilled water (H_2O) or wastewater treated with lagooning treatment. We studied the physicochemical characteristics of the TWW. Results show high levels of organic matter (OM) and suspended solids (TSS) and high conductivity in TWW. Responses of*Trigonellafoenumgraecum* to TWW are highlighted during germination (mobilization of reserves (sugars and free amino acids) and solutes leakage. Moreover, a significant increase in soluble sugars and free amino acids levels of embryonic axes and a decrease in the endosperm, show a strong reserve mobilization during germination of seeds soaked by TWW. Important solutes leakage is recorded by measuring electric conductivity during seed imbibition with TWW. Improving the quality of water by dilution (50%) stimulated germination of seeds and the growth of the tested plants. It significantly reduces the solutes leakage and enhanced seed metabolites accumulation.

***Keywords*:** *Conductivity · Solutes leakage · Treated wastewater ·Trigonellafoenumgraecum*

CHEMICAL FLUXES STUDY AT THE SEDIMENT-WATER INTERFACE TO ASSESS THE GENERAL SCHEME OF THE EARLY DIAGENESIS OCCURRING OFF THE MEJERDA OUTLET (GULF OF TUNIS)

HELALI Mohamed Amine, ZAABOUB Noureddine [a] , OUESLATI Walid, ADDED Ayed

Laboratoire des Ressources Minérales et Environnement, Département de Géologie, Facultédes Sciences de Tunis. Université Tunis-El Manar, 2092, Tunisia.

[a] Laboratoire du Milieu Marin, Institut National des Sciences et Technologies de la Mer, 2025Salammbô, Tunisia.

ABSTRACT

In-situ benthic flux of oxygen, dissolved iron and manganese, and nutrients were measured at the water-sediment interface by benthic chambers at three stations in the Mejerda River Delta (Tunisia). In parallel, three sediment cores were taken at the same locations to determine the diffusive flux of $Fe^{2+,}$ Mn^{2+}, NO_3^-, NH_4^+ and PO_4^{3-} to estimate diagenetic mechanisms occurring below the sediment-water interface. Oxygen consumption at the sediment-water interface is about 1.7 to 10mmol/m^2/day essentially under the control of organic matter degradation and oxidation of reduced elements. Nitrate concentration is relatively high in the pore water (above 140 µM) and its production below the oxic layer may therefore be the result of chemical production rather than biological processes. At the opposite, PO_4^{3-} and NH_4^+ are produced essentially by biological reactions and by chemical reactions; therefore these elements were released at a rate of 1.27 and 96.5µmol/m^2/day respectively. Sediment is a source of nutrients and, in many cases, the magnitude of sediment-water processes is sufficient not only to be a major component in nutrient and oxygen budget calculations, but is also very useful in proposing coastal management strategies.

KEYWORDS : *Iron, manganese, nutrients, benthic flux, diffusive flux, early diagenesis.*

ENOXACIN DEGRADATION BY PHOTO-FENTON PROCESS: OPTIMIZATION AND BIODEGRADABILITY IMPROVEMENT

ANNABI Cyrine [1,2], FOURCADE Florence [2], ASSADI Aymen [2], SOUTREL Isabelle [2], AMRANE Abdeltif [2], BELLAKHAL Nizar [1]

(1) Unité de Recherches de Catalyse d'Electrochimie, de Nanomatériaux et leurs applications et de didactique (CENAD), Institut National des Sciences Appliquées et de Technologie, (INSAT), B.P.N°676, 1080 Tunis Cedex, Tunisie.
(2) Institut des Sciences Chimiques de Rennes, Université de Rennes 1/ Ecole Nationale Supérieure de Chimie de Rennes, UMR-CNRS 6226, 11allée de Beaulieu, CS 50837, 35042 Renne Cedex 7, France.
E-mail

ABSTRACT

Advanced Oxidation Processes (AOP) are an alternative for the treatment of water polluted by toxic pollutants and / or persistent. In this context, this study focused on the photo-Fenton process. It was applied to the treatment of Enoxacin, an antibiotic belonging to the family of Fluoroquinolones. Enoxacin is poorly degraded by treatment plants and water purification.Here, the effect of some operating parameters on the Enoxacin degradation have been studied. The purpose of this study is to evaluate the photo-Fenton process not only the degradation but also for the biodegradability improvement of enoxacin.

The photo-Fenton process is based on the production of hydroxyl radicals by the reaction between H_2O_2 with ferrous ions, namely the Fenton reaction below at pH 3:

$$Fe^{2+}_{(aq)} + H_2O_2 \rightarrow Fe^{3+}_{(aq)} + OH^-_{(aq)} + °OH \qquad (1)$$
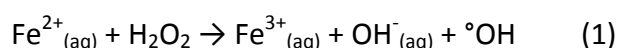
Hydroxyl radicals were also produced by the UV effect on H_2O_2 according to the reaction below: $\qquad H_2O_2 + h\nu \rightarrow 2 °OH \qquad (2)$

The influence of H_2O_2 concentration, Fe(II) concentration and light intensity was studied in this work. Once the optimal operating conditions fixed, a kinetic study and a monitoring of the antibiotic mineralization were conducted. The overall results showed that the degradation of enoxacin by photo-Fenton process follows a first order kinetic and reached a degradation efficiency of 100 % after 30 min of treatment at optimal conditions ([Fe2+]=0.5 mmol.L^{-1}, I= 30W/m2). Furthermore, the photo-Fenton process allowed 65 % mineralization and an improvement of the biodegradability of enoxacin's by-products after 2 hours of treatment, with a BOD_5 on COD ratio of 0.6. Finally, a comparison between Fenton and photo-Fenton degradation has been performed and mineralization has been enhanced by 40% with photo-Fenton process after two hours of treatment, in the same operating conditions. This effect can be due to the enhancement of °OH generation (eq2).

KEYWORDS : Enoxacin, photo-Fenton, batch reactor, pre-treatment, biodegradability.

SIMULATION STUDIES ON THE SOLAR VACUUM MEMBRANE DISTILLATION EQUIPPED WITH A HELICALLY COILED FIBERS

ZRELLI Adel [1,2], CHAOUACHI Béchir [2], GABSI Slimane [2]

1 High Institute of Applied Sciences and Technology of Gabes, University of Gabes, Omar Ibn. ElKhattab St. 6072 Gabes, Tunisia, Tel:216 75 39 21 08, Fax: 216 75 39 23 90
2.Environmental, Catalysis and Process Analysis Research Unity, National Engineering School of Gabes. University of Gabes, Omar Ibn. ElKhattab St. 6029 Gabes, Tunisia, Tel: 216 75 39 21 00, Fax : 216 75 39 21 90

E-mail: adel.zrelli@yahoo.fr

ABSTRACT

In this work, we have study some parameters of vacuum membrane distillation installation coupled with solar energy. The membrane module, in our case, is composed of two hollow fibers membrane wound in helically coiled shape. These fibers are placed in parabolic through concentrator absorber. Four parameters are studied in this paper in order to their optimization. After the establishment of the equations system, which is composed of two dimensional Navier-Stokes equations, the resolution was done with the finite element method. The results show that the optimized values of fiber geometric configuration are for the coil pitch is 3.22 cm, for the fiber diameter is 6 mm and 4.3 mm for the distance between fiber and absorber internal wall. The value of the optimized absorber diameter is 14 cm. For this configuration case, the permeate flow rate is equal as 18.6 10-5 kg/s.

KEYWORDS : *Vacuum membrane distillation, Solar energy, Helical fiber, Simulation*.

ELECTRO-KINETIC REMOVAL OF HEAVY METALS FROM SLUDGE GENERATED DURING A WASTEWATER TREATMENT

CHÉRIFI. Mouna

Laboratoire de traitement des eaux et valorisation des déchets industriels, Annaba, Algérie

Ecole préparatoire aux science et techniques, Annaba, Algérie

ABSTRACT

The treatment of industrial wastewater by electrocoagulation is well known to be very efficient and it has been extensively studied. However, the generated sludge contained a huge amount of aluminum (when such kind of electrode is used but also several other metals presented in the effluent). The objective of this paper is to study the possible removal of aluminum and Chromiun contained in the sludge by electrochemical migration.

This generated sludge containing a high amounts of Cr (14980 mg/Kg of dry sludge), above the maximum level allowed by legislation and Al (25300mg/Kg of dry sludge). It was mainly discussed about the potential toxicity of Al and Cr, and if a proper treatment technology is followed to remove toxic metals from this sludge to be properly used afterward without associating a risk to the environment the efficiency of the EC process will be accomplished.

The possibility of removing these pollutants from the resulting sludge by using electrokinetic technique was tested. Acetic acid (3, 6M) and Citric acid (1, 3M) acid were used as catholyte solutions to enhance removal of Aluminum and Chromium (III)

KEYWORDS : heavy metals, electro kinetic treatment, wastewater sludge

ACTIVATED CARBON PREPARED FROM DATE STONE BY PHYSICAL ACTIVATION: CHARACTERIZATION AND ADSORPTION OF DYE

REZMA Souad, LAFI Ridha, HAFIANE Amor

Laboratoire de Traitement des Eaux Usées, CERTE BP 273 Soliman 8020 Tunisia

ABSTRACT

Activated carbon was prepared from date stone by the pyrolysis and physical activation using a flow of CO_2 at 900°C. Material was characterized for their surface chemistry by elemental analysis, Boehm titration, point of zero charge measurement, infrared spectroscopy, and thermogravimetric analysis. Porous and morphological structure were determinate by scanning electron microporosity (SEM) and nitrogen adsorption at 77K. Also, the activated carbon had been characterized by adsorption of dye.

KEYWORDS : date stone, activated carbon, adsorption, dye, surface chemistry

DEVELOPMENT OF A PILOT INDUSTRIAL UNIT DESALINATION OF SEA WATER USING TIDAL ENERGY INSTALLED ON THE SEA WATER DISCHARGE CANAL IN THE SITE JORF ALASFAR OCP MOROCCO

SAIFAOUI D. [1], AAROUSSY Y.[1-2], HASSOUN H.[2], CERHANE I.

1-Université Hassan II Casablanca Maroc

2- Groupe OCP Jorf Alasfar EL Jadida Maroc

Dennoun Saifaoui: Fax: +21222230674   Email: ddsaifaoui@gmail.com

ABSTRACT

The Jorf Lasfar Industrial Complex is divided into several units: EMAPHOS, IMACID, PMP, BMP and Morocco Phosphorus III-IV. These plants manufacture of phosphoric acid (29% and 54% P_2O_5) and fertilizers. To ensure this production, these plants need a very large amount of sea water from the pumping station to the water recovery stations demer (REM) to finally distribute to its consumers. This sea water after use is returned through an open trapezoidal channel to the ocean carrying with it a significant amount of heat gained exothermic reactions processes.Phosphoric acid is produced through a reaction between phosphate rock and sulfuric acid. The latter is produced inside the jorf lasfar complex in 6 lines of sulfuric unit. The main sulfuric acid forming reactions are highly exothermic reactions and views that must be done under specific temperatures, cooling is provided by the acid coolers tube and calender in seawater.However, the idea of recovering the kinetic energy of sea water exit channel is very promising, given the high rate of output of the whole platform Jorf Lasfar seawater which is the about 35000 m^3 / h and the length of the outlet channel which is approximately 5 km with a slope of 1%. Furthermore, the recoverable power can reach 465 W maximum power as if we keep the current section of the channel of 12.35 m^2. But with a proposal to reduce the section of the channel, speed of seawater grow 12.35 m^2. But with a proposal to reduce the section of the channel, the speed of sea water increases to 3m per second which will have a significant recoverable maximum power of around 28 kilowatts by tidal. The energy produced will feed seawater desalination by reverse osmosis units, or heat resistance to desalt with technology Evaporation condensation

Vue du canal Longueur de 5 Km Débit volumique moyen de l'eau de mer passant par le canal = **35000 m³/h. Nombre d'Hydrolienne qu'on peut installer 180 de puissance 30kw**

KEYWORDS : Reverse osmosis, evaporation, condensation, Hydroelectric, resistance, discharge canal

SCALING THE STUDY IN THE GEOTHERMAL WATERS OF THE NORTHWEST OF TUNISIA

OUNIFI Ibtissem I. [*], HAMROUNI Béchir

Faculté des Sciences de Tunis, Université de Tunis El-Manar, Compus Universitaire, 2092, Tunisia

[*] Corresponding author: _ibtissemounifi@yahoo.com_

ABSTRACT

Geothermal waters flowing from calcareous soils and utilized in medical treatment are rich with significant concentrations of calcium bicarbonate. These waters have a total hardness of 113°F. During their progress in pipes, they increase the phenomenon of scaling. Serious problems could be faced as pipes clogging, devices failure, and heat exchangers loss of efficiency. Various methods of decarbonization as precipitation with lime or sodium carbonate or acid injection are commonly used. Some chemical inhibitors are sometimes added to block the germination calcium carbonate crystals. Our study focuses on the evaluation and inhibition of the scaling potential of geothermal hard water using chemical methods in presence of potassium dihydrogeno phosphate. The study of the scaling curve gave an accelerated scaling time of 14 min at 30°C and the increase in temperature decreases the value of scaling time (6 min at 60°C). By adding 1 g of KH_2PO_4 by one liter, the curve becomes a straight line, indicating the absolute inhibition of scaling. Softening realized by rapid controlled precipitation shows that when the dose of the inhibitor increase the rate of scaling ions elimination increase also. The application of a thermodynamic prediction program shows that for a dose of 3 mg/L, geothermal water should be brought to the calc-carbonic balance.

KEYWORDS: Scaling, $CaCO_3$, Inhibition, KH_2PO_4.

FABRICATION AND CHARACTERIZATION OF COMPOSITE NANOFILTRATION MEMBRANES BY INTERFACIAL POLYMERIZATION.

OUNIFI Ibtissem [a][*], HAFIANE Amor[a] , FERJANI Ezzedine[b]

(a) Laboratoire des Eaux Usées, Centre de Recherches et Technologies des Eaux, Technopole Borj-Cédria,
BP 273, 8020 Soliman, Tunisie
(b) Institut Supérieur des Sciences et Technologies de l'Environnement, Bp 2050 Borj-Cédria, Tunisie
[*] Corresponding author: *ibtissemounifi@yahoo.com*

ABSTRACT

Ultrafiltration (UF) membrane preparation is realized through Manjikian process via phase inversion technique from casting solution consisting of cellulose acetate powder (15, 16.5, 18, 19.5 and 21%wt), acétone and formamide. To characterize these membranes, water flux, retention of PEG and contact angle were measured.

Thus results indicated the enhanced hydrophilicity of ultrafiltration membrane.

These UF membranes are used as a support to nanofiltration (NF) membrane composite type by interfacial polymerization method using m-Phenylenediamine-4-methyl (MMPD) and Isophthaloyl chloride (IPC) as reactive monomers. Water flux, retention of salts and Molecularweightcut-off (MWCO) of the NF membranes were evaluated

The chemical composition and the surface image of UF and NF membranes are obtained by IR.

KEYWORDS : Ultrafiltration membrane, phase inversion, cellulose acetate, PEG, nanofiltration, interfacial polymerization.

ELIMINATION OF OXYTETRACYCLINE BY ADSORPTION ON SYNTHETIC SUPPORT

BELAIB.F (1), MENIAI A-H (1), MOKRI A, BOUKELLAL.B

Laboratoire de l'Ingénierie des Procédès de l'Environnement (LIPE), Université Constantine3, Constantine, Algerie.

belaibfouzia@yahoo.fr

ABSTRACT

Among the pharmaceutical pollutants, antibiotics deserve special attention because they are used in large quantities on the one hand and are biologically active molecules that can interact with specific biological targets leading to the appearance of the phenomenon of resistance of microorganisms potentially pathogenic bacteria such as the drugs used to control them. Preventive action is essential to reduce their presence in natural aquatic environments. In this study we have applied the method of adsorption of oxytetracycline (OTC) onto the silica gel coated with a polyaniline (1). The influence of different physico-chemical parameters such as contact time, the pH, and temperature. The effect of the recovery of silica gel with a polymer (polyaniline) is apparent from the yields of retention of OTC.Linear regressions have shown that the kinetics is controlled by the pseudo second order . The experimental data are well interpreted by the Langmuir and BET models.

KEYWORDS - oxytetracycline-modified silica gel-Adsorption –Kinetic

(1). Belaib F, AH Meniai, M.Bencheikh lehocine, A.Mansri, M.Morcellet, M.Bacquet, B.Martel"A macroscopic study of the retention capacity of copper by polyaniline coated onto silica gel and natural solid materials (2004) "Desalination 166,371-377

SYNTHESIS AND CHARACTERIZATION OF PEBAX AND PVDF BASED COMPOSITE MEMBRANES : APPLICATION FOR DYE REMOVAL BY ULTRAFILTRATION

BEN HAMOUDA Sofiane, GOUIDER Yosra, HAFIANE Amor
Laboratoire Eau et Traitements Membranaires, CERTE BP273- Soliman 8020

ABSTRACT

PEBAX-based membranes were prepared by evaporation of the solvent while the PVDF membranes were fabricated via dip coagulation. The characterization of these membranes has enabled us to define their structure and prove their semi-crystalline nature by means of differential scanning calorimetry in which a melting enthalpy of PA12 crystallites of about 246 J / g is obtained in the case of Pebax 2533. Par means of atomic force microscopy, we can observe that the roughnesses are quite high is 130.16 nm in the case of the membrane PEBAX 2533 and 16.71 nm in the case of the composite membrane PEBAX 2533- cellulose. This difference in roughness can be due to insertion of the cellulose which imparts a smoother character to the membrane. The synthesis of cellulose composite PVDF membranes allowed us later to consider elimination of applying a dye such as methylene blue by ultrafiltration. The percentage retention of 27% is obtained at a transmembrane pressure of 0.8 bar. The permeation flux obtained was 83.3 Lm-2.h-1 in the case of pure water which is comparable to the flow obtained by industrial membranes of regenerated cellulose. A contact angle study also allowed us to highlight the possibility of improving the hydrophobicity of a membrane by changing the coagulation bath (ethanol, methanol and butanol). Thus, it has reached a contact angle with pure water of 84 ° in the case where the coagulation bath is the metanol allowing to envisage applications in the case of membrane distillation.

The 5th *Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"*
Hammamet,Tunisia 21-24 December, 2015

153

NUMERICAL AND EXPERIMENTAL STUDY OF EVAPORATION OF LIQUID EFFLUENT ON AN INCLINED PLATE

[1] **ZOUAGHI H**Erreur ! Signet non défini**.., **[2]**BEN JABRALLAH S., **[3]**HARMAND S.**
1 National Engineering School of Monastir
Avenue Ibn El Jazzar, 5019 Monastir – Tunisia
2 Sciences Faculty of Bizerte – Laboratory LETTM - Zarzouna, 7021 Bizerte – Tunisia
3 University of Lille Nord, UVHC – LAMIH UMR CNRS 8201
Mont Houy, Valenciennes, Cedex 09, 59300 – France

ABSTRACT

This work deals with the recovery of liquid effluent by thermal evaporation. The effluent is a digestate of pig manure witch is subjected to anaerobic digestion and phase separation by centrifugation. Its dry matter is about 2.3%.

In order to concentrate fertilizer element contents, we analyze in this work the evaporation of this effluent using solar energy. The device consists of a stainless steel plate with a tilt angle of 30°. The liquid circulates as a film on the steel plate and is exposed to a 6000 Watt solar simulator. The plate receives an average heat flux of 450 W/m².

Before starting tests, the plate is exposed to solar radiation until stabilization of its temperature. The cartography of the plate temperature is obtained by two methods; the first is measured and the second is made by calculating from thermal balances.

Evaporation tests were performed. The device is, on one hand, covered with a glass, and removed, on the other hand. The liquid circulates as a film flowing from the top of the plate. A comparison between measured evaporated mass flow and calculated from mass balances is determined in laminar regime. It depends on heat flux, air, plate and liquid temperature.

***KEYWORDS* :** evaporation, effluent, balance, heat flux, mass flow.

Experimental device

The photo of the device is shown in **figure 1**.
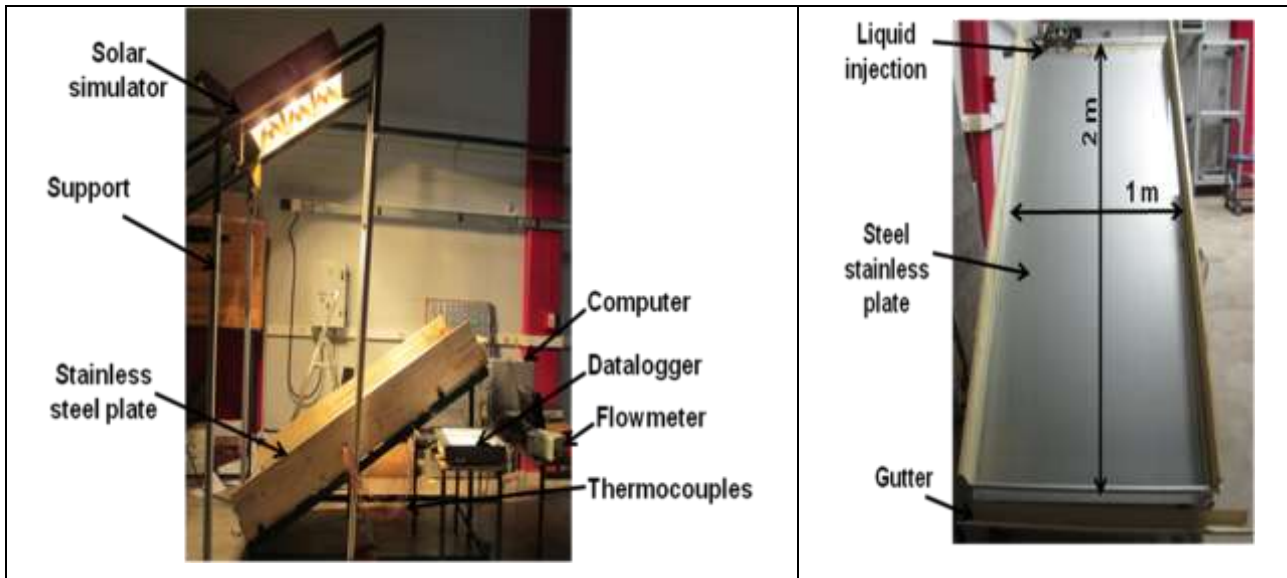
Fig 1: Experimental device

Heat and mass balances, on the steel plate with tilt angle of 30°, are shown in **figure 2**.

T_g: Gas temperature
T_f: Film temperature
T_p: Plate temperature
e_f : Film thickness
l: Plate thickness
I_0: Solar flux
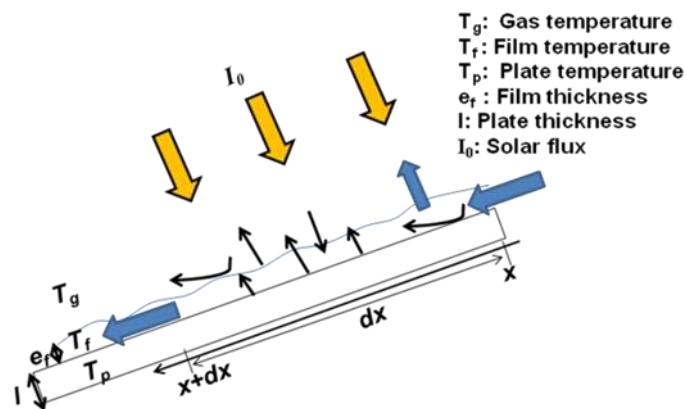
Fig 2: Heat and mass balances on the plate (without glass cover) and the liquid film

Balances are determined by assuming that the sum of the inflow is equal to the sum of the outflow.

OPTIMIZATION OF PROCESS PARAMETERS FOR THE REMOVAL OF FLUORIDE BY MEMBRANE DISTILLATION USING RESPONSE SURFACE METHODOLOGY APPROACH

BOUBAKRI Ali [a,*], BOUCHRIT Raja [a], HAFIANE Amor [a], BOUGUECHA Salah Al-Tahar [b]

[a] Center of Researches and Water Technologies, P.B 273, 8020 Soliman, Tunisia.
[b] Department of Mechanical Engineering, Faculty of Engineer, King Abdul-Aziz University, P.B: 80204 Jeddah 21589, Kingdom of Saudi Arabia.

ABSTRACT

In the present study, application of membrane distillation (MD) process was investigated for the removal of fluoride from aqueous solution. The effect of various operating parameters such as temperature difference, feed flow rate, permeate flow rate and initial fluoride concentration was optimized by response surface methodology (RSM). The second-order regression models, which determine the relation between permeate flux as function of different operating parameters, have been tested by the analysis of variance (ANOVA). The high R^2 value of 97.90% obtained showed that the experimental values were in good agreement with the predicted data. Temperature difference was considered to be the most important parameters in order to obtain maximum permeate flux. Based on the RSM results, the optimum conditions included a temperature difference of 46.82°C, a feed flow rate of 30 L/h, a permeate flow rate of 4.9 L/h and an initial fluoride concentration of 75.2 mg/L. under these conditions, the maximum permeate flux was 17.22 L/m-2.h-1. All experimental results proved that MD is able to produce water with very low fluoride content (removal rate more than 99.8%).

KEYWORDS : *Membrane distillation; Fluoride removal; Permeate flux; ANOVA; Optimization.*

SYNTHESIS OF ZnO NPs BY THERMAL DECOMPOSITION OF ACETATE OF ZINC DEHYDRATE AND ITS HIGH RATE OF ADSORPTION OF METHYLENE BLUE

CHMINGUI Hajer, HAFIANE Omar

[a] Laboratory of Wastewater Treatment, CERTE BP 273, 8020 Soliman, Tunisia-
Email: amor.hafiane@certe.rnrt.tn (A. Hafiane)

ABSTRACT

ZnO NPs were synthesized by the thermal decomposition of zinc acetate dehydrate at 300°C in air for different time without a catalyst. X-ray diffraction (XRD) patterns indicated that the ZnO NPs have a wurtzite crystal structure. The Study of surface morphology done by scanning electron microscopy (SEM) and transmission electron microscopy (TEM). The average crystallite size determined by XRD is found as 29.3 and 35.2 nm corresponding to reaction time of 1 and 3 h, respectively. Optical properties of the ZnO NPs have been investigated by UV–visible spectroscopy and photoluminescence (PL) spectroscopy at room temperature. PL photoluminescence study reveals the blue emission at 384, 447 and 483 nm and the green emission at 529 nm respectively. Thermogravimetric-differential thermal analysis (TG-DTA) was used to study the thermal behavior. The adsorption of a dye, the deals with Methylene blue, by ZnO synthesized, was investigated. The effects of increasing amounts of ZnO NPs as adsorbent and contact time with the MB were studied, we found an improved of adsorption of ZnO NPs .

KEYWORDS : Zinc oxide nanoparticules, Thermal decomposition, Optical properties, Adsorption, Removal of Dye, Methylene blue

SPECTROPHOTOMETRIC STUDY OF THE INTERACTION OF CATIONIC DYES WITH ANIONIC POLYOXOMETALATES

KAHLOUL Malak [a], HAFIANE Amor [a]

Laboratory of Wastewater Treatment, CERTE, BP 273, Soliman 8020, Tunisia

malak.kahloul@yahoo.fr

ABSTRACT

Polyoxometalates (POMs), due to their attractive physical, chemical and biological properties, have been the subject of numerous studies. In this present study we synthesized an anionic polyoxometalate monovacant $K_7PW_{11}O_{39}.14H_2O$, this product is characterized by FTIR, XRD X-ray diffraction and UV visible. We studied the interaction between the anionic POM and cationic dyes as methylene blue and toluidine blue. The UV–visible spectroscopy study shows a formation of a metachromatic complex .the large hypsochromic shift for MB (104 nm) and for TB (72 nm) were attributed to the formation of dye H-aggregates and for MB it was formed another complex that are characterized by a red-shifted absorption band (J-aggregates).

The effects of increasing amounts of anionic POM, pH, temperature and sodium chloride concentration have been studied.

KEYWORDS : *polyoxometalates, dyes, toluidine blue, methylene blue, Spectrophotometry UV–visible*

OPTIMIZATION OF ACETIC ACID ADSORPTION FROM AQUEOUS SOLUTIONS BY RAW PHOSPHATE : FULL FACTORIAL DESIGN METHODOLOGY

SOUADEK Rachida, RIDA Kamel , Boukhemkhem Ali
Laboratoire Interactions Matériaux Environnement (LIME)
Université Mohamed Seddik Benyahia – Jijel (Algeria)
E-maul : rida_kamel2001@yahoo.fr

ABSTRACT

In the present paper, acetic acid removal from aqueous solution by adsorption was investigated and 2^3 full factorial designs were applied to study the main effects and the interaction effects between operational parameters. The important parameters which affect the removal efficiency of acetic acid such as initial concentration, adsorbent dosage and contact time were investigated. The parameters were coded as x_1, x_2 and x_3, consecutively, and were investigated at two levels (-1 and +1). The model equation obtained after performing experiments and discarding the insignificant effects is as follows: $y(\%) = 35{,}133 - 9{,}148x_1 + 14{,}553x_2 + 10{,}463x_3 - 7{,}208x_1x_2 - 4{,}813x_1x_3 + 1{,}208x_2x_3 + 1{,}051x_1x_2x_3$. The effects of individual variables and their interaction effects for dependent variables, namely, adsorption removal efficiency (%) were determined. The experimental results and statistical analysis show that the adsorbent dosage and contact time have positive effects on removal efficiency and the initial acetic acid concentration has a negative effect. The interaction between initial concentration and adsorbent dosage was the most influencing interaction. Using these statistical tools, the best conditions for acetic acid removal from aqueous solution were initial acetic acid of 0.013 mol/l, adsorbent dosage of 0.036 g and time of contact higher than 95 second.

KEYWORDS : *Optimization, Full factorial design, Adsorption, Raw phosphate, Acetic acid*.

ESTIMATION OF FREEZING CRYSTALLIZATION KINETICS FOR SEAWATER DESALINATION: APPLICATION TO THE SCRAPED SURFACE HEAT EXCHANGER CRYSTALLYZER

ELABDELLAOUI Fouzia [a], SEMLALI AOURAGH HASSANI Naoual [a]

Laboratoire d'Analyse et Synthèse des procédés Industriels (LASPI), Ecole Mohammadia d'Ingénieurs,Université Mohammed V,BP 765 Rabat,Morocco,Tel.+212 54240310;email: fouziaelabdellaoui@hotmail.fr

ABSTRACT

Desalination presents a very important way to solve water problem shortage in the world arid areas. Technologies such as distillation and reverse osmosis are usually used in this term; but they present several inconveniences like energy consumption and environment impacts. To overcome these limits, a new process of sea water desalination combining freezing crystallization and reverse osmosis was developed in our laboratory [1].
Crystallization kinetic is an important aspect to study the freezing desalination process in order to understand these complex mechanisms. However, little experimental studies have been reported in this field. Effectively, kinetic factors are practically unknown due to the lack of precise supporting data and the incomplete understanding of the complex mechanisms involved in this freezing crystallization process. For determining growth rates some procedures are well known; whereas uncertainties still exist regarding particularly to the intrinsic kinetics and the application of available heat and mass transfer correlations of the studied system.

The present work aims to study the crystallization kinetics of seawater in a scraped surface heat exchanger, the most suitable system for food product and for continuous industrial processes. This crystallizer is adapted in our laboratory for many search studies for seawater desalination by freezing crystallization [1]. On the basis of mass and energy balances of the scraped surface heat exchanger and the experimental studies of freezing salt-water reported in the literature, nucleation and growth kinetic factors of seawater crystallization by freezing were calculated. For this, the diameter rate change of a single crystal was evaluated from a dynamic heat balance on the solid phase.

The obtained results show that the growth rate of ice in salt-water- system was proportional to the subcooling degree and the values of kinetic factors are comparable to those of the experimental studies reported for a continuous agitated system. These results are promising to be exploited in experimental tests in order to get more precise values of the kinetic factors estimated of such system in the scraped surface heat exchanger crystallizer.
Keywords: Desalination; Crystallization kinetics; Seawater; Scraped surface heat exchanger.

References

[1] I. Baayyad, N. Semlali Aouragh Hassani, T. Bounahmidi; Evaluation of the energy consumption of industrial hybrid seawater desalination process combining freezing system and reverse osmosis; Desalination and Water Treatment,(2014)1-9.

----

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

160

MESURE DES PROPRIETES DE SURFACES DE MATERIAUX ADSORBANTS

DEBIH Hadi

University Mohamed Boudiaf - M'sila, Faculty of Sciences, 28000 Algeria.
E-mail : debimah@yahoo.fr

RESUME

La méthode de mesure d'angle de contact sur les poudres et les matériaux poreux est basée sur le suivi de l'ascension capillaire de liquides organiques sur des colonnes ou tubes en verre et en application de l'équation de Washburn. Les auteurs qui utilisent cette méthode approchent le concept d'énergie de surface d'un solide d'une manière légèrement différente, basée sur la théorie de Lifshitz. Chacune des composantes de l'énergie totale de surface du solide pourra être déterminée par mesure de l'angle de contact.

Les liquides utilisés au cours de cette étude sont classés en trois groupes : les alcanes, liquides totalement mouillants, permettent la détermination du paramètre géométrique C (en cm^5) ; les liquides apolaires permettent de calculer les composantes dispersives de l'énergie de surface, les liquides polaires sont utilisés pour obtenir les composantes non dispersives de l'énergie de surface. En outre, aucun d'entre eux ne réagit avec les solides adsorbants (ni dissolution ni réaction chimique).

La méthode d'ascension capillaire présente un avantage principal qui réside dans le fait qu'il n'est pas nécessaire d'agglomérer préalablement les adsorbants dans l'eau. On évite ainsi la resédimentation préférentielle, ainsi que la formation de films imperméables gênant la montée capillaire. On mesure l'énergie macroscopique de surface du solide, proche des conditions naturelles, que l'on détermine.

Les résultats montrent des différences notables pour les différents charbons avant et après mise en contact avec les polluants. Ceci est donc particulièrement intéressant pour une approche de la mouillabilité des argiles dans les gisements pétroliers.

MOTS CLES: Energie de surface, charbon, ascension capillaire, mouillabilité, angle de contact.

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet,Tunisia 21-24 December, 2015

161

STATISTICAL MODELING AND OPTIMIZATION OF THE CADMIUM BIOSORPTION PROCESS IN AN AQUEOUS SOLUTION USING *POSIDONIA OCEANICA*

BRAHMI Lamia, KAOUAH Farida *, BOUMAZA Salim, BERRAMA Tarek, BENDJAMA Zoubida

Laboratoire des sciences de génie des procédés industriels - Faculté de Génie Mécanique et de Génie des Procédés - USTHB - BP 32, El-Alia, 16111, Bab-Ezzouar, Alger (Algérie)

*Email : faridakaouah@yahoo.fr

ABSTRACT

In this study, the process of cadmium biosorption on biomass (*Posidonia Oceanica*) was investigated in the batch mode. The effect of three independent variables, initial pH of solution, initial cadmium ion concentration and biomass dosage on the biosorption process was determined and the process was then optimized by means of response surface methodology (RSM). The process was evaluated by cadmium removal efficiency as the process response. Twenty experiments designed by central composite design (CCD) were carried out and the process response was modeled using a polynomial equation as function of the variables. The optimum values of the variables were found to be 5.90, 70.76.0 mg/l and 3.33 g/l for initial pH, initial cadmium ion concentration and biomass dosage, respectively. At optimal conditions, a cadmium removal efficiency of 98.40% was obtained. According to these results, biomass *Posidonia Oceanica* may have application as biosorbent for heavy metal removal from industrial wastewater effluents.

KEYWORDS **:** Posidonia Oceanica, Cadmium biosorption, Response surface methodology.

MOLECULARLY IMPRINTED POLYANILINE SORBENT OF SUNSCREENS IN WATER

AYADI C. [a], HBAIEB S. [a], KALFAT R. [a], CHEVALIER Y. [b]

[a] Laboratoire Méthodes et Techniques d'Analyse, INRAP, BioTechpôle Sidi Thabet, 2020 Ariana, Tunisia.

[b] Laboratoire d'Automatique et de Génie des Procédés, Procédés (LAGEP), UMR 5007 CNRS - Université Lyon1, 69622 Villeurbanne, France.

E-mail : sherifa.ayadi@gmail.com

ABSTRACT

Sunscreens, including chemical UV filters, are a threat to the environment due to their endocrine potential in contributing, among others, to the feminization of fish species and coral bleaching [1]. These filters pollute the aquatic environment, rivers, lakes and seawater, either directly by swimming or water sports, or by indirect contributions related to discharge of water from wastewater treatment units.

The analysis of such pollutants is usually conducted by chromatography. In general, these pollutants are present in low concentrations in complicated environmental matrices, so their determination requires extraction and concentration steps prior to instrumental analysis. Solid phase extraction (SPE) is now an emerging technique for the extraction of analytes and is substituting liquid-liquid extraction (LLE) protocols.

Molecularly Imprinted Polymers (MIPs) have been recently introduced as SPE sorbents and look promising to circumvent the drawbacks of traditional SPE sorbents owing to the selective recognition ability of MIPs for given molecules.

Acrylic polymers were mostly used for the production of MIPs. However, the common synthetic route (free radical polymerization) requires specific and complicated processing conditions (organic and oxygen free medium, thermo- or photolabile initiators). Polyaniline (PANI) could be a good alternative for the production of MIPs due to its easy synthesis by oxidative polycondensation of aniline in aqueous medium and its excellent environmental stability.

The aim of the present work was to develop a polyaniline-based MIP for sunscreen attached as a thin film at the surface of silica solid support. Thin layers of MIP at the surface of silica material of high specific area provide easily accessible sites related to fast association/dissociation kinetics.

Polymerizable entities were first grafted at the surface of silica particles. The grafting degree was determined from elemental analysis and TGA. Polymerization was conducted from surface attached groups in the presence or absence of sunscreen for the production of MIP or non-imprinted (NIP) coatings respectively. The adsorption sites were revealed by extraction of sunscreen from coated silica particles. A good extraction was attained by use of Soxhlet extraction method.

The experimental comparison between imprinted (MIP) and non-imprinted (NIP) materials was performed by means of adsorption kinetics and adsorption isotherms measurements.

[1] Environ Health Perspect. 2008 116(4):441-7. Sunscreens cause coral bleaching by promoting viral infections. Danovaro R, Bongiorni L, Corinaldesi C, Giovannelli D, Damiani E, Astolfi P, Greci L, Pusceddu A.

DEGRADATION OF REACTIVE DYES BY GAMMA IRRADIATION PROCESS

JAHOUACH-RABAI Wafa [a,b], AZZOUZ-BERRICHE Zohra [b], CHAMMAM Baha [a],

BOUSSELMI Latifa [a], GHRABI Ahmed [a]

[a] *Center of Water Research and Technologies (CERTE), Echopark Borj Cedria, Tunisia*

[b] *National Center of Nuclear Sciences and Technologies (CNSTN), Technopark Sidi Thabet,Tunisia*

Corresponding author: rabia.wafa@cnstn.rnrt.tn

ABSTRACT

A main advanced oxidative process (AOP) of wastewater treatment containing toxic and persistent organic pollutants, especially textile dyes was developed. This process is characterized by the generation of very reactive and highly oxidizing species, hydroxyl radicals (OH^-) which are able to oxidize any organic pollutant.

In this study, two azoic dyes (Reactive Black 5 and Acid Orange 8) were irradiated with gamma rays ($_{60}Co$ irradiator). The influence of absorbed doses and initial dye concentrations on degree of decoloration, chemical oxygen demand (COD) removal, radio-induced radicals and the pH value changes of treated dyes were investigated. During the radiolysis process, it was proved that the performance of dyes decoloration resulted to destruction of the chromophore groups of dye molecules, whereas COD removal was depended on the mineralization of dyes. The decrease in pH during irradiation process indicated the fragmentation of the large dye molecule into smaller organic components like organic acids. Finally, according to sophisticated analysis, it was proved that gamma irradiation technique is effective in degradation and decoloration and it could be a promising method for treatment of textile wastewater. This process can be applied in mineralization of wastewater containing different dyes.

KEYWORDS : *AOP, Gamma irradiation, azoic dyes, textile wastewater.*

APPLICATION OF 2D ELECTRICAL RESISTIVITY TOMOGRAPHY METHOD AND GEOCHEMICAL TRACERS FOR DELINEATION OF GROUNDWATER RECHARGE BY TREATED WASTEWATER FROM DHRAA TAMMAR WASTEWATER TREATMENT PLANT IN KAIROUAN REGION (CENTRAL TUNISIA)

LACHAAL Fethi [1,*]; M'RABET Marwa [1,2]; MANSOURI Youssef [3]; GABTNI Hakim [1]

* Georesources Laboratory, Water Research and Technology Centre, Borj Cedria Ecopark, PO Box 273 Soliman 8020, Tunisia. (E-mail: lachaalfethi@yahoo.fr / fethi.lachaal@certe.rnrt.tn)

[1] Georesources Laboratory, Water Research and Technology Centre, Borj Cedria Ecopark, PO Box 273 Soliman 8020, Tunisia.
[2] Faculty of Sciences of Tunis, Department of Geology, University Tunis El Manar, 2092 Tunis El Manar, Tunisia.
[3] Regional Directorate of the Environment and Steppes, Kairouan, Tunisia.

ABSTRACT

The Kairouan aquifer (Central Tunisia) is one of typical example of overexploited aquifer in semi-arid region. In fact, the piezometric levels are decreased and the water quality is deteriorated. In this hydrogeological environment, a treated wastewater from Dhraa Tammar Wastewater Treatment Plant (DTWTP) are discharged directly in the wadi Zeroud upstream.

The aim of this work is to study and to find out the hydrogeological impact of artificial recharge by treated waste water on the hydrodynamics comportments and the water quality of the Kairouan groundwater.

In this context, a hydr-geophysical and hydrochemical studies are carried out in Mai 2015. Four electrical tomography profiles of 315m length are installed at the upstream of DTWTP and in the river bed. To simulate the infiltration area, inverted apparent resistivity models has been developed. The hydrochemical study consist of physico-chemical analysis of water samples from 11 boreholes, 3 deep wells, surface water, and waste water before and after treatment.

The electrical resistivity contrast between the treated water infiltration and groundwater shows the infiltration of treated water at the DTWTP upstream and at the wadi Zeroud bed, where the groundwater salinity was decrease.

KEYWORDS : Wastewater treatment, treated wastewater reuse, Semi-arid, Groundwater, Electrical resistivity tomography, salinity.

COMPARATIVE STUDY OF THE PERFORMANCE OF WATER TREATMENT PROCESSES FOR HAEMODIALYSIS APPLIED IN TWO DIALYSIS UNITS AND THEIR IMPACT ON THE QUALITY OF PRODUCED WATER

MIME Mounia Insaf [1,2] , BENGHAREZ Zohra[1] et BENRACHEDI Khaled [2]

[1]Laboratoire Matériaux Avancés et Physico-chimie pour l'Environnement et la Santé.
Faculté des Sciences Exactes. Université DjillaliLiabes de Sidi Bel Abbes. Algérie.
[2]Laboratoire de recherche de technologie alimentaire. UMBB/FSI Boumerdes. Algérie
E-mail: mimemounia@yahoo.fr , dzbengharez@yahoo.fr

ABSTRACT

The water processing chain for haemodialysis comprises 3 main steps, namely the pretreatment, treatment and distribution, the objective is to produce high quality dialysis water free of bacteria, endotoxins, ion , minerals and metals. If the pre-treatment techniques are common in most dialysis units, the treatment is carried out either by simple reverse osmosis or by double osmosis to ensure ultrapure dialysis water In this context, our aim is to study the performance of two dialysis units proceeding by reverse osmosis and double osmosis and their impact on water quality for haemodialysis. 2 sites were selected: the dialysis unit of Abdelkader Hassani hospital of Sidi Bel Abbes (Northwest Algeria) noted S1 and the haemodialysis center of Thénia, department of Boumerdes (Centre of Algeria) S2. We performed physicochemical and bacteriological analyzes of the treated water at a frequency of 4 times per year.

The results showed the presence of contaminants in dialysis water for S1, the concentration of aluminum was found equal to 99µg /L, 9 times higher the ISO 23500.2011. The monitoring of conductivity has allowed us to detect its evolution almost exponentially reaching a peak of 32µS / cm whereas the 2011 European Pharmacopoeia has set a maximum of 4 µS/cm, this deviation on the conductivity of the osmosis water probably reflects aging of reverse osmosis membranes which makes their change inevitable.

For S2, the effectiveness of double osmosis relative to the ionic species (mono or divalent) was highlighted, the capacity of membranes to remove K^+, Ca^{2+}, Mg^{2+} et Cl^- remained in all our experiments between 95 to 98%. The concentration of trihalomethanes THM : Chloroform, dichlorobromomethane, bromoform and dibromochloromethane was estimated to 76.328 µg/L in tap water which supplies the dialysis unit, it decreases to 49.6773 µg/L after passing through the processing system, a decrease of 65.08% in THM concentration, considered as moderate, may be justified either by the saturation of the activated carbon filters supposed to retain the maximum of THMs in the preprocessing stage or to the nature of membranes that compose the osmosis system.

KEYWORDS : Dialysis water, treatment processes, performance, impact, quality.

CARACTERISATION ET MODELISATION DU MOUVEMENT DU LIT DE BOUES DANS LES DECANTEURS SECONDAIRES

BOUKEZOULA T.F., BAKIRI Zahir

Laboratoire de Génie des Procédés Chimiques (LGPC), Département de Génie des Procédés,
Université Ferhat Abbas de Sétif, Algérie,
E-mail : tayeb19set@yahoo.fr

RESUME

Le modèle mathématique pour le décanteur secondaire a été développé, notamment, de proposer une expression modifiée de la vitesse de sédimentation. Les traitements des paramètres de pollution ont été estimés. Les résultats des tests ont été dans les normes, de sorte que les résultats correspondent à la présente normalisation algérienne.

Par conséquent, cette étude a porté sur la caractérisation du mouvement du lit de boues dans le décanteur secondaire en utilisant la théorie du flux des particules solides et la loi de vitesse de sédimentation. Cela nous a permis de développer un modèle de dispersion basée sur une étude expérimentale approfondie et de l'application de données en ligne tels que, le flux massique, la concentration de transfert et les caractéristiques de liqueur mixte. D'autre part le calage des valeurs de l'indice de volume des boues (SVI) ont permis au modèle de reproduire les variations de la hauteur du voile de boues et pour s'assurer une bonne séparation liquide / solide.

MOTS CLES : Eaux usées, boues activées, décanteur secondaire, sédimentation, épuration, modélisation mathématique.

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

168

BIODEGRADATION OF M-AMINOPHENOL BY MIXED BACTERIA

HAMITOUCHE A. [a, b], BENDJAMA Z. [a], AMRANE A. [c,d], and KAOUAH F. [a]

[a] Laboratoire des Sciences du Génie des Procédés Industriels, Faculté de Génie Mécanique et de Génie des Procédés, Université des Sciences et de la Technologie Houari Boumediene, BP 32, El-Alia, 16111, Bab ezzouar, Alger, Algeria
[b] Centre de Recherche scientifique et technique en Analyses Physico-Chimiques, BP 248, CRAPC, Alger, Algeria
[c] Ecole Nationale Supérieure de Chimie de Rennes, Université Rennes 1, CNRS, UMR 6226, Avenue du Général Leclerc, CS 50837, 35708 Rennes Cedex 7, France
[d] Université européenne de Bretagne, 35000 Rennes, France
E-mail : zbendjama@yahoo.fr

ABSTRACT

The current work describes the ability of mixed bacteria to remove m-aminophenol in aqueous solution. For this reason, a series of experiments were performed to examine the effects of the mineral medium composition and the pH on m-aminophenol removal. In this purpose, m-aminophenol removal was carried out in a batch reactor containing mixed bacteria; the temperature (30°C), the stirring velocity (200 r /min), the KH_2PO_4 concentration (1.5 g/L), the K_2HPO_4 concentration (2 g/L) and m-aminophenol concentration (100 mg/L) were kept constants. The initial pH was varied in the range 5 – 9 and the mineral components were tested in the following concentration ranges: 0 – 2 g/L for Nitrogen sources (NH_4Cl, $(NH_4)_2SO_4$, KNO_3 and NH_4NO_3), 0 – 0.5 g/L for NaCl and 0 – 0.2 g/L for $MgSO_4$. Their effects on m-aminophenol biodegradation and specific growth rate were examined. The shorter biodegradation time of m-aminophenol was 50 h for NH_4Cl, NaCl and $MgSO_4$ concentrations of 1, 0.2 and 0.1 g/L respectively. Maximum specific growth rate (0.42 h^{-1}) and total m-aminophenol removal were recorded for an optimal pH value of 8.

KEYWORDS : m-aminophenol, biodegradation, batch reactor, mineral medium.

LEAD(II) AND CADMIUM(II) ELIMINATION FROM AQUEOUS SOLUTIONS BY COMMERCIALIZED RESIN : LEWATIT TP 214

ABDERRAHIM Omar, BENAISSA Esma, DIDI Mohamed Amine

Département de Chimie, Faculté des Sciences BP 119, Université de Tlemcen, Tlemcen, Algérie

E-mail : abderrahimomar@yahoo.fr

ABSTRACT

This study aims to investigate the Lewatit TP 214, which is a chelating ion-exchange polymer containing the thiourea group, for the sorption of Pb(II) and Cd(II) ions from aqueous solutions. The thiourea function is chemically bonded to the matrix of the styrene-divinylbenzene polymer. The effects of parameters such as the concentration, pH level, contact time, ionic strength and temperature were investigated.

The results showed more affinity of resin towards cadmium than lead cations. The maximum uptake values of Pb(II) and Cd(II) were 55.59 mg g^{-1} and 81.75 mg g^{-1}, respectively. The resin used in this study exhibited a good sorption potential at initial pH values, i.e. pH = 4.1 and pH = 6.1, for Pb(II) and Cd(II), respectively, at room temperature. The extraction kinetics, for both cations Pb(II) and Cd(II), was best described by the pseudo second order model. This study showed that the diffusion of moving boundary particles fits well the experimental data (r > 0.99) for the sorption of both Pb(II) and Cd(II) ions. The Langmuir isotherm fits better the obtained equilibrium data compared to the Freundlich isotherm. The thermodynamic data for the sorption of Pb(II) and Cd(II), on the Lewatit 214 resin, indicate that the process is endothermic for Pb(II) (ΔH = + 8.94 kj mol^{-1}), while it is exothermic for Cd(II) (ΔH = - 51.65 kj mol^{-1}). In addition, the thermodynamic study showed also negative ΔG values, indicating that the sorption process of both Pb(II) and Cd(II) ions is spontaneous.

KEYWORDS : Cadmium(II), Lead(II), Lewatit TP 214 resin, sorption; kinetics, thermodynamics, diffusion.

NUMERICAL STUDY OF THE HUMID AIR CONDENSATION IN A CONDENSER OF A SOLAR DESALINATION UNIT

SAIDI Sirine [a], BEN RADHIA Rym [a], BENHAMOU Brahim [b], NAFIRI Naima [b],
BEN JABRALLAH Sadok [a,c]

a : Laboratory of Energy and Heat-Mass Transfer, Tunis Al Manar University, 1060 Tunis, Tunisia
b : EnR2E, National Center Studies and Research on Water and Energy CNEREE & LMFE, CNRST Associated Research Unit,
Faculty of Sciences Semlalia, Cadi Ayyad University, Marrakech, Morocco
c : Faculty of Sciences of Bizerte, University of Carthage, 7021 Bizerte, Tunisia

Corresponding author: sadok.jabrallah@fsb.rnu.tn

ABSTRACT

The condensation rate of the steam influences the operation of some number of devices such as the desalination units by humidification-dehumidification. In these units, the yield depends on the yields of evaporation and condensation. As the condensation yield is generally weak, it is this phenomenon which imposes its rhythm. Therefore, condensation plays a primordial role in these systems. The comprehension of this phenomenon above all with the presence of a no condensable gas like the air and the mastery of the influence of the inlet parameters can improve the operating of these units.

This study consists in modeling the condensation of humid air in a condenser in order to better understand the phenomenon to improve the yield of a condenser of a solar desalination unit by humidification-dehumidification. To describe the phenomenon, a mathematical model thus the boundary conditions are presented. In order to solve the problem, the finite difference method is adopted for the equations discretization and the programming was carried out on software MATLAB R2012b.

The results concern essentially the temperature profiles of cooling water, humid air and specific moisture as well as the condensed flow rate. Calculations were carried out under various conditions to examine the influence of the inlet parameters on condensation. The results show that condensation improves by increasing the inlet humid air temperature and by decreasing the inlet cooling water temperature. By increasing the feed rate of cooling water, the condensation increases up to a value of 0.3 kg /s. Beyond this value the increase in the feed rate does not have any effect on condensation.

KEYWORDS : Condensation, Humid air, Desalination, humidification-dehumidification, finite difference.

DECOMPOSITION OF PHARMACEUTICALS IN WASTEWATER BY IONIZING RADIATION

JAHOUACH-RABAI Wafa [a,b], AZZOUZ-BERRICHE Zohra [b], LAHSNI Rim [c], HABIBI Belhassen [c], BOUSSELMI Latifa[a], GHRABI Ahmed [a]

[a] Center of Water Research and Technologies (CERTE), Echopark Borj Cedria, Tunisia
[b] National Center of Nuclear Sciences and Technologies (CNSTN), Technopark Sidi Thabet,Tunisia
[c] Society of Pharmaceutical industries of Tunisia (SIPHAT), Z.I. Ben Arous, Tunisia.
Corresponding author: rabia.wafa@cnstn.rnrt.tn

ABSTRACT

Advanced oxidation process using free radical reactions to directly degrade pharmaceutical contaminants in wastewater was developed in this study as an alternative to traditional wastewater treatment. Pharmaceuticals were treated by the Application of ionizing radiation in pilot scale ($_{60}$Co irradiator). Pharmaceuticals considered in this study are aqueous solutions of aspirin, paracetamol and gallic acid at different concentrations 0.1-2 mmol/L, which were treated by application of irradiation doses from 3 to 10 kGy.

Decomposition and elimination of treated pharmaceuticals in wastewater by ionizing radiation at optimal doses was investigated. In fact, hydroxyl radicals were generated water radiolysis. The influence of absorbed doses and initial concentrations on degree of decomposition, chemical oxygen demand (COD) removal, radio-induced radicals and the pH value changes of treated pharmaceuticals were presented. Variation curves of concentrations of these pharmaceuticals as a function of irradiation dose described the experimental data and the required dose for the elimination of wastewater by ionizing radiation were released. Preliminary degradation mechanisms are suggested based on product analysis using spectroscopic and chromatographic techniques, respectively EPR and HPLC.

KEYWORDS : *Pharmaceuticals, AOP, Gamma irradiation, wastewater, EPR, HPLC.*

USING BRICK WASTE FOR LEACHATE CONCENTRATE TREATMENT BY SOLIDIFICATION/STABILIZATION PROCESS

KALLEL Amjad [a], ZAIRI Moncef [a], TRABELSI Ismail [b]

[a] Laboratory 3E, Sfax National School of Engineers, PB 1173, 3038, Tunisia

[b] Laboratory of wastewater treatment, CERTE, University of Carthage-Tunisia

ABSTRACT

Several options for leachate treatment are technically possible, however the adequate choice is based on environmental requirements and economic constraints. In Tunisia, the leachate treatment process applied at landfill sites consist of the following steps: collection in an equalization pond, sieving, coagulation/flocculation/flotation treatment and then the leachate goes through a membrane bioreactor treatment. The final stage of the treatment is performed by reverse osmosis (RO). The RO technique have proved efficient purification of leachate up to the level for reuse standards of water. Nevertheless, besides economic and technical problems of RO, such as membrane fouling and replacement, the concentrate remaining at the end of the treatment process is a major issue and have to be properly treated before its discharge into the environment. In fact, the resulting concentrate represents 25 to 50% volume of treated effluent, heavily loaded with refractory organic pollutants and inorganic salts. The aim of the current work was to assess a cementitious solidification/stabilization (S/S) treatment by mixing the concentrate with portland cement for chemical/physical immobilization of contaminants and for obtaining a durable monolithic matrix suitable for storage, landfilling or use. In addition, we examined the possible use of brick waste as a partial replacement of natural aggregates used for S/S process. Concrete mixtures were prepared using local Ordinary Portland Cement OPC, sand, gravel and tap water/leachate concentrate (LC). The LC was collected at the reverse osmosis unit in the leachate treatment facility of Agareb landfill site in Sfax city, Tunisia. The Substitution of coarse aggregate material by brick waste was examined for the rates 25%, 50% and 75%. Hardened concrete specimens were subject to compressive test as well as flexural strength test at 7 days and 28 days of curing. Besides, a pH independent batch leaching test was carried out and the eluates collected were analyzed for several parameters (pH, TDS, TOC, chlorides, sulfates, phosphorus, heavy metals, etc.). The substitution of gravel aggregates

with brick waste, showed increasing trend on the compression strength where the best result were found with a 75% substitution and allowed to reach a compression strength at 28 days nearly equal to 27 MPa. The ratio of compressive/flexural strength varied between 5 and 6 for water mixed concrete and between 4 and 6 for concentrate mixed concrete. The flexural strength of 5 MPa was obtained with 50 % gravel replacement. Concerning the leaching test analysis, most of the samples showed pH values between 12 and 12.5. The high pH of eluates is mostly due to the alkalis present in the cement which might have contributed to achieve significant binding of high levels of heavy metal and chloride. These results confirmed that the S/S could be a successful treatment for RO LC and most of pollutants decreased beyond the regulation standards and comply with landfilling criteria, except for chromium which is known to be mobile at high pH. Furthermore, the substitution of natural aggregates with brick waste revealed the possibility to cast valuable masonry units. However, long term assessment is needed to ensure the mechanical and chemical stability/durability of concrete.

KEYWORDS : *Reverse Osmosis; Leachate concentrate; Solidification/Stabilization (S/S); Brick waste*

REMOVAL OF ZINC IONS FROM BRACKISH WATER
USING NATURAL ALGERIAN (NAB) BENTONITE

FADEL Ammar *[a], HAFIANE Amor [b], NACEF Saci [a]

[a]Laboratory of Chemical Process Engineering (LGPC), Department of Chemical Engineering,
Ferhat Abbas University of Setif, ALGERIA
[b]Water and Membrane Technologies, CERTE, Borj Cédria, Tunisia

*Corresponding author. Tel.: +213 780413600   ; E-mail address: am.fadel@univ-biskra.dz

ABSTRACT

In This work we studied the removal of zinc ions from synthetically brackish water by adsorption method using   natural Algerian bentonite (NAB). The effect of main physico chemical parameters such as contact time, pH, temperature, ionic strength, clay weight and initial metal ion concentration on the removal of Zn^{+2} were investigated. The experimental results showed that the equilibrium was attained within 10 min of shaking time. The retention capacity of Zn^{+2} increased with the increase of pH, the adsorbent dose and ionic strength. Modelisation study showed that adsorption follow Langmuir isotherm while kinetic is pseudo second order. Based on the whole results, natural and available NAB could be used as alternative for the removal of zinc from saline aqueous solution.

KEYWORDS : zinc removal, brackish water, adsorption, bentonite

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

175

INFLUENCE OF OPERATING CONDITIONS ON THE PERFORMANCE OF COAGULATION-FLOCCULATION AS PRETREATMENT OF TANNERY WASTEWATER

BEN GAMRA Anouar, BOZRATI Hend, FERSI Cheïma [1]*, GORGI Chiraz [2] and TOUMI Abdessatar [2]
[1]Method and Technical Analysis Laboratory, INRAP, Sidi Thabet 2020, Tunisia
[2]National Center of Leather and Shoes, CNCC, Megrine, Tunisia
Telephone: +216 71 537 666; Fax: +216 71 537 767 ; *E-mail address: cheimafersi@yahoo.fr*

ABSTRACT

The selection of the process and the operating conditions are important criteria to technically and economically optimize the treatment of aqueous effluents. The conventional methods of wastewater treatment, such as coagulation, flocculation and biological purification have been previously used with success for reducing the pollutant contents of industrial effluents, but their performance was limited by the increase in quantity and flow of wastewater channeled to the sewage plant.

In the present work, a contribution to improving the quality of two samples of tannery effluents in terms of turbidity and ion conductivity, has been suggested. A physico-chemical analysis of effluents collected was performed to determine the content of pollutants and determine the most significant parameters.

Optimization of various operating parameters such as the duration and the stirring speed of the coagulation phase, the type and added coagulant dose was established.

The main results obtained along this work are as follow :

In the case of treating wash water from liming process :

Very good yields in terms of reduction of turbidity for the four tested coagulants (PSS, starch, alginate and chitosan) were observed : these rates varied between 87 and 97%. The four polymers used gave better abatement rate of turbidity for a stirring time equal to 5 min and a stirring speed equal to 200 trs / min and the optimal coagulant dose is between 100 and 200 mg / L.

The abatement rate of ionic conductivity varies between 55.5 and 62% ; which promotes the use of the polymers comparing to the salts.

In the case of treating wash water from quenching process :

The turbidity reduction rate for the quenching wash water varied between 5 and 95% depending on the polymer used.

The alginate and PSS have closely guarded their efficiency and presented turbidity abatement rates greater than 80%. The better yield (90% and 93% for alginate and PSS respectively) were recorded at different operating conditions. However, when studying the ionic conductivity, the abatement rates observed for various polymers studied did not exceed 26%. The best of the ionic conductivity abatement rate was observed in the case of starch, by against the lowest yields were recorded in the case of chitosan.

KEYWORDS : Tannery wastewater, coagulation-flocculation, pretreatment, polymers

PRODUCTIVITY STUDY OF VARIOUS CONFIGURATIONS OF DESALINATION BY VACUUM MEMBRANE DISTILLATION COUPLED WITH SOLAR ENERGY

FRIKHA Nader BENABDALLAH Samira, GABSI Slimane
Ecole Nationale des Ingénieurs de Gabès, Rue Omar Ibn-Elkhattab 6029, Gabès - Tunisie
E-mail : naderfrikha@yahoo.fr

ABSTRACT

The objective of this work is to study, design and propose new systems for producing drinking water from seawater using systems based on coupling of membrane distillation and solar energy. The use of solar energy can be:

Provided by the heating of sea water by a coolant from the solar collector. The distillation module is separated from the solar system (system not integrated),

The module is integrated in the solar collector (integrated system).

The module is immersed in the solar collector,

For the first configuration, control of the temperature level of water feeding the membrane module is possible; we can provide storage if temperature admissible by membrane module is exceeded and we can also used an auxiliary energy when needed.

The second configuration is more original it makes it possible to reduce the components of the installation and the heating of sea water is direct.

It is necessary to study and evaluate the contribution of the sun and the possibilities of energy storage either to the lover or with the downstream.

Various configurations of membranes modules integrated in the solar collector can be designed. The study related to:

- The integration of a module in an absorber of a cylindro-parabolic collector,

- The integration of a module in solar pond.

The scientific interest is that solar flow is variable and intermittent during the day and all the year. This will lead to a study of the system in transient regime.

The study of different configurations has allowed us to present the processing advantages and disadvantages of each configuration, and enabled us to suggest recommendations on

the choice of the configuration according to the type of membrane and the application context (objective, constraints, availability of modules...).

The study of different configurations showed the benefits of integration of membrane module in the solar collector. This possibility reduces heat loss and also has a compact installation, this leads to improved productivity. This improvement is mainly observed in the case where the velocity is low (below 0.4 m/s). However, integration is facing several technical limitations. Indeed, given that sea water must necessarily circulate in the solar collector, it is necessary to use noble's materials for the construction of the collector (eg titanium). This problem does not arise in the case of the configuration where the membrane module is separated from the collector. A second constraint is the large gap between the membrane area required compared to the collector surface necessary, because for 1 m² membrane area, 10 m² collector surface are necessary for the functioning of the membrane. This problem can be solved with concentrating collectors. On the other hand, the improvement of productivity is observed in the case of low fluid velocities, these speeds are not adequate for the functioning of membranes. In fact, the velocity needed to be greater than 0.5 m/s and this to minimize the fouling of the membrane.

DEVELOPMENT OF A SCALE MODEL FOR FOULING FACTOR CALCULATION IN MED DESALINATION PLANTS

BOUROUNI Karim [a], JABER Tawfiq [a], BEN JABRALLAH Sadok [b]

[a]ALHOSN University, P.O. BOX: 38772, Abu Dhabi, UAE
[b]Faculté des Sciences de Bizerte, Zarzouna, Bizerte, Tunisie
E-mail : k.bourouni@alhosnu.ae   ;   karimbourouni@yahoo.fr

ABSTRACT

In desalination plants fouling factor (FF) calculation is an important step for the design of Heat exchangers (evaporators and condensers). This parameter is generally determined in empirical way assuming it as a constant, which induces to overestimate the heat transfer area. On the other hand FF increases during time due to scale deposition (calcium sulfate in MSF plants and calcium carbonate in MED units).

In this paper we present a model for scale deposition in desalination plants allowing to determine the variation of the thickness and characteristics of scale layers on the heat transfer area during time. The model takes into account also the CO_2 release and the evaporation taking place at the liquid film interface. In fact, evaporation has an influence on water salinity and the concentration of the different species during its flow across the tube bundle.

The heat exchanger was divided into different elements (rows of tubes), hence the mass transport equations were solved in each element of the domain. For the validation of the model the numerical results were compared to different experimental data obtained from direct measurement of the scale thickness [1-3].

The results issued from the model are used to calculate the heat resistance caused by the scale layer and allowed to study the variation of the FF with time. This result is very important to optimize the design and the maintenance of heat exchangers in desalination plants.

KEYWORDS : *Scale deposition, Fouling factor, Desalination, Evaporation, Heat Transfer*

CALCIUM SULFATE AND CARBONATE CO-PRECIPITATION

ZARGA Yosra [1], MAKLHOUF Kalthoum [2], ELFIL Hamza [1]

Laboratoire de Traitement des Eaux Naturelles (LabTEN) ; Centre de Recherche et des Technologies des Eaux – Technopole de Borj-Cédria

Laboratoire des Procédés Thermiques ; Centre de Recherche et des Technologies des Energies – Technopole de Borj-Cédria

ABSTRACT

Co-precipitation is frequently observed in water desalination processes and particularly reverse osmosis. However, unlike the simple one, co-precipitation is still a phenomenon far from being well controlled and which is not yet well defined thermodynamically.

This work is a contribution to the study of simple and mixed precipitation of calcium carbonate and calcium sulfate encountered in several industrial sectors.

The kinetics of the simple precipitation and co-precipitation has been studied using the method of double decomposition and following four parameters simultaneously. The pH and the alkali are used to detect $CaCO_3$ germination, calcium ion concentration to follow gypsum precipitation, and the quartz microbalance response can provide information on germination outbreak and particularly that of gypsum.

The simple precipitation of two salts is influenced by temperature, ionic strength and reactor walls. Calcium carbonate germination is also very influenced by the pH of the treated solution.

The $CaCO_3$ co-precipitation has been proved to be different from the simple precipitation. In fact, the calcium carbonate germination does not seem to have any effect on the germination of the gypsum. However, when it is triggered first, the gypsum induced $CaCO_3$ nucleation. Indeed, the presence of gypsum crystals appears to reduce the energy barrier of calcium carbonate nucleation and leads to its precipitation by activating a heterogeneous germination.

The identification of the precipitates was carried out using IR spectroscopy and showed that the presence of gypsum crystals seems to promote the formation of calcite to the detriment of other forms

KEYWORDS : Germination; Co-precipitation; Gypsum; Calcium carbonate.

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"

Hammamet,Tunisia 21-24 December, 2015

180

ADSORPTION OF 2-NITROPHENOL BY BENTONITE CLAY

GHOUDI Amira, GUIZA Sami and BAGANE Mohamed

Department of Chemical Engineering Process.National Engineering School of Gabés. Tunisia

Tel. 0021697568403; email: sami_guiza@yahoo.f

ABSTRACT

The potential of grey clay for phenol adsorption from aqueous solutions was studied. Batch kinetics and isotherm studies were carried out to evaluate the effect of temperature, initial concentration, weights and characteristics of clay. The adsorption process was significantly influenced by the adsorbent type. The affinity of 2-nitrophenol to grey clay was greater than to green clay and was lowest to red clay. Furthermore the amount of adsorbed 2-nitrophenol by activated clay was greater than by natural one. The adsorption of phenol increases with increasing initial 2-nitrophenol concentration. The degree of extraction was dependent on the amount of 2-nitro phenol adsorbed by grey clay. The equilibrium data in aqueous solutions was well represented by the Langmuir and Freundlich isotherm models. The removal of 2-nitrophenol from aqueous solutions was observed without surface modification.

KEYWORDS : *Natural clay, activated clay, 2-nitrophenol, adsorption.*

ELECTRODIALYSIS AS MEMBRANE PROCESS FOR NITRATE REMOVAL FROM DRINKING WATER : EFFECTS OF THE ACCOMPANYING COMPENENTS

TURKI Thouraya[a] , BEN AMOR Mohamed[a]

Laboratory of Natural Water Treatment, Water Researches and Technologies
Centre, BP 273 Soliman 8020, Tunisia

E-mail: thouraya.turki@yahoo.fr

ABSTRACT

Electrodialysis (ED) is one of the membrane processes that proved reliable and efficient in many applications, especially in desalination of drinking water. In this paper, the influence of initial nitrate concentration, the cell voltage and the flow rate have been investigated.

The effects of sulfate, chloride and bicarbonate on the nitrate removal by electodialysis have been systematically studied. The results of ED showed that NO_3^- concentration could be reduced from initial 400-800 mg/l to 4-8 mg/l, with the removal rate 99%.

REMOVAL OF CADMIUM AND LEAD FROM AQUEOUS SOLUTION BY CALCITE

HAJJI Sabah [1], TURKI Thouraya [1], MZOUGHI Nadia [2]

Natural Water Treatment Laboratory , Water researches and Technologies Centre of Borj Cedria (CERTE), Technopark of Borj Cedria , 8020 Soliman , Tunis
Higher Institute of Sciences and Technologies of environment of Borj Cedria, Tunisia
E-mail : sabahhaj@gmail.com

ABSTRACT

The objective of this study is to test the adsorption efficiency of cadmium and lead using two types of Tunisian calcite (Cal –A and Cal-B). The adsorption tests were conducted in synthetic solutions of distilled water. The effects of some experimental parameters such as pH, temperature and the agitation rate were studied, by applying a factorial experimental design which allows to show the influence of all parameters to the adsorption of metals.

The adsorbent were characterized by using mineralogical analysis (XRD), spectroscopy X-ray, fluorescence analysis, particle size analysis with sedimentation, Fourier transform infrared spectroscopy (FTIR), the specific surface and analysis thermogravimetric (TGA).

KEYWORDS : cadmium, lead, removal, calcite, factorial design

ELIMINATION OF HEAVY METALS BY A TREATED AQUATEXTILE

ZOUAMBIA Soumia[a], ZOUAMBIA Yamina[a], HACHACHE Naima[b]

[a] Department of Process Engineering and Environment, Faculty of Science and Technology, University of Medea, Algeria.

[b] Department of Process Engineering, Faculty of Technology, University of Laghouat, Algeria

ABSTRACT

The awareness of the damage caused by pollution of the natural environment has forced the authorities of developed and developing countries to introduce regulations to protect the environment. The importance of the study of water pollution grew significantly for several years around the world because of harmful effects on living beings. Every day hundreds of tons of pollutants are released into the environment. Among them, the heavy metals are considered serious pollution of the aquatic environment, due to their persistence and tendency to bioaccumulate in aquatic organisms.

The Main objective of this study is the evaluation of adsorption capacity of modified synthetic fibers of polyethylene terephthalate (PET) by Aliquat 336, for metal cations Cu^{2+} in aqueous synthetic solution.

The results of the adsorption kinetics showed to be very rapid, within a period of time which does not exceed 40 minutes we found a high removal rate that varied between 75% to 82%.

KEYWORDS : Heavy Metals, adsorption, aquatextile, aliquat336, PET.

ADSORPTION OF ACID DYE ONTO BENTONITE AND ORGANOPHILIC BENTONITE

AYARI F.[1,2] **, SRASRA E.**[2] **and TRABELSI AYADI M.**[1]

[1]*Laboratoire des Applications de la Chimie aux Ressources et Substances Naturelles et à l'Environnement (LACReSNE),*
Université de Carthage, Faculté de Sciences de Bizerte, Zarzouna 7021, Tunisia.
[2]*Centre National de Recherches en Sciences des Matériaux (CNRM) Technopôle Borj Cédria, BP 73, 8020 Soliman, Tunisie*
fadhilaayari@yahoo.fr

ABSTRACT

Adsorption of toxic anionic dye (Congo Red (CR)) from water via batch adsorption experiments onto bentonite and HDTMA-modified bentonite (H-bent) was investigated. Studies concerning the factors influencing the adsorption capacities of bentonite and H-bent, such as initial dye concentration, adsorbent dosage, pH, ionic strength, contact time and temperature were investigated and discussed.

The results revealed that HDTMA-modified bentonite established high adsorption capacities toward acid dyes, while bentonite exhibited a lower sorption capacity than H-bent. The kinetics data were analyzed using three kinetic models, i.e., the pseudo-first-order Lagergren model, the pseudo-second-order model and the intraparticle diffusion model. The pseudo-second-order kinetic model described the adsorption of Congo red in both used sorbents very well.

The isotherm data were investigated according to both Langmuir and Freundlich equations. Thermodynamic parameters $\Delta G°$, $\Delta H°$ and $\Delta S°$ were calculated for the adsorption of CR on bentonite and H-bent. From thermodynamic studies, it was seen that the adsorption was spontaneous and endothermic.

The study revealed that these low cost materials can be used as efficient adsorbents for the removal of acidic dye solution.

KEYWORDS: Adsorption; Congo red; Bentonite; Surfactant

CALCULATION OF SALTS ACTIVITY COEFFICIENTS IN MIXED SOLVENTS SOLUTIONS USING AN ADAPTED PITZER MODEL

BOUKHALFA N.[1,2] and MÉNIAI A-H.[2]

[1] Chemistry Department, University of Batna, 05000. Algeria.

[2] Laboratoire de l'Ingénierie des Procédés de l'Environnement, University of Constantine 3, 25000, Algeria.

E-mail: meniai@yahoo.fr

ABSTRACT

In this work, the Pitzer model, initially designed for aqueous electrolyte solutions was adapted to the case of salts in mixed solvents solutions.

The considered salts were KCl, CsCl, NaCl and NaBr in Water and Ethanol as the two solvents. The approach was applied for calculating activity coefficients of the electrolyte species in the two solvents at 25°C.

The results showed a good agreement with experimental values obtained from literature.

KEYWORDS **:** Pitzer Model, Activity Coefficient, Mixed Solvent, Ethanol, Electrolyte.

DIFFUSION AND PERMEATION IN POLYMERS :

CONSIDERATION ON THE DEBORAH NUMBER

HASSINI Noureddine, BOUCHAMA Mohamed [a], DOBBI Abdelmadjid [b]

University of Oran 1, Po Box 1524 Oran, Algeria
USTO MB, Oran, Algeria
University of Ouargla, Ouargla, Algeria

E-mail : noureddine.hassini@gmail.com

ABSTRACT

There is a direct relationship between the diffusion and relaxation of the polymer and on whether we place ourselves below (glassy state) or above (rubbery state) of the glass transition temperature Tg, the diffusion mechanisms are very different. On a fundamental level, the transition temperature (Tg) marks the transition from a cooperative mobility (T> Tg, rubbery state) to a localized mobility (T <T g, glassy state). Fickian diffusion in polymers is an idealized case of mass transport, corresponding to a free diffusion of permeant without interactions with the molecular conformation of the polymer and then with its structural relaxation. There are two types of models to describe the variation of the diffusion coefficient D. In this contribution, we will review the different behaviors of the distribution function of the Tg and show us the Deborah number D꠸ defined as the ratio of characteristic times of diffusion and relaxation, to indicate the nature of dissemination and to apply the model. As a practical example we have studied the case of low density polyethylene manufactured and processed by the national Algerian plastic society ENPC

KEYWORDS : *Diffusion, Polymer, Relaxation, Deborah number*

Di-μ-CHLORIDO-BIS[(2-AMINOBENZAMIDE-$\kappa^2 N^2$,O) CHLORIDOCOPPER(II)]

DAMOUS Maamar [1], DÉNÈS Georges [2], BOUACIDA Sofiane [1,3], HAMLAOUI Meriem [1], MERAZIG Hocine[1], and DARAN Jean-Claude [4]

[1]*Unité de Recherche de Chimie de l'Environnement et Moléculaire Structurale,*

CHEMS, Université Constantine 1, 25000 , Algeria

[2]*Laboratory of Solid State Chemistry and Mössbauer Spectroscopy, Department of Chemistry and Biochemistry, Concordia University, Montréal, Québec, H3G 1M8, Canada*

[3]*Département Sciences de la Matière, Faculté des Sciences Exactes et Sciences de la Nature et de la Vie, Université Oum El Bouaghi, 04000 Algeria*

[4]*Laboratoire de Chimie de Coordination, UPR CNRS 8241, 205 route de Narbonne, 31077 Toulouse cedex, France*

E-mail of presenting author: damousmmaamar@yahoo.fr   E-mail of corresponding author: georges.denes@concordia.ca

The title compound, $[Cu_2Cl_4(C_7H_8N_2O)_2]$, crystallizes as discrete $[CuLCl_2]_2$ (L = 2-aminobenzamide) dimers with inversion symmetry. Each Cu(II) ion is five-coordinated and is bound to two bridging chloride ligands, a terminal chloride ligand and a bidentate 2-aminobenzamide ligand. The crystal structure exhibits alternating layers parallel to the (010) plane along the b-axis direction. In the crystal, the components are linked via N—H…Cl dipole-dipole interactions, to form a three-dimensional network. These interactions link the molecules within the layers and they also link the layers together and reinforce the cohesion of the structure. General background about 2-aminobenzamide derivatives and related stuctures can be found in references 1-4. The crystals were obtained by adding the 2-aminobenzamide ligand L to an acidic aqueous solution of copper(II) chloride.
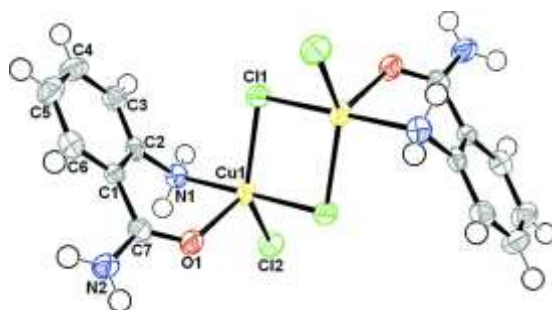
Figure. Molecular structure of the title dimer. Displacement are drawn at the 50% probability level. H atoms are represented as small spheres of arbitrary radius. Only the contents of the asymmetric unit are numbered.

REFERENCES:

[1] *Nagaoka, Y., Maeda, T., Kawai, Y., Nakashima, D., Oikawa, T., Shimoke, K., Ikeuchi, T., Kuwajima, H. & Uesato, S. (2006), Eur. J. Med. Chem. **41**, 697-708.*

[2] *Butsch, K., Klein A. & Bauer, M. (2011) Inorg. Chem. **374**, 350-354.*

[3] *Kapoor, P., Panmu, A. P. S., Sharma M., Hundal, M. S., kapoor, R., Corbella, M. & Aliaga-Alcalde, N. (2010), J. Mol. Struct. **981**, 40-45.*

[4] *Yang, F., Chui, W., Guo, W., Jing, H., Min, X. & Yi, F., Bioorg. Med. Chem. Lett. **22**, 4703-4706.*

NANOFILTRATION VERSUS REVERSE OSMOSIS FOR BRACKISH WATER DESALINATION

MINYAOUI K. [a], PONTIE M. [b], HANNACHI A. [a]

[a] National Engineering School of Gabes, University of Gabes, Street of Omar Ibn El Khattab, 6029 Gabes, Tunisia
[b] *Laboratory of Process , Environment and agri-food, University of Nantes*

E-mail : ahmed.hannachi@enig.rnu.tn

ABSTRACT

The alarming depletion of water reserves is driving forwards a coherent and rational management of this precious and limited resource. Currently the seawater and brackish water desalination world market is booming to provide part of the growing need for fresh water. The most used processes in desalination plants are distillation and reverse osmosis. Reverse osmosis has lately gained more interest in water desalination. However, the energy demand of this membrane technology is still relatively important. On the other side, for brackish water, nanofiltration is able to produce a good water quality for a much less working pressure than reverse osmosis. It could be a competing membrane process to Reverse Osmosis for water desalination. In fact, nanofiltration is more advantageous because of lower energy consumption; however at the expense of slightly saline permeate.

In this work, simulations were conducted in order to compare reverse osmosis and nanofiltration performances in brackish water desalination process. The considered water quality is identical to that feeding of Tunisian desalination plant in Bouchamma with a salinity of 3 g/L. Commercial software was used for calculations. The system configuration of the adopted process has two stages allowing treating 400 m^3/h feed flow rate. Simulations have shown that specific energy consumption in reverse osmosis is almost double that in nanofiltration for the same distributed water quality by the desalination plant operator.

KEYWORDS : *Brackish Water, Desalination, Reverse Osmosis, Nanofiltration, Simulation, Energy Consumption*

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

189

REMOVAL OF MICRO-POLLUTANTS USING MEMBRANE BIOREACTOR (MBR) AS AN ADVANCED WASTEWATER TREATMENT TECHNOLOGY

CHTOUROU Mariem[a,b], WALHA Khaled [a], COMAS Quim [b]

[a] **Laboratory of materials science and environment of Sfax (Mes-Lab), Road of Soukra km 4 - B.P. n° 802 - 3038 Sfax**
[b] Laboratory of Chemical and Environmental Engineering (LEQUIA), University of Girona, Science and Technologic Park. Ed. Jaume Casademont, c/Pic de Peguera 15, E17003, Girona, Spain
E-mail : chtouroumariem@ymail.com

ABSTRACT

Membrane bioreactors (MBRs) nowadays attract serious attention for the treatment of municipal wastewater, due to recent technical innovations and drastic cost reductions of the employed membranes. Especially the high biomass concentrations and long sludge retention times are favorable for the biodegradation of organic pollutants, resulting in high rate treatment systems. These characteristic features of MBR technology are not merely advantageous for organic matter removal, but also likely promote a higher biodegradation efficiency of refractory organic pollutants. The increasing concern about the potential accumulation of micro-pollutants such as pesticides, pharmaceuticals and personal care products, in the aquatic environment triggered many investigations into their biological degradation or fate in wastewater treatment systems. In this work In conclusion, MBR represents an efficient and cost effective process that copes excellently with the growing needs for transforming wastewater into clean water that can be returned to the hydrological cycle without detrimental effects.

SILICONE ROD EXTRACTION OF COSMETIC PRODUCTS IN ENVIRONMENTAL WATER SAMPLES BY HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY– ULTRAVIOLET DETECTION

MALLEK Mariem[a,b], BEN SALAH Abdelhamid [a], SALVADO Victoria [b]

[a] Laboratory of materials science and environment of Sfax (Mes-Lab), Road of Soukra km 4 - B.P. n° 802 - 3038 Sfax, Tunisia
[b] Laboratory of Chemical and Environmental Engineering (LEQUIA), University of Girona, Science and Technologic Park. Ed. Jaume Casademont, c/Pic de Peguera 15, E17003, Girona, Spain

E-mail : mallek.mariem87@gmail.com

ABSTRACT

This review focuses on the applications of silicone in the form of tubes or rods for sorptive extraction of cosmetic compounds such as triclosan and triclocarban as sample preparation method in combination with various chromatographic techniques. Silicone rods (SRs) and silicone tubes (STs) of type polydimethylsiloxane (PDMS) have the advantage of being inexpensive, flexible and robust. SRs and STs have so far been applied for the extraction of a large variety of organic micropollutants from different matrices. The theoretical principle of SR and ST extraction in comparison with similar microextraction techniques is presented as well as a summary of the published applications of SR and ST extraction in combination with gas chromatography (GC) or liquid chromatography (LC). Furthermore, the use of SRs and STs for time-integrated (passive) sampling is reported.

DETERMINATION OF THE THERMODYNAMIC PARAMETERS OF THE ADSORPTION OF PHENOL ONTO SEWAGE SLUDGE BASED ADSORBENT

BOUSBA Salim [a,b], **MENIAI Abdeslam Hassen** [b]

[a]Département de Pétrochimie et de Génie des Procédés, Faculté de Technologie, Université 20-Août-1955 Skikda, BP26 Route d'El-Hadayek, Skikda 21000, Algérie

[b]Laboratoire de l'Ingénierie des Procédés d'Environnement (LIPE), Faculté de Génie des Procédés Pharmaceutiques, Université Constantine 3, Constantine 25000, Algérie

E-mail : bousba_salim@yahoo.fr

ABSTRACT

The aim of this study is the determination of thermodynamic parameters of adsorption of phenol onto sewage sludge based adsorbent SSBA. Removal of phenol from aqueous solutions by adsorption under batch equilibrium experimental conditions at 293, 303 and 328 K was investigated. The value obtained of $\Delta G°$ is -6.6 kJ/mol (at 328 K) this indicate that the adsorption process of phenol on the SSBA is spontaneous and thermodynamically feasible process. We also note that as the temperature increases more than the absolute value of $\Delta G°$ decreases, it shows that the adsorption is more spontaneous at low temperatures. The negative value of the standard enthalpy $\Delta H°$ (-13.66 kJ/mol) confirms that the adsorption of phenol on the SSBA is an exothermic process and the adsorption process is physisorption. The negative value of the standard entropy $\Delta S°$ (21.53 J/mol.K) clearly shows that the arrangement of phenol molecules is more ordered on the surface of the adsorbent.Finally and according to the value of ΔH we can say that the mechanisms of adsorption of phenol on the SBA are mainly attributed to the binding of phenol by hydrogen bonding with the adsorbent and dipolar attractions between the molecules of phenol and water.

KEYWORDS : Thermodynamic parameters, adsorption, phenol, sewage sludge, adsorbent

DEGRADATION OF RED ACID UTILIZED IN ALGERIA TEXTILE INDUSTRIES BY ELECTRO-FENTON : OPTIMIZATION ASSESSMENT OF TOXICITY USING BIOMARKERS OF OXIDATIVE STRESS

KOURDALI Sidali [a,b,c], BADIS Abdelmalek [a,b,c], BOUCHERIT Ahmed [a] & SAIBA Ali [a]

[a] Department of Industrial Chemistry, Faculty of Technology, University of Saàd Dahlab at Blida, PO Box 270, 09000 Blida, Algeria;

[b] Laboratory of Natural Substances Chemistry and Biomolecules, University of Saàd Dahlab at Blida, PO Box 270, 09000 Blida, Algeria;

[c] National Centre for Research and Development of Fisheries and Aquaculture (CNRDPA) 11, Bd Amirouche PO Box 67, Bousmail (W. Tipaza), Algeria

E-mail : hsidalo@yahoo.fr

ABSTRACT

Effluents containing high concentrations of toxic organic compounds (15%), particularly Azo dyes are continuously discharged from various textile and paper industries in Algeria, as well as in several other countries throughout the world. The literature present several studies where in the EF process has been successfully applied for the degradation of various organic pollutants, including drugs, dyes, pesticides, petroleum, and hydrocarbons. This line of research indicates that living organisms can be used as pollution bio-indicators to predict the pollution state of ecosystems and to monitor the impacts of the byproducts generated during EF treatment prior to their ultimate discharge into the aquatic environment. The present study was undertaken to investigate the degradation and removal of Red Acid (RA114) by the electro-Fenton (EF) process in batch reactor using iron and stainless steel electrodes. RA114 removal decreased with the increase in pH (3 to 8) and increased with the increase in current intensity (0.05 to 0.2 A) and $[H_2O_2]$ (0 to 0.5 g L^{-1}, but not with high doses which led to low rates of RA114 removal and OH·uptake). The regression quadratic models describing RA114 degradation yield "R (percent)" and electrical energy consumption "EEC (kW h kg^{-1})" were validated by the analysis of variance (ANOVA) and were both noted to fit well with the experimental data. The R^2 correlation coefficients, those adjusted coefficients, and F values obtained for the responses validated the efficiency of model. The results revealed that among several other parameters, EEC depended essentially on the degradation yield. The eco-toxicity tests showed a positive correlation between Catalase activity and RA114 concentration, and Catalase could be qualitatively identified to assess the effect of dye and its by-products generated during the EF process.

KEYWORDS: Dye; Electro-Fenton, Biomarker, Catalase, SEM

STUDY OF THE ELECTROCOAGULATION OF WATER CONTAMINATED WITH METRIBUZIN EFFECT OF THE NATURE OF THE ELECTRODE AND THE INTER-ELECTRODE DISTANCE

SAIBA Ali [a,b], KOURDALI Sidali [b]

a : Département de Génie des Procédés et Environnement, Université Dr. Yahia Fares, Médéa. Algérie.
b : Département de Génie des Procédés, Université Saad Dahlab, Blida. Algérie.
E-mail : ali.saiba@yahoo.fr

ABSTRACT

In this study, the process of electrocoagulation has been applied in batch for the treatment of synthetic solutions containing commercial metribuzin (herbicide). Several treatment configurations were studied (nature of the electrode and inter-electrode distance).

Our reactor consists of two electrodes (iron or aluminum) with an active area of 46.8 cm^2 in a cylindrical container containing 500 mL of water to be treated and an initial concentration of 25 $mg.L^{-1}$ of metribuzin. The applied voltage is 12 V for 120 minutes treatment time with the addition of 1 $g.L^{-1}$ of NaCl.

Different distances inter-electrode (1, 2 and 5.5 cm) were studied, where up to 73 % removal efficiency was obtained for iron electrodes and inter-electrode distance of 2 cm and up to 71 % removal efficiency was obtained for aluminum electrodes and inter-electrode distance of 1 cm.

KEYWORDS : metribuzin, electrode, iron, aluminum, electrocoagulation.

SYNTHESIS, CHARACTERIZATION OF Al-Fe-PILLARED CLAYS

KHELIFI Selma, AYARI Fadhila & BEN HASSAN CHEHIMI Dalila

Laboratoire des Applications de la Chimie aux Ressources et Substances Naturelles et à l'Environnement (LACReSNE), Université de Carthage,Faculté de Sciences de Bizerte, Zarzouna 7021, Tunisia.

E-mail : selma.khelifi@gmail.com

ABSTRACT

Such wastewaters have become a major social and economic problem as modern health-quality standards and environmental regulations are gradually being more restrictive. Among these pollutants an increased concern is directed towards organic refractory compounds which are difficult to remove by means of conventional wastewater treatment technologies.

One of the most promising solutions for the elimination of pollutants from waste waters is catalytic wet peroxide oxidation (CWPO) using pillared clays, will probably constitute the best option in the near future.

Al-Fe-pillared clay was synthesized from Tunisian clay precursors according to a common procedure: grinding, sieving, Na exchange, pillaring, drying and calcinations. Four synthesized samples differing only in the Fe/(Fe + Al) ratios were prepared. The structural and textural properties of the starting clay and synthesized pillared clays have been determined by X-ray diffraction, nitrogen adsorption-desorption isotherms, scanning electron microscopy, X-ray fluorescence and infrared spectroscopy.

KEYWORDS : clay, Al-Fe pillared clays, iron, wastewater treatment, and catalyst

The 5^{*th*} *Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"*
Hammamet,Tunisia 21-24 December, 2015

195

EFFECTIVE APPROACH TO REMOVE HEAVY METALS FROM WATER USING AN AQUATIC PLANT

NEMAMCHA Abderrafik [a], **BOUZIT Fatima Zohra [a]**, **MOUMENI Hayet [a,b]**

Equipe : Nanostructures, Surfaces et Interfaces, Laboratoire d'Analyses Industrielles et Génie des Matériaux, Université 8 Mai 1945 Guelma – Algérie

Département des Sciences de la Matière, Faculté des Mathématiques et de l'Informatique et des Sciences de la Matière, Université 8 Mai 1945, Guelma, B.P.401, Guelma 24000, Algérie

E-mail : arnemamcha_dz@yahoo.fr

ABSTRACT

The quantity and quality of water has been always an important factor of life. Entire civilizations have been disappeared for lack of water. Besides the advance of the Sahara (desert), the pollution of available water increases continuously due to the Industry effluents (nitrates, organic compounds, heavy metals, etc.). Recently, many studies have proposed different mechanisms for water treatment in order to preserve environment and reduce the concentration of harmful pollutants in water.

In this work, an experimental system based on an emerging aquatic plant (Phragmites Australis) was used for purification of water taken near an industrial area. Several quality parameters of the water were measured before and after experimental device.

The analysis of the rate of heavy metals (iron) was carried out by ICP (Induction Couple Plazma). The results obtained on samples taken before and after treatment show a decrease in the concentration of this element, the best value is of about 91.22%. In addition, the physicochemical analysis showed an elimination of 95% for suspended solids (SS) and 90% for chemical oxygen demand (COD).

KEYWORDS: Water treatment, Phragmites australis, Heavy metals, ICP.

ELABORATION AND CHARACTERISATION OF NANOPOROUS CERAMIC MEMBRANES FOR WATER NANOFILTRATION PROCESS

MOUMENI Hayet [a,b], ROUABHIA Fatima [b], NEMAMCHA Abderrafik [b], REHSPRINGER Jean luc [c]

a)*Département des Sciences de la Matière, Faculté des Mathématiques et de l'Informatique et des Sciences de la Matière, Université 8 Mai 1945, Guelma, B.P.401, Guelma 24000, Algérie*

b) *Equipe : Nanostructures, Surfaces et Interfaces, Laboratoire d'Analyses Industrielles et Génie des Matériaux, Université 8 Mai 1945 Guelma – Algérie*

c) *Département de Chimie et des Matériaux Inorganiques, Institut de Physique et de Chimie des Matériaux de Strasbourg, UMR 7504 CNRS-UDS, Strasbourg, France.*

E-mail : hmoumeni@yahoo.fr

ABSTRACT

Ceramic membranes are porous fine filters which have a high porous support and active particles. The porous support ensures the mechanical resistance while the active particles induce the purification mechanism. The water flow through the solid network is regulated by pore diameter and their connectivity (Microfiltration, Ultrafiltration, or Nanofiltration).

In this work, nanoporous ceramic membranes for water nanofiltration process were prepared from silica and different additives (DCCA, active nanoparticles) according to the sol gel process. The wet gels were heat treated in an electric furnace up 900°C.

The effect of the additives on the gels formation has been investigated using Fourier transform infrared absorption spectroscopy (FTIR). Analysis of absorption bands corresponding to silanols (Si–OH) and siloxanes (Si–O–Si) shows the dependence of the silica network formation on the presence of the formamide molecules and confirms the total disappearance of silanols groups after heat treatment at 900°C. The results show that formamide acts as an envelope on silica nanoparticles which favors a uniform drying without cracks and large network connections.

Textural characteristics of ceramic membranes are estimated using mercury intrusion porosimetry methods. The obtained results show that the membranes are nanoporous (pore size distribution centered at 25 nm). Scanning Electron Microscopy confirms the connectivity of pores and the formation of regular silica network which favors a nanofiltration process of water.

KEYWORDS : *Nanoporous membranes, water treatment, Nanofiltation, Scanning electron microscopy, FT-IR, Mercury porosimetry.*

APPLICATION OF BIOINOCULATION TO ENHANCE RHIZOCOMPETENCE IN BACTERIA REMOVAL OF HORIZONTAL SUBSURFACE FLOW CONSTRUCTED WETLAND SYSTEM

BEN SAAD Marwa, BEN SAID Myriam, BOUSSELMI Latifa and GHRABI Ahmed
Wastewater Treatment Laboratory
Water Researches and Technologies Center Borj-Cedria Technopark
Tourist Route of Soliman Nabeul PO-box N°273 - 8020 Soliman

Email : marwabensaad@gmail.com

ABSTRACT

The main goal of the present study was to enhance the rhizobacterium potential in horizontal subsurface flow constructed wetland system planted by *phragmites australis* using biotechnology. The bioinoculation of antagonist bacteria fluorescent *Pseudomonas* spp. fluorescent against pathogenic bacteria has been used to confer higher rhizosphere competence by environment friendly biological approaches.

The main results show that the isolated strain of *Pseudomonas* spp. fluorescent (PFH$_1$) can limit the persistence of pathogenic bacteria *in situ* the horizontal constructed wetland system. In fact, the individual bioinoculated of the interest bacteria improves remarkably the inactivation kinetic of a pathogenic bacteria; *S. typhi* by 1U-Log$_{10}$. Consequently, by the application of this method, you can enhance the performance of water treatment system without adding a complementary water treatment stage that can be harmful for environment.

KEYWORDS : Constructed Wetland, Fluorecent *Pseudomonas* spp., bioinoculation, rhizophere

OPTIMIZATION OF METHYLENE BLUE ADSORPTION PROCESS USINGWATER INSOLUBLE CYCLODEXTRIN POLYMER

OUGHLIS-HAMMACHE F. [1,2,3], **SENHADJI-KEBICHE O.** [2], **SKIBA M.** [3,4], **LAHIANI-SKIBA M.** [3,4], **AIT ALI S.** [1,2], **BENAMOR M.** [2]

Département de Génie de Pétrochimie et de Génie des Procédés, Faculté de Technologie, Université du 20 Août 1955-Skikda- Algérie

Laboratoire des Procédés Membranaires et des Techniques de Séparation et de Récupération (LPMTSR), Faculté de Technologie, Université A. Mira de Béjaia – Algérie

Pharmaceutical Technology and Biopharmaceutics Laboratory, Faculty of Medicine and Pharmacy, Rouen University, 22 Bd Gambetta, 76183 Rouen, France,

In-Cyclo, 75 Route de Lyon, 76183 Rouen

hammachefadila06@yahoo.fr

ABSTRACT

In this study, the effects of various experimental parameters on the adsorption yield of methylene blue (MB) from aqueous solution by γ-cyclodextrin (γ-CD) polymer were investigated statistically. The response surface methodology (RSM) based on statistical design of experiments (DOEs) was used in order to obtain the desired response, as an empirical function and to reach easily the optimum of the adsorption yield. A first-order 2^4 full factorial design (FFD) was planned fixing the adsorption period at 270 min. The experimental design was done at two levels of the operating variables which were the initial dye concentration, pH, agitation rate and NaCl concentration and their studied ranges are 8-16 mg/L, 4.5-7.5, 200-300 rpm, 0.09-0.11M, respectively.

The optimal conditions determined by using surface contour plots for initial dye concentration, pH, agitation rate and NaCl concentration were 12 mg/L, 6, 250 rpm and 2×10^{-9} M, respectively. The interaction between pH and agitation rate on the adsorption yield of the methylene blue was significant, whereas there was no interaction between the other variables. Sorption isotherms were constructed for this polymer under optimal conditions and fitted well to the Freundlich model ($R^2 > 0.99$).

KEYWORDS : Cyclodextrin, Methylene blue, Adsorption, Inclusion complex, Full Factorial Design at two levels.

MICRO-CHANNEL CELL FOR THE EXTRACTION OF IONIC METAL (Zn(II)) USING POLYMER PLASTICIZED MEMBRANES

BELLOUL-SAHI S. [a], SENHADJI-KEBICHE O. [a,*], TINGRY S. [b], BENAMOR M. [a]

[a]Laboratoire des Procédés Membranaires et des Techniques de Séparation et de Récupération (LPMTSR), Faculté de Technologie, Université de Bejaia, DZ-06000 Béjaia, Algeria.
[b]Institut Européen des Membranes (IEM), UMR CNRS 5635, Montpellier Cedex 5, France
Email* : kebiche_anissa@yahoo.fr

 ABSTRACT

The membrane Techniques are used as well to simplify the manufacturing processes as to treat the effluents where they make it possible to reduce the volume of the industrial rejections, to develop waste or to separate the pollutants. During last years, many studies were devoted to the problems of pollution due to the rejections of ionic metals. So, it is very important to explore new implementation of processes allowing recovering metal with the state of traces. Among the innovating processes explored for this purpose, the use of membranes in micro-channel cell.

The aim of this work is designing a micro-channel cell for the study of the extraction and of the facilitated transport of ionic metals using polymer plasticized membranes in continuous process.

The system was composed of a flat sheet membrane sandwiched between donor and acceptor aqueous phases that flow in micro-channels built in Teflon plates. The polymer membrane was composed by cellulose triacetate as polymer base, Cyanex 302 as carrier and o-nitrophenyl octyl ether as plasticizer. Parameters affecting the facilitated transport and the extraction process of the Zinc ions (flow, stirring velocity, nature of the aqueous phases, etc…) are studied. The various experiments carried out showed that the micro-channel cell is more advantageous than the traditional system in term of flows, which are significantly higher.

KEYWORDS : *polymer plasticized membranes, micro-channel cell, facilitated transport, Zinc ions, Cyanex 302.*

APPLICATION OF PHOTOACTIVATED PERIODATE TO THE DEGRADATION OF ANTHRAQUINONIC DYE IN WATER

GHODBANE Houria [a,b], HAMDAOUI Oualid [b]

[a,b] Univ Souk Ahras, Fac. Sci & T Dept. Science of Matter. Souk Ahras, Algeria
[b] Laboratory of Environmental Engineering, Faculty of Engineering Sciences, Department of Process Engineering, Badji Mokhtar-Annaba University, P.O. Box 12, Annaba 23000, Algeria.

E-mail : hiba_ghodbane@yahoo.fr

ABSTRACT

Wastewater containing dyes impose serious environmental problems because of their color and their potentially toxicity. Dye removal from effluent of related industries has been the subject of great attention in the last few years. The reports projected are alarming that 10–20% of dyes in the textile sector is lost in residual liquors through incomplete exhaustion and washing operations. The presence of low concentration of dyes in the effluent streams is highly visible and undesirable and it reduces the light penetration which leads to inhibiting photosynthesis and stringent restrictions on the organic content of industrial effluents. Several

chemical and physical processes such as chemical precipitation, coagulation, electrocoagulation, adsorption on activated carbon, and reverse osmosis are used for color removal from dye-bearing effluents. However, these processes merely transfer the contamination from one stage to another to produce secondary wastes and leave the main problem unsolved. Recent developments of chemical treatment of wastewaterresulted in a considerable improvement in the oxidative degradation of organic compounds dissolved in aqueous media. Among these methods mentioned, advanced oxidation processes that are focused on the hydroxyl radicals' production ($^{\bullet}OH$) may oxidize contaminants. Lately, the photoactivated periodate (UV/IO_4^-) system was suggested as a as a modern advanced oxidation technology, and which was shown to remove aqueous organic compounds in several studies.

The main aim of this work concerned the degradation of Acid blue 25 (AB25) by UV/IO_4^- process. After azo compounds, anthraquinone dyes are classified as the second most important class of commercial dyes and are mainly used for dyeing wool, nylon, and leather.

The reasons that stand behind the AB25 choice are its wide applications known (wool, nylon, silk, paper, ink, aluminum, detergent, wood, fur, cosmetics, and biological task) as well as its use as a model compound for removing anthraquinone dyes in aqueous media. The effects of process parameters such as periodate concentration, initial dye concentration and initial solution pH on the destruction of this dye were examined. The results have shown that the degradation rate was increased in the presence of UV/IO_4^- compared to UV irradiation alone. The degradation rate increased with the increase in periodate concentration to 1 mM and decreased slightly at higher values (>1 mM).The degradation of AB25 decreased when the dye concentration increased. AB25 degradation was significantly affected by varying the initial solution pH.

KEYWORDS : Acid blue 25; Advanced oxidation process; Periodate; Ultraviolet irradiation.

AN EXPERIMENTAL INVESTIGATION ON FLOW BEHAVIOUR IN BUBBLE PUMP OF ABSORPTION DIFFUSION SYSTEM

BENHMIDENE A.[(*)], CHAOUACHI B., GABSI S., BOUROUIS M.

URECAP Ecole nationale d'Ingénieurs de Gabès Route Mednine 6029 Tunisie

Center CREVER, Universitat Rovira i Virgili, 43006 Tarragona, Spain

E-mail : ali.benhmidene@gmail;com

ABSTRACT

In the diffusion absorption system thermally driven bubble pump is used to circulate the solution from the absorber to the generator. A bubble pump is simply a vertical tube to which liquid and vapour streams are introduced at the lower end from the boiler or generator. The liquid fills the lift tube to a predefined depth. The vapour circulates upwards through this section and forms bubbles that act like pistons driving the liquid slugs up in the remainder of the tube.

An experimental research on the performance of the bubble pump for absorption diffusion units was made. The bubble pump is a key component in diffusion-absorption refrigeration systems.. The bubble pump's property and the operating conditions determines the efficiency of the absorption refrigeration system. A continuous experimental system with fixed size of bubbles pumps were designed, constructed and successfully worked. The experiments were performed by changing some of the parameters affecting the bubble pump performance. The experimental results shows that the performance of the bubble pump depends mainly on the driving heat power and the submersion ratio. With the suitable size of section area of the pump tubes driving heat power applied is between 20 and 200W. Three submersion ratio are tested such as 25, 35 and 45%. The obtained result shows that an flow oscillation is present during experience, it increases with submersion ratio. The average mass flow rate of refrigerant increases for the increasing of heat power, however mass flow rate of the poor and rich solution are function of flow regime. The present study can be defined the operating driving heat power of bubble pump used.

KEYWORDS: experimental study, bubble pump, flow pattern, oscillation flow

REMOVAL OF CATIONIC DYE METHYLENE BLUE FROM AQUEOUS SOLUTION USING A LIGNOCELLULOSIC FIBERS : LUFFA CYLINDRICA

KESRAOUI Aida, SEFFEN Mongi

Laboratory of Energy and Materials (LABEM). High School of Sciences and Technology of Hammam Sousse, BP 4011Hammam Sousse (Sousse University-Tunisia). FP4BATIW project

E-mail : aida.kesraoui@gmail.com

ABSTRACT

The aim of the present work is to develop an effective and inexpensive pollutant-removal technology using a lingo-cellulosic fibers: *Luffa Cylindrica*, for the biosorption of an cationic dye methylene blue (MB). The influence of some experimental parameters such as pH, temperature, initial concentration of the polluted solution and mass of the sorben *Luffa Cylindrica* on the biosorption of MB by *Luffa Cylindrica* fibers has been investigated. Optimal parameters for maximum quantity of biosorption dye was achieved after 2 hours of treatment in batch system using an initial dye concentration of 20 mg/L, a mass of 1.5 g of *Luffa Cylindrica* fibers and pH 10. In these conditions, the retention rate is 97 %. The calculated thermodynamic parameters showed that the biosorption of MB onto *Luffa Cylindrica* is an exothermic and spontaneous process. Finally, the biosorption mechanism follows the kinetics BSf(n,α) model and in other hand the Brouers-Sotolongo isotherm model presents a good fit to the experimental for a biosorption of MB dye by *Luffa Cylindrica* fibers.

KEYWORDS **:** Lignocellulosic materials; *Luffa Cylindrica*; Biosorption; methylene blue; Brouers-Sotolongo; Kinetics. Isotherms.

THE USE OF MLP NEURAL NETWORK FOR REMOVAL 4-CHLOROPHENOL BY MEMBRANE LIQUID EMULSION

MESSIKH Nabil

Faculty of technology, Department of Petrochemical and Process Engineering, Universityof 20 Août 1955-Skikda

E-mail : nabchem@yahoo.fr

ABSTRACT

In this present work, artificial neural networks (ANN) are applied for prediction of percentage of extraction efficiency of removal of 4-chlorophenol using emulsion liquid membrane (ELM) process. The effect of operational parameters such as external phase concentration, agitation speed, internal phase reagent and pH of external phase were studied to optimize the condition for maximum removal of 4- Chlorophenol. The performance of proposed model of multilayer perceptron (MLP) for predicting 4-Chlorophenol removal efficiency was found to be impressive. The MLP model perfectly represents the experimental data.

KEYWORDS : Emulsion liquid membrane, 4-Chlorophenol, Artificial neural network, multilayer perceptron.

COPPER REMOVAL FROM WASTEWATER BY ELECTROCOAGULATION PROCESS USING ALUMINUM ELECTRODES

BARHOUMI Afef [a*], BOUGUERRA Wided [b], NCIB Sana[a], ELALOUI Elimame[a].

[a] *U. R Matériaux, Environnement et Energie (ME2) (UR 14 ES26) , Département de Chimie,*
Faculté des Sciences de Gafsa, Campus Universitaire Sidi Ahmed Zarroug -2112 Gafsa, TUNISIE.
*e-mail : limam_aloui@yahoo.fr   *e-mail : afefebarhoumi@yahoo.fr*
[b] *U. R Traitement et Dessalement des Eaux, Département de Chimie,*
Faculté des Sciences de Tunis, Université Tunis El Manar, 2092 Manar II, Tunisie E-mail : bg_wided@yahoo.fr

ABSTRACT

Industrial wastewaters can contain various kinds of organic and mineral toxic compounds. Most of the mineral pollutants such as copper are harmful when they are discharged without treatment. The purpose of this study is to investigate the feasibility of electrocoagulation (EC) as a pretreatment process to remove copper from wastewaters.

 To optimize the experimental condition of copper removal by electrocoagulation using aluminum electrodes, the effect of the main parameters: pH, electrolysis time t_{EC} , current density J, electrolyte concentration, inter electrode distance d_{ie}, area volume ratio S/V and the mode of connection (bipolaire- monopolaire) on copper removal was explored. Experimental results obtained showed that total copper removal was achieved for optimal conditions: pH= 5.0,J = 1.388 mA cm^{-2}, t_{EC} = 30 min, [NaCl] = 1g L^{-1}, d_{ie} = 1 cm, S/V = 7.2 m^{-1} and bipolaire connection. The present study proves that the optimization of electrocoagulation chemical parameters and some reactor parameters provide cost competitive investment. A total copper removal was achieved with an energy consumption of only W= 0.275 KW h m^{-3}. In the light of these results, this method promises interesting industrial applications.

***KEY WORDS*:** Electrocoagulation, Copper removal, Aluminum electrodes, Water treatment

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

206

PREPARATION AND CARACTERISATION OF POLYMER INCLUSION MEMBRANES FROM CELLULOSE TRIACETATE AND ACETYLATED LIGNIN FOR METALS SEPARATION

NCIB Sana[a], BOUGUERRA Wided [b], BARHOUMI Afef [a], LARCHET Cristian[c],

DAMMAK Lasaad[c], ELALOUI Elimam[a]

[a] *U. R Matériaux, Environnement et Energie (ME2) (UR 14 ES26) , Département de Chimie, Faculté des Sciences de Gafsa, Campus Universitaire Sidi Ahmed Zarroug -2112 Gafsa, TUNISIE. e-mail : limam_aloui@yahoo.fr*

[b] *U. R Traitement et Dessalement des Eaux, Département de Chimie, Faculté des Sciences de Tunis, 2092 Manar II, TUNISIE e-mail : bg_Wided@yahoo.fr*

[c] *Laboratoire Systèmes Polymères Complexes (SPC), Institut de Chimie des Matériaux Paris-EST-UMR 7182 CNRS. 2-8 rue Henri Dunant, 94320 Thiais France.*

ABSTRACT

Polymer inclusion membranes (PIMs) present an attractive approach for the separation of metals from an aqueous solution. They have shown a significant stability compared to supported liquid membranes. In this work, the principal objective was to prepare PIMs from cellulose triacetate (CTA) and a bio-polymer: the lignin, to form a thin, flexible and stable film. The lignin was acetylated to change its solubility and increase the interaction with the CTA. In this work, the di-2-(ethylhexyl)phosporic acid was used as a plasticizer and a carrier.

The PIM was characterized by several techniques, to obtain information regarding its composition and morphology, namely Fourier Transformed Infrared Spectroscopy (FT-IR) and Scanning electron microscopy (SEM). Measurement of the contact angle gives information about the hydrophobicity and roughness of the membrane. The mechanical properties of the membrane are obtained by the measurement of the tensile strength.

The experimental results revealed that the carrier is dispersed in physical form in the polymer matrix. The mechanical properties were considerably improved through the incorporation of the lignin. The surface of the membrane was found to be more hydrophobic and can be applied in water purification processes.

KEYWORDS : Polymer inclusion membrane, Lignin, acetylation, FTIR, SEM

DEFLUORIDATION OF DRINKING WATER USING FUNCTIONALIZED SBA-15 TYPE ORDERED MESOPOROUS SILICA

BEN AMOR Taissire, HAMROUNI Anissa, BEN AMOR Mohamed

Laboratoire de Traitement des Eaux Naturelles, Centre de Recherche et Technologies des Eaux (CERTE), Technopole de Borj-cedria, 8020, Soliman, Tunisia ; E-mail : taissire.benamor@gmail.com

ABSTRACT

A Most of the remediation technologies available today, while effective, very often are costly and time-consuming, particularly pump-and-treat methods [1]. Water treatment technology suggests that many of the issues involving water quality could be resolved or greatly ameliorated using nanoparticles [2,3]. The application of specific nanoparticles can effectively, inexpensively, and rapidly render usable potable water is being explored at a variety of institutions. The present survey highlights for the first time that glucamine-modified ordered mesoporous silica type SBA-15 [4] can be used as adsorbents for the uptake of Fluoride from water. By means of X-ray diffraction (XRD), N_2 adsorption-desorption, Thermogravimetry (TGA) and Fourier transform InfraRed (FTIR) the structure and physicochemical properties of the materials were characterized. Batchwise adsorption test of prepared adsorbent was carried out in aqueous sodium fluoride solutions and real water containing fluoride ion. Physico-chemical parameters such as adsorbent dose, pH, initial fluoride concentration, temperature, equilibrium contact time and co-existing anions were studied in a series of batch adsorption experiments. Fluoride ion adsorption was determined using fluoride ion selective electrode. Adsorption of fluoride on the adsorbent was saturated within 3 hours in solution containing 2 mg/L of fluoride, with 2 g/L of adsorbant dose. The effects of pH were found to play a major role. The maximum adsorption of fluoride could be obtained in the solution at about pH 3. The N-methylglucamine post-synthesis grafted SBA-15 possessed higher defluoridation capacity, about 50% of F^- removal, than unmodified SBA-15 which showed only a 5% of F^- removal. The pH changes during the adsorption process suggested that the OH^- on the surface of the material was the adsorption sites. The more adsorption sites were formed on glucamine-modified SBA-15, which possessed abundant surface hydroxyl groups compared with unmodified SBA-15, resulting in higher efficiency of F^- removal.

KEYWORDS : *Defluoridation, SBA-15, Grafting, Adsorption.*

[1] M. Hichour, F. Persin, J. Sandeaux, J. Molénat, Rev.Sci. Eau., 12, 671 (1999).
[2] T. Benamor, Synthèse et caractérisation de silices mesoporeuses hydrophobes à porosité contrôlée (2011).
[3] T. Benamor, V. Loic, B. Lebeau, C. Marichal, Micropor.Mesopor. Mater., 153, 100 (2012).
[4] T. Benamor, J. Miesch, G. Montégut, H. Nouali, C. Marichal, B. Lebeau, Eur.J.Inorg.Chem., 5371 (2012).

HEAT AND MASS TRANSFER BY NATURAL CONVECTION IN PARTIALLY POROUS CAVITIES

HADIDI Noureddine [1] , BENNACER Rachid [2] and OULD-AMER Yacine [3]

[1] University Dr.Yahia Farès of MEDEA, neighborhood Ain D'Hab MEDEA 26000

[2] LMT-ENS Cachan, 61 av. du president Wilson F-94235 Cachan Cedex, France

[3] USTHB, FGMGP, LTPMP, Department of Energy

B.P. 32 El Alia Bab Ezzouar, 16111 Alger, Algeria

[*] Corresponding author. Tel.:+213 025 78 58 31   E-mail address: hadd71@yahoo.fr (N. Hadidi)

ABSTRACT

The study of heat and mass transfer in saturated porous media takes place more and more important due to the considerable challenge that it represents in new problems related to competition effects of heat and mass. The importance of porous media in the industrial and technological phenomena and processes is now well established. However, despite the rise of ways to study, gaps still exist in terms of basic knowledge, especially understanding the phenomena of heat transfer and mass transfer in systems include porous media.

Therefore, studies of the thermosulotal convection in the presence of a porous medium are currently the subject of an ever increasing interest. This interest is due to many practical applications relating thereto, in various applications industrial and natural medium such as the diffusion of pollutants in soil, drying of agricultural products and pharmaceuticals, diffusion of the radioactive substances in the underground deposits reserved for nuclear waste, diffusion of the chemical elements in reactive porous beds (coal gasification), environment, storage of agricultural products, chemical processes. It should be noted that most studies concerned with the double diffusion convection in porous medium are made using a layer of porous medium, while in practice, porous medium do not consist of a single layer, but several layers forming the structure, they are generally designated by multilayer. It is the case for example ground water exposed to the contamination, so does the dispersion of chemical contaminants through water saturated soil, or moisture migration in grain storage systems.

KEYWORDS : heat and mass, natural convection, partially porous cavities.

SURFACTANT REMEDIATION OF CRUDE OIL-CONTAMINATED SOIL

RAHAL S*, KHALLADI R, MOULAI-MOSTEFA N

Materials and Environmental Laboratory
University of Medea, Ain D'Heb, 26001 Medea, Algeria
*Corresponding author: Fax: +00 (213) 25594540
Email: rahalsoufiane@yahoo.fr

ABSTRACT

Problems associated with crude oil contaminated site in environmental media have received increasing attention. To resolve such problems, innovative technology for cleaning up this contamination.

The objective of this work is to study the power of surfactants to remove hydrocarbons from contaminated soil during a continuous washing process. We used as surfactants Sodium dodecyl sulfate (SDS), Sodium dodecyl benzenesulfonate (SDBS). The performance of water in the removal of crude oil was found to be non-negligible, while water contributed by 40 % in the global elimination. After 3h of treatment with surfactant solution and surfactant solution in the presence of pentanol. The soil washing process at a rate of 21.15 mL/min has removed 83 % of the crude oil. These results are of practical interest in developing effective surfactant remediation technology of crude oil contaminated.

KEYWORDS : *Soil remediation; Surfactant; crude oil; Washing process*

REMOVAL OF NICKEL(II) IONS FROM AQUEOUS SOLUTION
BY AN ACTIVATED CARBON PREPARED FROM SEWAGE SLUDGE

AFFOUNE Abed Mohamed, KHELIFI Omar et NACEF Mouna

Laboratoire d'Analyses Industrielles et Génie des Matériaux, Département de Génie des Procédés, Faculté des Sciences et de la Technologie, Université 8 Mai 1945 Guelma,

BP 401 Guelma 24000, Algeria.

affoune2@yahoo.fr; khelif.omar@yahoo.fr ; nacef2010@yahoo.fr

ABSTRACT

The aim of this study is to investigate the adsorption capacity of of nickel (II) ions from aqueous solution by an activated carbon prepared from sewage sludge. The effect of several adsorption parameters such as adsorbent dose, pH solution, initial concentration of nickel(II) solutions, contact time and temperature on the adsorption capacity was studied. Activated carbon was characterized by Fourier Transform Infrared Spectroscopy (FTIR) and Nickel solutions were analyzed using a flame Atomic Absorption Spectrometery (AAS). The equilibrium data were analyzed by Langmuir and Freundlich isotherms, and the thermodynamic parameters $\Delta H0$, $\Delta S0$ and $\Delta G0$ were calculated. The results obtained in this study showed that the prepared activated carbon can be used advantageously for the removal of nickel (II) ions from aqueous solutions and helped to develop an economic method for treating wastewater.

KEYWORDS : Sewage sludge, Activated carbon, Nickel(II) adsorption.

ELIMINATION OF NITRATE FROM BRACKISH WATER IN SOUTHERN ALGERIA

BERKANI Ismahane[*], BENSADOK Kenza, BELKACEM Mohamed

Industrial Science and Process Engineering Laboratory.
Faculty of Mechanical Engineering and Process Engineering.
University of Science and Technology Houari Boumediene,
PB 32, El Alia, 16111 Algiers, Algeria.
* E-mail: ismahaneberkani@gmail.com

ABSTRACT

In southern Algeria's brackish water, elimination of nitrate is necessary because of its terrible effects on human beings and environment. Nowadays, the most common used technique to treat brackish water is reverse osmosis (RO), although its concentrate represents a major problem. The aim of this present study is to consider the applicability of Electro-coagulation method as a secondary treatment on elimination of nitrate present in the brackish water of EL OUED (an area of southern of Algeria).

The influence of various variables such as electrode material, reaction time and current density, on the treatment efficiency, was investigated.
It was observed that the treatment efficiency is optimal with the use of both cathode and anode made of aluminum, 0.5 A and 240 min of electrolysis. At these optimal conditions, nitrate concentration was reduced from 200 to 6,86 mg/L, corresponding to 93,13 % removal efficiency.

KEYWORDS : *Electro-coagulation, brackish water, EL OUED, Nitrate.*

AN INVESTIGATION OF THE PERFORMANCE OF A SOLAR VACUUM MEMBRANE DISTILLATION OPERATING A REVERSE OSMOSIS DESALINATION PROCESS IN AN ARID AREA: A CASE STUDY FROM THE SOUTH OF ALGERIA

TRIKI Z. [a,*], BOUAZIZ M. N. [a], BOUMAZA M. [b]

[a]Laboratory of Biomaterials and Transport Phenomena, Department of Process and Environmental Engineering, University of Médéa, Médéa, Algeria
Tel: + 213 (0) 25588466, Fax: + 213 (0) 25581253 ; email: triki.zakaria@univ-medea.dz

[b]Department of Chemical Engineering, College of Engineering, King Saud University, Riyad, Saudi Arabia

ABSTRACT

Reverse osmosis (RO) desalination is widely used for drinking water production, because of its relatively low energy consumption. However, RO is limited in recovery ratio due to the osmotic pressure which increases with salinity. It results with high rejected brine volume inducing negative environmental impact. The aim of this work is to investigate the possibility of using solar vacuum membrane distillation (VMD) in an integrated RO desalination process in order to reduce brine discharge volume and increase RO global recovery ratio. A small RO desalination unit operated by solar energy in a real site in the Algerian desert is considered for the feasibility study. The obtained results proved that important permeate fluxes can be reached with RO coupled with VMD as the water recovery increased from 37% to nearly 87.5%. Brine volume can so be reduced by a factor of 5 and the global water production is more than doubled. Furthermore, the economic feasibility study showed that the cost estimate for water produced via RO-VMD integrated system ($3.77/m^3) is relatively low compared to other mature solar energy-driven desalination technology. Finally, a sensitivity analysis was carried out to study the effects of operating conditions on the desalination system performance in terms of feed water temperature, vacuum pressure and solar collector efficiency.

KEYWORDS : component ; Reverse osmosis desalination ; Brine disposal ; Vacuum membrane distillation ; Solar energy ; Economic study ; Sensitivity analysis.

MATHEMATICAL MODELING AND NUMERICAL STUDY OF HEAT AND MASS TRANSFER IN HUMIDIFIER AND CONDENSER FOR SOLAR HUMIDIFICATION DEHUMIDIFICATION DESALINATION SYSTEM

GOUIDER Hana[1], ZILI-GHEDIR Leila[2], BEN NASRALLAH Sassi[3]

Université de Monastir - Ecole Nationale d'Ingénieurs de Monastir

5000 MONASTIR - TUNISIE

[1] E-mail: gouiderhana@hotmail.fr

[2] E-mail: leilazilighedra@yahoo.fr

[3] E-mail: sassi.bennasrallah@enim.rnu.tn

ABSTRACT

This paper presents a mathematical model of heat and mass transfer in porous media. This model is applied in the field of solar desalination system. It is deduced from Whitaker's theory. The method of volume averaging is used to derive a three-temperature macroscopic model considering local thermal non-equilibrium between the three phases. A closed form of the evaporation rate at the macroscopic level is obtained depending on the macroscopic temperatures and the effective properties.

The solar desalination system with air humidification-dehumidification processes had the following independent components, an evaporator, a condenser and two solar collectors of air and of water.

The usually used models in these components can be deduced from the present model by using a simplifying hypothesis.

The Counter flow evaporator used in this paper is formed by a packing materials.This model allows predicting the temperature and humidity evolutions in the solar desalination humidifier and condenser. A numerical study is carried out leading to the mentioned variables. These variables were obtained for wide ranges of mass flow rates of air and water as well as for several inlet water temperatures.

KEYWORDS : heat and mass transfer,humidifier,condenser , humidification dehumidification desalination ,numerical study

USE OF ADSORPTION USING GRANULAR ACTIVATED CARBON (GAC) FOR THE ENHANCEMENT OF COAGULATION PERFORMANCE FOR BORON REMOVAL

BOUGUERRA Wided [a, b]*, MISSAOUI Khaoula [b], BENKHLIFA Eya [b], HAMROUNI Béchir [b]

[a] Faculté des Sciences de Gafsa, Département de Chimie, Campus Universitaire Sidi Ahmed Zarroug -2112 Gafsa, TUNISIE.
[b] U. R Traitement et Dessalement des Eaux, Département de Chimie,
Faculté des Sciences de Tunis, 2092 Manar II, TUNISIE
E-mail : bg_Wided@yahoo.fr

ABSTRACT

Boron is an important micronutrient for plants, animals and humans but the excess and the deficiency of this element are harmful. The World's Health Organization WHO recommended a limit value of 2.4 mg L^{-1} of boron in drinking water.

The aim of this study is to investigate the feasibility of coagulation-flocculation combined to adsorption onto Granular Activated Carbon (GAC) as a treatment process to remove boron from water. Several working parameters such as pH, initial boron concentration, coagulant sort and dose were studied in an attempt to achieve higher removal efficiency. Alum, ferric chloride and zinc sulfate were used as coagulant to observe their differential effects. Boron removal by coagulation is more effective using aluminum as coagulant. Removal efficiency increases with increasing coagulant dose. The effect of the initial pH solution on boron removal is negligible. It was demonstrated that boron removal using coagulation-flocculation does not exceed 20 %. The addition of GAC as adsorbent resulted in remarkable increase in the removal rate of boron. The optimum conditions for boron removal were achieved at pH 6, an aluminium dosage of 30 mg L^{-1} and an adsorbent mass of 30 g. At optimum conditions, residual boron concentration is 2.4 mg L^{-1} corresponding to a removal percentage of 51%. Coagulation-flocculation process combined with adsorption on GAC can remove boron effectively compared to conventional coagulation process.

KEYWORDS: *Coagulation-flocculation, Adsorption, Boron, Granular activated carbon.*

REMOVAL OF CADMIUM FROM WATER BY ADSORPTION ON CALCIUM PHOSPHATES

JEBRI Sonia, BEN AMOR Mohamed

Centre de Recherches et des Technologies des Eaux, Laboratoire de Traitement des Eaux Naturelles,
Borj Cédia BP 273, 8020 Soliman, Tunisie.
E-mail : sonia.jebri@gmail.com

ABSTRACT

The calcium phosphoapatites form the major part of sedimentary phosphate ores and the mineral matter of the calcified tissues. In addition of the high thermal stability, these compounds have the advantage of being non-toxic and insoluble materials. Their crystalline structures can accommodate a great variety of substitutions both in cationic and anionic sites which make them as highly effective ion exchange matrices. This property is widely exploited in the field of water treatment.

The main objective of this work was to investigate the retention of cadmium in water by adsorption on hydroxyapatite $Ca_{10}(PO_4)_6(OH)_2$ and tricalcium phosphate $Ca_3(PO_4)_2$.

These phosphates were prepared according to the "double decomposition method" in aqueous medium. Experiments consist in adding a solution of diammonium hydrogen phosphate into a boiling solution of calcium nitrate with a molar ratio of reactants Ca/P = 1.55 for calcium phosphate and 1.67 for the hydroxyapatite. Characterization and purity control of the obtained samples were checked by X-ray diffraction and IR spectroscopy.

The adsorption experiments were carried out, from five minutes to six hours, on 100 ml of cadmium solutions with initial concentration 10 mg l^{-1} at 25°C and pH=7.

The results show that the percentage of cadmium removal increases with the adsorbent doses of calcium phosphates. The kinetic study shows, that for the same dose of phosphate, the metal removal is faster in the case of using the tricalcium phosphate as adsorbent.

Finally, the total depollution was achieved with adsorption capacity of 25.0 mg/g for tricalcium phosphate and 16.7 mg/g for the hydroxyapatite.

KEYWORDS: water treatment, adsorption, cadmium, tricalcium phosphate, hydroxyapatite.

SYNTHESIS AND CHARACTERIZATION OF NEW PROTON EXCHANGE MEMBRANE DERIVING FROM SULFONATED POLYETHERSULFONE USING IONIC CROSS LINKING FOR ELECTROCHEMICAL APPLICATIONS

MABROUK W. [1,2,3,5] **, VIDAL S.** [1] **, SOLLOGOUB C.** [2] **, MATOUSSI F.** [4] **,**

HAFIANE A. [5] **FAUVARQUE J. F.** [2]

1- ERAS Labo, 222 RN 90, 38330, St Nazaire Les Eymes, Grenoble, France.
2- CNAM, P-2AM, EA4626, F75003 Paris, France.
3- FST, Analytical Chemistry and Electrochemical Laboratory Tunisie T1092 Tunisia.
4- INSAT, Chemical and Biological Engineering Departement, Tunisie T1080, Tunisia.
5- Laboratory of Water and Membrane Technologies, LETM, BP 273, Soliman 8020, Tunisia.

E-mail : mabrou_walid@yahoo.fr

ABSTRACT

The present work concerns the synthesis and characterization of a new proton exchange membrane made of sulfonated polyethersulfone (S-PES) crosslinked by the aminated polyethersulfone (PES-NH$_2$). The crosslinking method is based on the availability of tunable ratio of pendant SO$_3$H pmu in starting polyethersulfone polymer. The sulfonic group is very reactive and crosslinking may be easily obtained using diamine or polyamine. In this work, the croslinking agent used is amino-polyethersulfone (PES-NH$_2$). Three membranes were fabricated with various degrees of sulfonation (named HNH2).

The S-PES and the PES-NH$_2$ have similar chemical structures allowing a good compatibility of the material. The HNH2 membrane obtained has been characterized by TGA, DSC, ionic conductivity and water swelling. The results show that the thermal stability and mechanical stability in water is improved when compared to S-PES starting membrane. Furthermore the ionic conductivity of HNH2 membrane is in the order of 0.1mS/cm which is comparable to commercial nafion conductivity.

KEYWORDS : Ionic conductivity; aminated polyehersulfone; ionic crossling; sulfonated polyethersulfone; Proton exchange membrane.

1. W. Mabrouk, L. Ogier, S. Vidal, C. Sollogoub, F. Matoussi, J. F. Fauvarque. '*Ion exchange membranes based upon crosslinked sulfonated polyethersulfone for electrochemical applications*', **Journal of Membrane Science** 452 (**2014**) 363-270.

2. W. Mabrouk, L. Ogier, C. Sollogoub, S. Vidal, F. Matoussi, J. F. Fauvarque. 'Synthesis and characterization of new membranes deriving from sulfonated polyethersulfone for PEMFC applications', **Desalination and Water Treatment** 1944 (**2015**) 3986-3994.

CORROSION INHIBITORY EVALUATION OF ANACYCLUS PYRETHRUM L. AQUEOUS EXTRACTS ON THE CORROSION OF MILD STEEL IN ACIDIC MEDIUM

SELLES Chaouki [1], BENALI Omar [2].

[1] Laboratoire des substances naturelles et bioactives (LASNABIO), Université Abou Bekr Belkaid, Tlemcen, Algérie.

[2] Département de Biologie, Faculté des sciences et de la technologie, Université Dr. Tahar Moulay, Saïda, Algérie

E-mail : selleschaouki@yahoo.fr

ABSTRACT

Industries depend heavily on the use of metals and alloys. One of the most challenging and difficult tasks for industries are the protection of metals from corrosion. Sulphuric acid solutions are widely used in the pickling processes of metals. Chemical inhibitors play an important role in the protection and mitigation strategies for retarding corrosion. The most effective and efficient inhibitors are the organic compounds containing O, N or π electrons in their molecules and inorganic compounds, such as chromate and nitrite.

However, the use of these compounds has been questioned lately, due to the several negative effects they have caused in the environment. In the last years, interest in using natural products as corrosion inhibitors increased substantially and scientists around the world reported several plant extracts.

The inhibition effect of the aqueous extract of different parts of *Anacyclus pyrethrum* L*.* on corrosion of mild steel in 0.5 M H_2SO_4 has been investigated using polarization curves, polarization resistance and electrochemical impedance techniques. The corrosion inhibition efficiency increases on increasing plant extract concentration till 350mg/L. The effect of temperature on the corrosion behavior of mild steel in 0.5 M H_2SO_4 with addition of plant extract was studied in the temperature range 25–40°C. Polarization curves show that the different parts of plants act as anodic type inhibitors. Changes in impedance data (charge transfer resistance, Rt, and double layer capacitance, Cdl) were indicative of adsorption of the extracts on the metal surface, leading to the formation of protective films. The extent of surface coverage by the inhibitors was determined by measurement of ac impedance; it was found that adsorption of these inhibitors on the mild steel surface obeys the Langmuir adsorption isotherm. In order to evaluate the surface morphology of the composite surface a superficial analysis was carried out using SEM. The specimen surface can be observed to be covered with a thin layer of the inhibitor molecules, giving protection against corrosion. It was found that the aqueous extract has showed promising corrosion inhibition properties for mild steel in 0.5 M H_2SO_4 media and the plant could serve as effective green corrosion inhibitor.

KEYWORDS : *Plant extract, Corrosion, Mild steel, Electrochemical techniques.*

INTERACTION OF POLYSTYRENE CO STYRENE SULFONATE WITH METHYLENE BLUE AS A FUNCTION OF PHYSICAL CHEMICAL PARAMETERS IN AQUEOUS SOLUTION

ESSAFI Wafa [1], BEN MAHMOUD Souha [1,2] and HAMZAOUI Ahmed Hichem [3]

1 Laboratoire Matériaux, Traitement et Analyse - Institut National de Recherche et d'Analyse Physico-Chimique, Pôle Technologique de Sidi Thabet, 2020 Sidi Thabet-Tunisie,
2 Institut Nationales des sciences appliquées et technologie, INSAT, Centre Urbain Nord BP 676 - 1080 Tunis Cedex, Tunisie.
3 Laboratoire de Valorisation des Matériaux Utiles - Centre National des Recherches en. Sciences des Matériaux, BP 95, Hammam Lif 2050, Tunisie
E-mail : wafa.essafi@wanadoo.fr

ABSTRACT

The interaction of the cationic phenothiazine dye, the Methylene blue (MB) with poly-(sodium styrene sulfonate)$_f$–co-(styrene)$_{1-f}$, (PSSNa f), has been investigated by spectrophotometric method. The polyelectrolyte induced metachromasy resulting in a blue the shift of the absorption maxima of the dye, in agreement with the formation of a dye H-aggregates. The stability of the complexes was studied as a function of polyelctrolyte concentration, polyelctrolyte chain length, polyelectrolyte electrostatic charge density f, NaCl salt addition, THF addition to polyelectrolyte/dye aqueous solutions and THF treatment. It was found that the stoichiometry of PSS-MB complex evaluated by the molar ratio method is 4:1. Reversal of metachromasy was observed upon tetrahydrofurane (THF) addition, while THF treatment does not affect the stoichiometry of the complex. Finally, thermodynamic parameters of the interaction between the polyelectrolyte and the dye at different temperatures, namely free energy ΔG, the enthalpy ΔH and the entropy ΔS have been evaluated to determine the binding constant and as a consequence the stability of the complex. The binding was found to be even higher as the value of the chemical charge f increases and reaches its maximum value $f=1$, when operating at optimal conditions such that of polyelectrolyte concentration.

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet,Tunisia 21-24 December, 2015

219

ORANGES PEELS FOR BIOSORPTION OF HEAVY METALS

ZOUAMBIA Soumia[a], ZOUAMBIA Yamina[a], YOUCEF ETTOUMI Khadidja, KREA Mohamed, MOULAI MOSTEFA Nadji

Laboratoire Matériaux et environnement (LME), Université de Médéa, Ain d'Heb, 26001 Médéa Algérie

E-mail : zouambia_k@yahoo.fr

ABSTRACT

Oranges peels studied within the framework of this research, constitute a locally abundant and a low cost resources. The aim of study is to illustrate the valorization of this fruit peels and their use in the biosorption of heavy metals. The biosorption phenomenon was carried out for fixing copper ions Cu (II) from synthetic sulfates solutions of this metal. The biosorption kinetics was discussed in terms of influence of various parameters (size of biosorbent, biosorbent content, pH, temperature and concentration of the metal solution). The maximum fixation capacity of the copper ions on oranges peel determined by UV-Visible spectroscopy was obtained under the following optimized conditions: an initial concentration of metal of 20 mM, with a biosorbent content of 10g/l, pH = 4 and a temperature of 37 °C. In these conditions the results of the biosorption kinetics showed to be very rapid, within a period of time which does not exceed 40 minutes we found a high removal rate.

KEYWORDS : *Oranges peel,* biosorption phenomenon, copper, removal rate.

ADSORPTION STUDIES OF BASIC DYE ON ACTIVATED CARBON DERIVED FROM AGRICULTURAL WASTE: (ZIZIPHUS JUJUBA) SEED COAT

BENTURKI Oum Saâd. , BENTURKI Asma

Laboratoire d'étude physico-chimique des matériaux et application à l'environnement.
Faculté de Chimie, USTHB Bp 32 El-Alias, 16111, Bab Ezzouar, Algiers, Algeria
E-mail : Tayima2003@yahoo.fr

ABSTRACT

Activated carbon prepared from (ziziphus *jujuba*) seed was used to remove cationic basic (methylene blue (MB) from aqueous solutions from a biomass material, Ziziphus *Jujuba* seeds . The used precursors were heated at 475°C, in presence of an activating chemical agent. The porosity characterization of the activated carbons obtained was investigated by BET method. Batch adsorption studies were conducted to evaluate the effect of contact time (1–48 hours), initial pollutant concentration (5–200 mg/L) and solution temperature (25–45°C) were investigated. Equilibrium data were fitted to Langmuir, the adsorption capacity, were quantitatively determined. The maximum adsorption capacity obtained from Langmuir equation. Furthermore, adsorption kinetics of dye was studied and the rate of adsorption was found to conform to pseudo-second-order kinetics. The intraparticle diffusion was one of the rate determining steps. Thermodynamic parameters such as ΔG^0, ΔH^0 and ΔS^0 were also calculated for the adsorption processes. The adsorption interaction was found to be endothermic in nature. Activated carbon developed from *Ziziphus Jujuba* seed was shown to be a promising adsorbent for removal of dye (organic polluant) from aqueous solutions.

KEYWORDS : *Activated carbon; Adsorption; Biomass material; Dye; Water treatment; Isotherm; Kinetics*

Topic 8 :Pretreatment (fouling and scaling, removal of specific compounds), membrane processes,

PREPARATION AND CHARACTERIZATION OF POROUS CLAY CERAMIC FOR DESALINATION APPLICATIONS

JALALI Jalila[a,b] ; BALGHOUTHI Moncef [a] ; EZZAOUIA Hatem[a]

a : Photovoltaic Laboratory, Laboratory of thermal processes.
Research and Technology Centre of Energy Bordj Cedria CRTEn, Tunisia.
b : Bizerte Faculty of Sciences
E-mail : jalali.jalila@gmail.com

ABSTRACT

Salinization of soil is a major problem in arid and semi-arid regions. Soil drainage and reclamation is often achieved by soil leaching with fresh water. However, soil leaching is limited by land conditions and the availability of fresh water. In this study, porous ceramic columns formed by argil of traditional pottery were used to remove salt from the saline soils. Experiences were conducted in a laboratory prototype to determine the salinity variation in different soil depths and locations as well as the salt germination and deposal on the porous ceramic. The obtained experimental results showed that this technique has effectively reduced the soil salts concentration by 95%.

The porous ceramic material used in the experiments was also analyzed using the X-ray diffraction analysis (XRD) and scanning electron microscopy (SEM) showing the importance of the pores dimensions and structures on the solution movement and salt deposal. In addition, the possible mechanisms of salt movement and deposal such as evaporation, interaction between saline solution and porous ceramic and salt ionic germination were discussed.

KEYWORDS : soil; saline solution movement; desalination; porous ceramic, evaporation, salt removal

CORROSION OF Zn-Mn ALLOY COATING IN CARBONATED CONCRETE SOLUTION

TOUAZI S.[a], BUČKO M.[b], MAKHLOUFI L.[a], LEGAT A.[c], BAJAT J.B.[d]

[a] Faculty of Technology, University A.M. of Bejaia, 06000 Bejaia, Algeria
[b] Military Academy, University of Defense, P.J. Sturma 33, Belgrade, Serbia
[c] Slovenian National Building and Civil Engineering Institute, Dimičeva 12, 1000 Ljubljana, Slovenia
[d] Faculty of Technology and Metallurgy, University of Belgrade, P.O. Box 3503, Belgrade, Serbia
E-mail : laid_mak@yahoo.fr

ABSTRACT

Nowadays, reinforcing steel is often protected with zinc coating (galvanized steel). The coating is sacrificial and protects steel, but there is still problem with zinc corrosion, when it is exposed to the carbonate, it could become brittle, crusty, and eventually split. For this reason we have to find and replace the galvanized steel by another coating better than Zn. Recently, Zn-Mn alloy has been proposed as better protection for steel in atmosphere [1-2].

The aim of this work was to optimize Zn-Mn plating parameters with respect to corrosion resistance in alkaline environment. The alloy coating was obtained by electrochemical deposition in the range of potentials, starting from -1.7 V vs saturated calomel electrode. Data obtained from voltamperometric studies showed higher corrosion resistance for the Zn-Mn alloy deposits obtained at -1.8 SCE when compared to pure Zn deposit. EIS investigations revealed that impedance increases steadily with time and is significantly higher compared pure Zn after 24 hours in solution simulating carbonated concrete. This may be attributed to the formation of protective corrosion product [3]. Contrary, for pure Zn, the impedance increased in the first 12 hours, and then decreased during prolonged exposure time, which can be explained by rapid degradation of zinc coating, as it was confirmed by optical microscope after 24 hours of immersion in corrosion solution.

KEYWORDS : *Zn-Mn coating, electrodeposition, carbonation of concrete, corrosion protection.*

REFERENCES

[1] M. Marín-Sánchez, P. Ocón, A. Conde, I. García, Electrodeposition of Zn-Mn coatings on steel from 1-ethyl-3-methylimidazolium bis (trifluoromethanesulfonyl) imide ionic liquid, Surface & Coatings Technology 258 (2014) 871–877

[2] Selvarani Ganesan, Ganesan Prabhu, Branko.N. Popov, Electrodeposition and characterization of Zn-Mn coatings for corrosion protection, Surface & Coatings Technology 238 (2014) 143–151

[3] M. Bučko, J. Rogan, S. I. Stevanović, A. Perić-Grujić, J. B. Bajat, Initial corrosion protection of Zn–Mn alloys electrodeposited from alkaline solution, Corrosion Science 53 (2011) 354–2861

AN EXCHANGE MARKET OF WATER RIGHTS IN MULTI-ROUND AUCTION

ASKRI Intissar, *BCHIR Mohamed Ali, BALLOUMI Mounir*
Laboratoire du management, d'innovation et du développement durable (LAMIDED)
E-mail : intissaraskri@yahoo.fr

ABSTRACT

Climate variability in Tunisia (a marked difference between the availability of water in the North West and the use of water for irrigation in the North East of Tunisia) makes water resource both scarce and unequally distributed in time and space. This issue led to search for mechanism that make water management more efficient and that ensure a good distribution of this resource in all areas of the country by encouraging some farmers, who do not use all their allocated water (representing as permits), to sell them to the State. The State subsequently transfers them to other exploiting who need, to ensure that everyone benefits, using a multi-round auctions as a market mechanism to share these permits at a price determined by the interplay of this market. This paper's goal was to vary auction parameters (that influence farmer's decision) between sessions, to focus on the impact of modifying some parameters on bidder's behavior and thus on bidder's revenue and to see which best strategy allows the policy maker to achieve his goal. In response, we proposed to conduct a laboratory experiment, to test a variety of auction procedures taking irrigated perimeter of Beja as example.

KEYWORDS **: climate, experiment, auction, irrigation, water**

SYNERGISTIC CORROSION INHIBITION BY PHOSPHONIC ACID AND Cu^{2+} IONS ON CARBON STEEL IN 3% NaCl

KAMELI D., HAMMACHE - MAKHLOUFI H., ALIOUANE N.

Laboratoire d'Electrochimie, Corrosion et de Valorisation Energétique, Faculté de Technologie,
Université de Bejaia, 06000 Bejaia, Algérie
Email : houahammache@yahoo.fr

ABSTRACT

The synergistic effect of the combination of a new tetraphosphonic acid and Cu^{2+} ions on carbon steel corrosion was investigated using open circuit potential (OCP), potentiodynamic polarizations and electrochemical impedance spectroscopy (EIS). The steel surface was examined by SEM observations, EDX and XRD analysis. The combination of tetraphosphonic acid and Cu^{2+} is an environment-friendly inhibitor and exhibited mixed-type inhibition behaviour. The potentiodynamic curves show that there is a clear reduction of both the anodic and cathodic currents in the presence of studied inhibitor compared with those for the blank solution. It was found that the cathodic reaction (hydrogen evolution) and the anodic reaction (dissolution metal) are inhibited. The corrosion rates of carbon steel in presence of the phosphonic acid and in the presence of the mixture of phosphonic acid and Cu^{2+} were determined by electrochemical impedance spectroscopy. Results confirmed that the inhibition efficiency increased with an increase in concentration of TPA up to 10^{-3} mol. L^{-1} where the highest inhibition efficiency was obtained. Also, the mixture of phosphonic acid and Cu^{2+} efficiently inhibited corrosion on carbon steel at relatively low dosages in severely corrosive media. The observed inhibition efficiency in the presence of Cu^{2+} ions indicates that the Cu^{2+} has synergistic effect on the corrosion inhibition process. Such an increased activity of the metal chelates can be explained on the basis of chelation theory. Results from potentiodynamic polarization and electrochemical impedance spectroscopy revealed the mode of inhibitive action and adsorption of inhibitor molecules and Cu^{2+} ions. Further, surface morphological examination supports the protective film formation by the synergistic effect of the new tetraphosphonic acid and Cu^{2+} ions on carbon steel surface.

KEYWORDS : Corrosion, inhibition, tetraphosphonic acid, Cu^{2+} ions

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

225

DECARBONATION OF THE GEOTHERMAL WATERS OF CHOTT EL FEJJIJ: SCALING PROBLEM AND HARDNESS TREATMENT

FARHAT Asma, ROMDHANE Mehrez

Unité de recherche Environnement, Catalyse, et Analyse des Procédés,
École Nationale d'Ingénieurs de Gabès, Route de Médenine, 6029 Gabès, Tunisie.
E-mail : farhatassma@yahoo.fr

ABSTRACT

During the cooling of the geothermal water of *Chott El-Fejjej* (South-Est Tunisia), considerable scaling occurred in the inlet to the tower. To attempt to resolve this problem, decarbonation ($CaCO_3$ precipitation) induced by addition of lime (CaO) and sodium carbonate (Na_2CO_3) has been studied. Attention is paid to seeding time, Ca^{2+}, Mg^{2+} and HCO_3^- concentrations, and pH. Experimental results indicate that the use of sodium carbonate is more efficient in reducing the hardness of water. The concentration of Ca^{2+} and Mg^{2+} achieve the minimum respectively 252,16 mg\L and 54,96 mg. Similarly for concentration of HCO_3^- reach a minimum of 103.7 mg\L using Na_2CO_3. The treatment of geothermal water Chott El Fejjij with sodium carbonate shows more efficient compared to lime treatment.

KEYWORDS : decarbonation, geothermal water, scaling, hardness,

The 5^{*th*} *Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"*
Hammamet,Tunisia 21-24 December, 2015

226

OPTIMIZATION OF CADMIUM REMOVAL BY DONNAN DIALYSIS

MTAALLAH Salma, MARZOUK Ikhlass, HAMROUNI Béchir

U.R Traitement et Dessalement des Eaux, Faculté des Sciences de Tunis,
Université de Tunis El Manar, 2092 Manar II – Tunisie.
Tel. / Fax: +216 71 871282; email: salmamtaalah@yahoo.fr

ABSTRACT

The removal of cadmium from aqueous solution with CMS and CMX cation-exchange membranes were studied by Donnan dialysis (DD). The effects of initial concentration of cadmium, type of cation-exchange membrane, and concentration of counter ion were investigated. A 2^3 full factorial design analysis was performed to screen the parameters affecting the cadmium removal efficiency. Using the experimental results, a linear mathematical model representing the influence of the different parameters as well as their interactions was obtained. Analysis of variance, the F-test and the student's test shows that the concentration of counter ion is the most significant parameter affecting the cadmium removal. The statistical analysis of the experimental data assumes it to be a normal distribution.

KEYWORDS : Cadmium, Donnan Dialysis, Factorial design, Cation-Exchange Membrane.

ADSORPTION OF CADMIUM ONTO ACTIVATED ALUMINA :

KINETICS AND THERMODYNAMIC STUDIES

MTAALLAH Salma, MARZOUK Ikhlass, HAMROUNI Béchir

U.R Traitement et Dessalement des Eaux, Faculté des Sciences de Tunis,
Université de Tunis El Manar, 2092 Manar II – Tunisie.
Tel. / Fax: +216 71 871282; email: salmamtaalah@yahoo.fr

ABSTRACT

In this study, Activated Alumina as an adsorbent was assessed for the removal of cadmium ions from aqueous solutions by equilibrium, kinetics, and thermodynamics studies. The Freundlich adsorption isotherm equation was found to be more suitable than the Languimir isotherm for the activated alumina adsorption experimental data with a correlation coefficient of R^2= 0,99. The sorption energy calculated from Dubinin-Radushkevich isotherm were more than 8 Kj/mol indicated that the adsorption process was chemical in nature. The adsorption of cadmium ions onto activated alumina followed pseudo-second order kinetic. The ΔG° value, at different temperatures, was calculated and found to be negative, indicated that the reaction is spontaneous in nature and the positive value of ΔH° indicated that the adsorption was endothermic.

KEYWORDS : Cadmium, Adsorption, Activated Alumina, Kinetic, Thermodynamic.

AEROBIC BIODEGRADATION OF THE TEXTILE DYES, CIBANON NAVY, SOLOPHENYL SCARLET AND CIBACRON GREEN

KHELLAF Nabila [a,b], DJELAL Hayet [c,e], AMRANE Abdeltif [d,e]

[a] *Department of Process Engineering, Faculty of Engineering, Badji Mokhtar University, P.O. Box 12, 23000 Annaba, Algeria*

[b] *Laboratory of Organic Synthesis-Modeling and Optimization of Chemical Processes, Badji Mokhtar University, P.O. Box 12, 23000 Annaba, Algeria*

[c] *Ecole des Métiers de l'Environnement, Campus de Ker Lann, 35170 Bruz, France*

[d] *Université de Rennes 1, ENSCR, CNRS, UMR 6226, Avenue du Général Leclerc, CS 50837, 35708 Rennes Cedex 7, France*

[e] *Université Européenne de Bretagne, 5 Boulevard Laennec, 35000 Rennes, France*

E-mail : khellafdaas@yahoo.fr

ABSTRACT

In this work, biodegradation of organic dyes by activated sludge (AS) in the presence of glucose (2 g/L) as an additional carbon source was studied. The AS (without pre-acclimation) was freely suspended under aerobic conditions. Three organic dyes representative of the Algerian textile industry were selected: Cibanon Navy (CN), Solophenyl Scarlet (SS) and Cibacron Green (CG). The results showed that after 10 days of incubation, AS displayed good biodegradation capabilities achieving removal percentages ranging from 50.3% to 89.4% and reduction in COD ranging from 93.1% to 98.3%. Particularly, the textile dye CN was removed up to 89% with high reduction in COD (94.7%). The microbial development stimulated by glucose achieved therefore efficiently the discoloration of contaminated solutions and pollutant degradation. The wastewater treatment using AS appears therefore suitable to the removal of different types of textile dyes before final discharge.

***KEYWORDS* :** Activated sludge; Aerobic bioreactor; Bioremediation; Degradation; Organic dyes.

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

229

GEOCHEMICAL AND MINERALOGICAL STUDY FOR THE PURPOSE OF THE CRYSTALLIZATION PROCESS OPTIMIZATION BY SOLAR ENERGY :
"IN THE CASE OF CHOTT MEROUANE EL-OUED" (ALGERIA)

BOUNOUALA Mohamed, REMLI Salim and TALHI Korichi

Mineral Processing and Environmental Laboratory, Department of Mines, Faculty of Earth Sciences, Badij Mokhtar University of Annaba,
E-mail: bounouala_fr@yahoo.fr, Mobile: +213.554.808.877

ABSTRACT

Extracting salt brines pumped from the Chott is realized by crystallization system in salt tables. Solar salt is crystallized through the evaporation of brine in the salt tables for an extended period (December to July), the climate of this region is arid. This affects the period of harvest: hardening of the layer of salt, evaporated by reason of the precipitation and drying at the end of crystallization. To resolve this behavior, it is imperative to know the geochemical and mineralogical characteristics Merouane of the salt and the influence of climatic conditions on the crystallization phenomenon solar. Thus, a geochemical and mineralogical contribution will allow us to harvest a bank of information to optimize the crystallization process and to improve the quality of the commercial product.

In order to achieve its objectives, development of a system of flat mirrors, reflections of solar radiation on salt tables will capture more solar energy and accelerate the crystallization process, brine, optimization of time stay is needed to better manage the flow of the salt harvest.

KEYWORDS : *El-Oued, Chott, Solar energy, Crystallization, Optimization, Recovery, Salt.*

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

230

USE OF ELECTROCOAGULATION WITH ALUMINUM ELECTRODES TO REDUCE HARDNESS IN TUNISIAN PHOSPHATE PROCESS MINING WATER

BRAHMI Khaled [a], Wided BOUGUERRA [a], BELHSAN Hamza [b], ELALOUI Elimame [b], LOUNGOU Mouna [c], TLILI Zied [d], HAMROUNI Béchir [a]

[a] U. R Traitement et Dessalement des Eaux, Département de Chimie,
Faculté des Sciences de Tunis, 2092 Manar II, Tunisie.
[b] U. R Matériaux, Environnement et Energie, Département de Chimie,
Faculté des Sciences de Gafsa, Campus Universitaire Sidi Ahmed Zarroug -2112 Gafsa, Tunisie.
[c] Groupe Chimique Tunisien, Usine de M'Dhilla Gafsa, Km. 14 Route M'Dhilla- 2100 Gafsa.
[d] Higher Institute of Business Administration of Gafsa, Campus Universitaire Sidi Ahmed Zarroug -2112 Gafsa, Tunisie.
Tel./ Fax: +21671871282; Corresponding author E-mail:khaled.brahmii@gmail.com

A B S T R A C T

Chemical treatment to reduce hardness is less common in industrial water treatment than in conventional municipal systems due to: (a) prolonged holding time requirements for magnesium and calcium precipitation; (b) encrustation of conduits and (c) the need to adjust hardness to meet the regulatory requirements. This study evaluates the performance of electrocoagulation using aluminum electrodes for removal of non-carbonate hardness in phosphate process water. Examination process parameters identified optimal conditions for hardness removal at pH 7, a NaCl concentration of 4 g L^{-1}, a current density of 22.2 mA cm^{-2}, an inter-electrode distance of 2 cm, a stirring speed of 450 revolutions per minute (revs/min), and treatment time of 30 min. The production of primary coagulant during electrolysis improved flotation of both calcite $CaCO_3$ and magnesium hydroxide $(Mg(OH)_2)$. Optimized hardness removal by the Tunisian Chemical Group (TCG) showed highly efficient hardness removal with an overall removal rate of 83.8 % at 30 min retention time.

KEYWORDS : Water treatment; Electrochemistry; Electrocoagulation; Hardness Removal; Optimization of electrocoagulation parameters.

The 5th Maghreb Conference on Desalination and Water Treatment "*CMTDE 2015*"
Hammamet,Tunisia 21-24 December, 2015

231

BALLASTED ELECTROFLOCCULATION :
AN INNOVATIVE WASTEWATER TREATMENT PROCESS

BRAHMI Khaled [a]*, BOUGUERRA Wided [a], LOUNGOU Mouna [b], HAMROUNI Béchir [a]

[a] U. R Traitement et Dessalement des Eaux, Département de Chimie,
Faculté des Sciences de Tunis, 2092 Manar II, Tunisie.
[b] Groupe Chimique Tunisien, Usine de M'Dhilla Gafsa, Km. 14 Route M'Dhilla- 2100 Gafsa.
Tel. / Fax: +21671871282; Corresponding author E-mail:khaled.brahmii@gmail.com

ABSTRACT

The ballasted electroflocculation combines two very efficient processes: the ACTIFLO and the electrocoagulation. This combination yields a new ultra clarification water treatment process. This study investigated the efficiency and cost-effectiveness of ballasted electroflocculation (BEF) parameters using aluminum electrodes to remove cadmium, zinc and hardness from synthetic as well as real industrial mining wastewater. The method works as weighted settling in conjunction with lamella settling. Based on an examination of the operation parameters one by one, the best removal rate of the target pollutants was obtained at water flow of 20 L h^{-1}, an optimal micro sand dose of 6 g L^{-1}, an optimal polymer concentration of 100 mg L^{-1}, a monopolar electrode connection, a number of electrodes equal to 10, a current density of 19 mA cm^{-2}, an agitation speed of 50 RPM, an initial pH of 7, and a sodium chloride (NaCl) dose of 2 g L^{-1} corresponding to a conductivity of 5.3 mS cm^{-1}. The best removal efficiency found was: Cd 99%, Zn 93%, Ca 87% and Mg 100%. The obtained optimum conditions simultaneously enabled the achievement of highly efficient removal with a significantly low operating cost of 0.2 TND m^{-3}, and low energy consumption of 0.5 kW h m^{-3}. The investigation of BEF process carried out in this work proposes a highly cost-effective wastewater treatment method if compared to other widely used technologies such as coagulation, ACTIFLO, and electrocoagulation.

KEYWORDS: Electrochemistry, **ballasted** electroflocculation; wastewater treatment; high-rate removal of pollutants; operating cost

ADSORPTION OF Cu(II) FROM AQUEOUS PHASE BY CEDAR BARK

HAMDAOUI Oualid *

Laboratory of Environmental Engineering, Department of Process Engineering, Faculty of Engineering, Badji Mokhtar –
Annaba University, P.O. Box 12, 23000 Annaba, Algeria
E-mail : ohamdaoui@yahoo.fr

ABSTRACT

The capability of Cedar bark (Cedrus atlantica Manetti) (CB) for the adsorption of Cu(II) from aqueous solutions was examined. Adsorption isotherm and kinetics of Cu(II) by CB were investigated through a number of batch adsorption experiments. The effect of experimental parameters such as initial Cu(II) concentration, adsorbent mass, initial pH and ionic strength on the removal of metal ions was examined. Equilibrium data were fitted to the Langmuir, Freundlich and Harkins-Jura isotherm models. Experimental equilibrium data were best represented by the Langmuir and Harkins-Jura isotherms. The findings revealed that the CB has the potential to be used as an adsorbent for the removal of heavy metal ions from aqueous solutions.

KEYWORDS : *Adsorption; Copper(II); Cedar bark; Kinetics; Equilibrium*

MODIFICATION OF CMX ION EXCHANGE MEMBRANE : EFFECT OF TEMPERATURE ON ION EXCHANGE EQUILIBRIUM

CHAABOUNI Akram, GUESMI Fatma, HARBI Soumaya,HANNACHI Chiraz, HAMROUNI Béchir

UR Dessalement et Traitement des Eaux (UR11ES17), Faculté des sciences de Tunis, Université de Tunis El Manar2092 Manar II, Tunisia, Tel/Fax. +216(71)871282,

E-mail: **Akrem__@hotmail.fr**

ABSTRACT

In order to improve the selectivity of cation exchange membrane CMX, a polyethyleneimine (PEI) layer was adsorbed on its surface. Ion exchange isotherms for the binary systems (Na^+/K^+), (Na^+/Ca^{2+}) and (K^+/Ca^{2+}) were established for the modified and unmodified membrane. All experiments were carried out at constant concentration of 0.1 $mol.L^{-1}$ and at different temperatures (from 283 to 313 K). Obtained affinity order is : $K^+ > Na^+ > Ca^{2+}$, selectivity coefficients $K_{Na^+}^{K^+}$, $K_{2Na^+}^{Ca^{2+}}$ and $K_{2K^+}^{Ca^{2+}}$ and thermodynamic equilibrium constants for the binary systems for the modified membrane were determined and found to increase with increasing temperature . These results were compared with those obtained with the unmodified membrane. Thermodynamic equilibrium constants $K_i^{\circ j}$, standard free energy ΔG_T°, standard enthalpy change ΔH_T° and standard entropy change ΔS_T° were calculated.

KEYWORDS : Modification. Ion exchange membrane. Polyethylenimine. Response surface methodology. Selectivity coefficient. Binary system isotherm

INVESTIGATION OF THE OPERATIONAL PARAMETERS ON HUMIC ACID REMOVAL FROM WATER BY ELECTROCOAGULATION

BARHOUMI Afef [a*], BOUGUERRA Wided [b], NCIB Sana [a], ELALOUI Elimame[a,].

[a] *U. R Matériaux, Environnement et Energie (ME2) (UR 14 ES26) , Département de Chimie,*
Faculté des Sciences de Gafsa, Campus Universitaire Sidi Ahmed Zarroug -2112 Gafsa, TUNISIE.
e-mail : limam_aloui@yahoo.fr
*e-mail : afefebarhoumi@yahoo.fr
[b] *U. R Traitement et Dessalement des Eaux, Département de Chimie,*
Faculté des Sciences de Tunis, 2092 Manar II, TUNISIE
e-mail : bg_Wided@yahoo.fr

ABSTRACT

Humic substances compose the major fraction of natural organic matters (NOMs) present in surface or ground waters. One of the most common organic pollutants is the humic acid (HA). HA can cause color, taste and odor of water. Also the presence of humic substances results in a decrease of adsorbent capacity due to the competitive adsorption or formation of a complex.

The purpose of this study is to evaluate the treatability of synthetically prepared humic acid solution by electrocoagulation (EC) process using aluminum electrodes. The effect of the main parameters such as the initial pH, conductivity ,electrolysis time, current density , electrode gap, area volume ratio, stirring speed, energy consumption and connection mode were evaluated. Experimental results showed that optimal humic acid removal was obtained after 10 min of electrolysis with the following optimum conditions: pH= 4, a current density =1.39 mA cm^{-2}, an inter-electrode distance = 1 cm, Na_2SO_4 concentration = 1g L^{-1}, area volume ratio =7.2 m^{-1}, stirring speed = 300 rev/min and monopolar connection. Using these optimal operating conditions a removal percentage up to 98 % could be achieved with very low power consumption. The present study proves that the optimization of both electrocoagulation chemical parameters and reactor design provide cost competitive investment and a great removal efficiency of humic acid.

KEYWORDS : Electrochemistry; Electrocoagulation; Humic Acid removal; aluminium electrodes.

RECOVERY OF COPPER IONS BY SUPPORTED LIQUID MEMBRANE (SLM) EXTRACTION

NCIB Sana[a], BOUGUERRA Wided[b], BARHOUMI Afef [a], ELALOUI Elimam[a].

[a] U. R Matériaux, Environnement et Energie (ME2) (UR 14 ES26) , Département de Chimie,
Faculté des Sciences de Gafsa, Campus Universitaire Sidi Ahmed Zarroug -2112 Gafsa, TUNISIE.
e-mail : limam_aloui@yahoo.fr
[b] U. R Traitement et Dessalement des Eaux, Département de Chimie,
Faculté des Sciences de Tunis, 2092 Manar II, TUNISIE
e-mail : bg_Wided@yahoo.fr

ABSTRACT

This work deals with the liquid–liquid extraction and the facilitated transport through a supported liquid membrane (SLM) system of aqueous copper solution using di(2-ethylhexyl)phosphoric acid (D2EHPA) as carrier dissolved in chloroform. Copper has been quantitatively extracted from aqueous solutions through a polytetrafluoroethylene (PTFE) membrane.

The important operational variables affecting the facilitated transport of copper through the SLM system studied are concentration of D2EHPA (in membrane), feed phase pH and initial Cu(II) concentration. The extracted Cu(II) was stripped from the membrane phase using different phases: deionizer water, H2SO4 (1M) and EDTA.

It has been observed that Cu(II) flux across the membrane tends to increase with the concentration of copper ions. The optimum conditions for Cu(II) transport are: feed phase pH of 4.5 and a D2EHPA concentration of 5.10–2 mol L-1. At optimal conditions the stability of the liquid membrane was found to be one cycle (24h) with rising transport ability.

KEYWORDS: supported liquid membrane, copper, extraction, D2EHPA, transport ability.

*The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

236

APPLICATION OF DOEHLERT EXPERIMENTAL DESIGN TO AN ANIONIC MEMBRANE MODIFICATION BY ELECTRODEPOSITION

ARFAOUI Maroua, OUEJHANI Ali, HAMROUNI Béchir

Desalination and water Treatment Research Unit (UR11ES17), Faculty of Sciences of Tunis,
Tunis El Manar University, El Manar II, 2092, Tunisia.
E-mail : Maroua.arfaoui1@gmail.com

ABSTRACT

The aim of this work is to study the modication of an anionic membrane by fixation of polyethyleneimine (PEI) on its surface. This fixation was carried out under an electric field effect, thus it is called electrodeposition. Optimization of different parameters affecting the modification process such as the current intensity, concentration of PEI and the time of electrodeposition was investigated with the Doehlert exprimetal design involving response surface methodology (RSM). Besides reducing the number of experiments, this approach allowed optimal experimental conditions to be chosen : current intensity (20mA), concentration of PEI (1.5g·L) and temps (30 min).

KEYWORDS : electrodeposition, anionic membrane, Doehlert exprimetal design, polyethyleneimine (PEI).

STUDY OF THE IMPACT OF MINE WASTE ON THE GROUND, AND SURFACE WATER SULFUR CONTAMINATION AS A RESULT OF ACID MINE DRAINAGE (AMD). IN THE CASE OF CHAABET EL HAMRA MINE– ALGERIA

BOUKELLOUL Mohamed Laid[1], BOUNOUALA Mohamed[1], TALHI K[1] , IDRES Abdelaziz [1] , GADRI Larbi[2]

[1]Laboratory of Mineral Processing Resources and Environment, University Badji Mokhtar, BP 12, 23000, Annaba, Algeria.
[2] Laboratory of Mines, University of Tebessa, Algeria
E-mail : mboukelloul@yahoo.fr

ABSTRACT

The mining generates major mining waste containing sulfur and heavy metals, minerals that may be the source of contamination of ground and surface water. The main impact of the extraction of the ore types that affects the quality of water is the phenomenon of acid mine drainage. This is a natural process where acid is produced when the sulfide in the rock is exposed to air and water. This seriously degrades the quality of the water, destroys aquatic life and makes the water virtually unusable. If security and technology measures are not taken into account for this purpose the environment will be affected. In this article, an application is considered. It relates to the impact of mining waste on water quality in the underground mine Chaabet El Hamra (Algeria). The methods used are filtration of mining waste, neutralization by adding lime and recovery of mining waste against oxidation. The results obtained have allowed us to protect the environment against any water contamination in the case of the studied mine.

KEYWORDS : Mine Chaabet El Hamra, desulphurization methods, neutralization, Recovery, Environment.

MULTI-OBJECTIVE OPTIMIZATION OF OPERATING PARAMETERS OF A MSF-BR DESALINATION PLANT USING PARETO-OPTIMALITY

BEN ALI Mongi *, KAIROUANI Lakdar

Université de Tunis El Manar, Ecole Nationale d'Ingénieurs de Tunis,
05/UR/11-14 Unité de Recherche Energétique et Environnement,
Tunis Belvédère, BP 37, 1002, Tunisie
Tel. +216 98 823 114;
Email: mongibenali2000@yahoo.fr

ABSTRACT

Multi-Stage Flash (MSF) desalination process is energy intensive and it is, therefore, essential to search for operating the plant at its optimum parameters which lead to reduction of energy consumption and consequently lower water production cost.

In this study, we used a solver optimization tool of Matlab software, for optimization of operating parameters of recirculation multi-stage flash (MSF-BR) desalting plant, taking in consideration the change of brine heater fouling factor and seasonal variation of seawater temperature. The solver uses genetic algorithms for solving multi-objective optimization problems. The operating variables over which optimization was carried out are the make-up flow rate, the cooling seawater flow rate, the brine recycle flow rate and the steam temperature. The optimization method and results analysis are based on actual plant data that includes 10 desalting units, each of 16 flashing stages and a nominal capacity of 26 700 m^3/d.

Three objectives were considered in this optimization approach. The first is to maximize the fresh water capacity of the installation. The second is to minimize the heating steam flow rate in order to reduce the thermal energy consumption, and the third is to minimize the sum of flow rates of main pumps of the unit production in order to reduce the electric energy consumption. The expressions of the first two objective functions are obtained using response surface methodology (RSM). Solving the optimization problem has led to obtaining a set of Pareto optimal solutions, which defining various combinations of the optimal operating parameters of a each MSF-BR desalination plant unit, and thus leading to optimal plant operation policy for the whole year.

DYNAMIC BIOSORPTION OF METHYLENE BLUE BY MELON PEEL IN FIXED-BED COLUMNS

KHERRAT Rochdi *, HAMDAOUI Oualid, DJELLOUL Chawki

Laboratory of Environmental Engineering, Department of Process Engineering, Faculty of Engineering, Badji Mokhtar –
Annaba University, P.O. Box 12, 23000 Annaba, Algeria
E-mail : rkherrat@yahoo.fr

ABSTRACT

The dynamic biosorption of methylene blue (MB) by melon peel (MP) was studied in packed bed columns. The values of column parameters were predicted as a function of flow rate and initial dye concentration. On evaluating the breakthrough curves, the biosorption isotherms of MB by MP were experimentally determined in batch conditions by using the Langmuir, Freundlich, and the Temkin equations. The Langmuir model was found to fit the biosorption isotherm data well with a maximum biosorption capacity of 333.33 mg/g at 25°C. A series of column tests using MP as a low-cost and non-conventional biosorbent were performed to determine the breakthrough curves with varying initial dye concentrations and volumetric flow rates. High bed height, low volumetric flow rate and high initial dye concentration were found to be the better conditions for maximum dye biosorption. To predict the breakthrough curves and to determine the characteristic parameters of the column useful for process design, four kinetic models namely Bohart and Adams, Clark, Wolborska, and Yoon and Nelson were applied to experimental data. All models were found suitable for describing the whole, or a definite part of the dynamic behavior of the column, with respect to volumetric flow rate and initial dye concentration. The initial segment of the breakthrough curve was not well fitted by the Wolborska model, while the whole breakthrough curve was well predicted by the Bohart and Adams, Clark, and the Yoon and Nelson models. This work revealed that MP can be successfully employed as a biosorbent for dye removal from wastewaters.

KEYWORDS : *Methylene blue; Dynamic biosorption; Fixed bed; Melon peel; Modeling*

ENZYMATIQUE TRAITEMENT OF DIRECT YELLOW 106 BY PURIFUD PEROXIDASE OF CUCURBITA PEPO

BOUCHERIT Nabila[a,c], ABOUSEOUD Mahmoud[a,b], ADOUR Lydia[c], Tandjaoui Nassima[a]

[a] Laboratoire de Biomatériaux et de Phénomènes de Transports, Université Dr. Yahia Fares, Médéa, Algérie

[b] Laboratoire de Génie de la réaction- Faculté Génie des procédés et génie mécanique- USTHB-Alger,Algérie

[c] Université Mouloud Mammeri de Tizi-Ouzou, Algérie.

E mail address : na_boucherit@yahoo.fr

ABSTRACT

In this study, the objective is to shown the efficiency of a new C-peroxidase extracted from a local source of zucchini (cucurbita pepo) in treatment of direct yellow 106. The extracted peroxidase was partially purified using precipitation by acetone method and purified by size-exclusion chromatography G100 Sephadex. Activity of free and immobilized C-peroxidase was assessed by employing 4-aminoantipyrene method involving colorimetric estimation using phenol and hydrogen peroxide as substrates and 4-aminoantipyrene as chromogen.

The specific enzyme activity were 1.12 IU.mg^{-1} and 2.01 IU.mg^{-1} for purified and partially purified peroxidase respectively. The C-peroxidase used in treatment of direct dye was in two form: free and immobilized in beads of calcium alginate.

The optimal conditions for immobilization of C-peroxidase in Ca-alginate were identified. The immobilization was optimized at 2%(w/v) of sodium alginate and 0.2 M

of calcium chloride. The optimization of treatment parameters, indicate that at pH 2, dye concentration: 30 mg/L (for FCP) and 80 mg/L (for ICP), hydrogen peroxide dose: 10 mM (for FCP) and 5mM (for ICP) the decolourization by free and immobilized C-peroxidase were 97% and 37 % respectively. After optimization of parameters, contact time is reduced for free peroxidase from 30 min to 5 min and for immobilized form from 60 min to 15 min.

The degradation pathway and the metabolic products formed after the degradation were also predicted using UV–vis and FTIR spectroscopy analysis.

KEY WORDS: C-peoxydase, purification, direct yellow 106, decolourization.

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet,Tunisia 21-24 December, 2015

241

EVALUATING THE ADSORPTIVE CAPACITY OF SMECTITE LOCAL CLAY ON THE REMOVAL OF SEVERAL PHARMACEUTICAL PRODUCTS IN AQUEOUS SYSTEMS

GHORBEL-ABID Ibtissem [1,2], **KHAZRI Hassen** [1,2], **WESLATI Najoua** [2], **BOUBAKRI Saber** [2], **TRABELSI-AYADI Malika** [2]

[1]- *Laboratoire Méthodes et Techniques d'Analyse (LMTA).Institut National de Recherche et d'Analyse Physico-chimique (INRAP) Tunisie. e-mail: ibtissem.gh.ab@gmail.com*

[2]- *Laboratoire des Applications de la Chimie aux Ressources et Substances Naturelles et à l'Environnement (LACReSNE). Faculté des Sciences de Bizerte. (Université de Carthage) Tunisie. E-mail : malikatrabelsi_ayadi@yahoo.fr*

ABSTRACT

The aim of this study was to evaluate the effectiveness of the Tunisian clay from Sejnène (denoted ASJ) in the retention of four pharmaceuticals in waste water: Doxycycline (DOX), the oxytetracycline (OTC) and the associated trimethoprim and sulfamethoxazole (TMP - SMX). It is particularly studying the adsorption by the kinetic and equilibrium parameters in aqueous solutions prepared from the products separately. The clay Sejnène, was chosen because it belongs to the family of smectites, known for its swelling properties and its phase separation character, its good cation exchange capacity and the large specific surface developed in an aqueous medium.

The clay was characterized using several analytical techniques.
All adsorption experiments were carried out both on the raw clay (denoted ASJb) as its purified fraction (denoted ASJp), depending on the parameters involved in this phenomenon, such as retention time, temperature, pH , concentration.

KEYWORDS : Adsorption, Clay, Doxycycline, Oxytetracycline, Trimethoprim, Sulfamethoxazole

ION EXCHANGE EQUILIBRIUM OF MAJOR INORGANIC CATIONS (Na^+, K^+ AND Ca^{2+}) ON DOWEX 50W×8 RESIN : EFFECT OF IONIC STRENGTH

HARBI Soumaya, GUESMI Fatma [*], CHAABOUNI Akrem, HANNACHI Chiraz and HAMROUNI Béchir

U. R. Desalination and Water Treatment (UR11ES17), Faculty of Sciences of Tunis,

University of Tunis El Manar 2092 Tunis, Tunisia

Tel/Fax. +216(71)871282 ; e-mail : [*]guesmi_fatma@yahoo.fr

ABSTRACT

Ion exchange process is one of the most venerable desalination concepts. In this work, ion exchange equilibrium was studied between the cation exchange resin Dowex 50W ×8 and electrolytes solutions containing the most dominant cations of natural water (K^+, Na^+ and Ca^{2+}) at different ionic strength (I = 0.1, 0.3 and 0.5 M). The surface condition and functional groups of the resin was examined with FT-IR spectrum and the ion exchange capacity was determined by French standard NF X 45–200. Ionic selectivity was estimated from the ion exchange isotherms for the binary systems (Na^+/K^+), (K^+/Ca^{2+}) and (Na^+/Ca^{2+}). The affinity order was investigated for the studied ionic strength at 298 K. at I = 0.1 M this order is: $K^+ > Ca^{2+} > Na^+$. For I = 0.3 M and I = 0.5 M, the Dowex 50W×8 resin has a greater affinity for sodium. Selectivity coefficients $K_{Na^+}^{K^+}$, $K_{2K^+}^{Ca^{2+}}$ et $K_{2Na^+}^{Ca^{2+}}$, separation factors and thermodynamic constants of ion exchange were calculated and influenced simultaneously with ionic strength.

KEYWORDS: affinity order, ion exchange isotherm, ionic strength, selectivity coefficient.

REMOVAL OF FLUORIDES BY ADSORPTION ONTO THE MODIFIED AFN MEMBRANE

GUESMI Fatma [1],*, HANNACHI Chiraz [1], HAMROUNI Béchir [1]

[1] UR11ES17 Desalination and Water Treatment, Faculty of Sciences of Tunis, University of Tunis El Manar, 2092 Tunis Tunisia. Tel/Fax. +216(71)871282

* Corresponding author. E-mail address: guesmi_fatma@yahoo.fr

ABSTRACT

Water and groundwater contain various pollutants and several other substances are dissolved in it. Their concentration is useful for human body but in a specific limit. Fluoride is one of these pollutants and it has been recognized as one of the serious problems worldwide. Although highly beneficial for dental health, low concentrations of fluoride in environmental waters may be toxic to several organisms. Several processes were used to remove fluoride from water, among them adsorption process is simpler and effective for fluoride removal

The main purpose of this work was to determine adsorption characteristics of fluoride, on the modified AFN membrane. The studied anion exchange membrane was modified by adsorption of polyethyleneimine (PEI) on its surface. The sorption isotherms for fluoride ions on the modified AFN membrane were investigated in the range (0.05-1mol L^{-1}) at 283, 298 and 313 K. The suitability of the Langmuir, Dubinin–Astakhov and Redlich-Peterson adsorption models to the equilibrium data was investigated. The sorption parameters of the studied models were determined by non-linear regression. The equilibrium data obtained in this study were found to follow Dubinin–Astakhov adsorption isotherm. Obtained results were compared with those obtained with the unmodified AFN membrane. In fact, the adsorption capacities of fluorides were found to be increasing after modification of the surface of the AFN membrane. Indeed, at 298 K, for the modified AFN membrane the maximum adsorption capacities of fluoride was 5.28 mmol.g^{-1}, while for the unmodified AFN membrane the adsorption capacities were found to be 1.51 mmol.g^{-1}. According to these results, removal of fluoride ions by adsorption on the modified AFN membrane was more effective than the adsorption on the unmodified one, which can be attributed to the layer of polyethyleneimine adsorbed on the surface of the AFN membrane. The effect of temperature on the adsorption of fluorides has been attempted. It was found that the adsorption of fluoride ions increase with rise in temperature. Thermodynamic parameters of the adsorption process have been determined.

KEYWORDS **:** Adsorption isotherm models, Fluoride, Modified AFN membrane, Polyethyleneimine, thermodynamic parameters.

REMOVAL OF BORON FROM GEOTHERMAL WATER BY REVERSE OSMOSIS AND OTHER PHYSICO-CHEMICAL PROCESSES

KHERIJI Jamel, LOUATI Islem and HAMROUNI Béchir

U. R. Desalination and Water Treatment (UR11ES17), Faculty of Sciences of Tunis,
University of Tunis El Manar 2092 Tunis, Tunisia

ABSTRACT

Boron removal from geothermal water was studied using reverse osmosis membrane. Under normal operating conditions, boron removal efficiency cannot exceed approximately 50%. Other physic-chemical processes, such as complexation, precipitation, ions exchange and adsorption, are coupled with RO process to improve the water quality and to reduce the boron concentration in geothermal water. Based on these different applications, the improved performance of boron removal has been observed.

KEYWORDS : Boron, geothermal water, reverse osmosis, complexation, precipitation, adsorption, ions exchange

SIMULTANEOUS ADSORPTION OF Cr (VI) IONS AND PHENOL ONTO GRANULAR ACTIVATED CARBON: ARTIFICIAL NEURAL NETWORK MODELING AND CENTRAL COMPOSITE DESIGN OPTIMIZATION

TABASSI Dorra, HARBI Soumaya, HAMROUNI Béchir

Desalination and Water Treatment Research Unit (UR11ES17), Faculty of Science of Tunis, University of Tunis El Manar , 2092 manar II, Tunisia Phone: Tel./Fax: + 216 71 871 282

ABSTRACT

The simultaneous adsorption of Cr (VI) ions and phenol, which are frequently encountered together in wastewaters, onto granular activated carbon was investigated. The adsorbent was characterized using FTIR and determination of point of zero charge (pHpzc) and surface function. The optimization of adsorption process was developed using central composite design (CCD) combined with response surface methodology (RSM) and artificial neural network (ANN). The input variables are pH, adsorbent dose, initial Cr (VI) concentration and phenol concentration. The adsorption capacity of Cr (VI) ions and phenol are the responses. The results of analysis of variance (ANOVA) identified the significance of various factors and their interaction. Both RSM and ANN results reveal the goodness of fit between the experimental data and the predicted value. Adsorption of Cr (VI) ions and phenol was affected by ionic strength. The potential of applicability of the adsorption process in treatment of real wastewater was evaluated by investigating the simultaneous adsorption of Cr (VI) ions and phenol onto activated carbon at optimum conditions.

KEYWORDS : Simultaneous adsorption, Phenol, Cr(VI) ions, Granular activated carbon, Central composite design, Artificial neural network, Optimization

BORON REMOVAL FROM BRACKISH WATER BY ION EXCHANGE RESIN

DHAOUADI I., JANDOUBI M., JOUINI M., BEN AMOR T., ELFIL H.

Laboratoire de Traitement des Eaux Naturelles (LabTEN) ; Centre de Recherche et des Technologies des Eaux
Technopole de Borj-Cédria
E-mail : elfilhamza@gmail.com

ABSTRACT

Reverse osmosis (RO) membrane desalination process is an efficient and reliable technology for the production of drinking water from seawater. However, some serious limitations have been discovered during field practice. Boron problem belongs to one of them. Among several methods of boron removal from aqueous solutions, the use of boron selective resins seems to be on the top of industrial interest.

The objective of this study is to explore the performance of the boron selective ion exchange resins (amberlite 743) for boron removal from brackish water prepared synthetically, and where the amounts of boron vary from 5 to 100 mg/L. The efficiency of boron removal was investigated with respect to several key experimental parameters, including the pH of the solution, the boron initial concentration, the temperature, ionic strength, contact time and pumping rate.

Experimental results showed that the efficiency of adsorption is obtained at 20min. The proportion of removed boron increased with increasing pH. Indeed, when pH>8, the abatement rate is around 90%. At neutral pH, It was showed that only high temperature had significant effects on the percent of total boron removal, that reaches 86 %at 60°C.A concentration of 12g/L of NaCl at (pH = 8), reduces the boron abatement rate to 40% while it was 73% when an amount of 1g/L NaCl is tested.

Experimental data in batch reactor reveals that low pumping flow rates (2mL/min) achieved better performance of boron adsorption, therefore, high boron elimination ratio (up to 90%).Optimized parameters under static mode have been transposed in batch reactor to study the adsorption kinetics which adopted the pseudo-second order. The adsorption isotherm imitates the model of Frendlich.

KEYWORDS : boron, adsorption, amberlite resin, reverse osmosis, Frendlich model.

EXPERIMENTAL STUDY AND MATHEMATIC SIMULATION OF DEHP CONCENTRATION PROFILES IN A SOLID PVC DISCS MATRIX DIPPED IN METHANOL.

TOUBAL Abd-El-Aziz [1], FERTIKH N. [2] and MESSADI Djelloul [1]

Laboratory of Environmental and Food Safety, BADJI Mokhtar University, B.P. 12, 23000, Annaba, Algeria-
E-mail: n_fertikh@yahoo.fr

A B S T R A C T

The evolution of concentration profiles of di-(2 ethylexyl) phthalate developed through a PVC disc, in long time contact with methanol, was followed experimentally by using a peeling method in conjonction with gas chromatography quantization of plasticizer (recovered by dissolution/precipitation method) for different times and x values of abscissa along the thickness of the disc. A self-consistent theoretical model, adapted by neglecting the small amounts of methanol transferred into the polymer matrix, was found to be available for determining the plasticizer concentration profiles, which integration provided correct values for plasticizer masses transferred, in methanol, at equilibrium.

KEY-WORDS : DEHP dispersed in a PVC disc - Kinetics of transfer in methanol -

Phenomenological study - Mathematical model - Numerical resolution.

POLYCHLORINATED BIPHENYLS IN GROUNDWATER OF GROMBALIA : OPTIMIZATION OF ANALYTICAL PROCEDURES, VALIDATION AND ANALYSIS BY GAS CHROMATOGRAPHY COUPLED WITH ELECTRON CAPTURE DETECTOR

ATTAYAT Ameni [1,2], KHADHAR Samia [2], OUESLATI Fethi [1], MZOUGHI Nadia [3]

1.   Natural Water Treatment Laboratory , Water researches and Technologies Centre of Borj Cedria (CERTE), Technopark of Borj Cedria , 8020 Soliman , Tunisia

2.Georesources Laboratory, Water researches and Technologies Centre of Borj Cedria (CERTE), Technopark of Borj Cedria , 8020 Soliman , Tunisia

3. Higher Institute of Sciences and Technologies of environment of Borj Cedria, University of Carthage, Tunisia

ABSTRACT

Polychlorinated Biphenyls (PCBs) are one class of persistent organic polluants. PCBs in recent decades have attracted the attention of scientific and policy maker communities due to their persistence, their capacity to bioaccumulation in the food chain and their toxic properties. To our knowledge, this work is the first study about contamination of the groundwater by PCBs in Tunisia. An efficient method was developed for the analysis of selected PCBs in groundwater sample taken from the region of Grombalia. Optimization of PCBs extraction was performed with applied the experimental design of Dohlert with two factors, solvent and number of extractions. Analysis of PCBs was performed with gas chromatography coupled with electron capture detector (GC-ECD) with an optimization of temperature program. Results shows that the optimal temperature program was obtained with a starting temperature of 160 °C up to 280°C during 10 min with a rate of 4 °C min-1 and the optimal condition of extraction was obtained with a mixture of hexane/ether (75/25%) and a three time extractions. The optimized method has been applied to the analysis of the PCBs in 9 groundwater samples collected from the region of Grombalia. Concentrations of PCBs obtained varied between 5,2 $\mu g.L^{-1}$ and 169 $\mu g.L^{-1}$. However, the maximum acceptable concentration (MAC) recommended by EPA is 0.5$\mu g.L^{-1}$ with a detection limit (LD) ranged between 0.05 to 1.9 $\mu g.L^{-1}$.

KEY WORDS : liquid-liquid extraction, Gaz chromatography coupled with ECD, PCBs, experimental design of Dohlert, groundwater of Grambalia.

REMOVAL OF DYES FROM AQUEOUS SOLUTIONS BY ADSORPTION ON THE SHRIMP CARAPACE

OULD BRAHIM I. [(1)], **BELMEDANI M.** [(1)], **BELGACEM A.** [(1)], **HADOUN H.** [(2)]

[(1)]Laboratory of transfer phenomena, Faculty of Mechanical and Processes Engineering,
University of Sciences and Technology Houari Boumediene, BP n°32 El Alia bab ezzouar 16111 Algiers, Algeria
[(2)] Nuclear Research Center, 2 Bd Frantz Fanon, Algiers, Algeria
E-mail : mbelmedani@usthb.dz , m_belmedani@yahoo.fr

ABSTRACT

We propose in this study to remove textile dye: green methyl dye by adsorption. As adsorbent, the powder shrimp carapace was used, which is low-cost, abundantly available, highly efficient, and has been reported as an alternative to the current expensive methods. Adsorption experiments were performed at ambient temperature 25°C. Series of 50 mL volumetric flasks containing 30 mL of dye solutions at different concentration were employed at desired pH. The dye solution pH was adjusted with NaOH (0.1 N) or HCl (0.1 N) to desired initial pH prior to the experiment. A specific amount of adsorbent with particular particle size (between 50 and 800 μm) was added into each flask and was agitated at 100 rpm, until the equilibrium was reached and then centrifugated at 7000 rpm for 30 min. The sample was collected and diluted before analysis using UV-visible spectrophotometer at wave length of 633 nm.

Adsorption isotherm plays a crucial role in the predictive modeling procedures for the analysis and design of an adsorption system. Thus, the correlation of the equilibrium data by theoretical or empirical equations is essential to practical operation... In this study, adsorption isotherms were analysed according to the linear form of Langmuir, Freundlich and Dubinin-Radushkevich (D-R) isotherms.

Powder of shrimp carapace is an effective adsorbent for the removal of green methyl dye from aqueous solutions. According to the experiments results, the equilibrium was achieved within 112 min of contact time. The adsorption capacity of green methyl dye onto powder of shrimp carapace is high by using basic solutions (pH up to 8). Langmuir, Freundlich and Dubinin-Raduchkevich isotherm models were applied to describe the experimental data. The Langmuir adsorption isotherm was found to provide the best fit of the experimental data. Maximum adsorption capacity was evaluated at 76, 336mg.g^{-1}. The results of the present study suggested that shrimp carapace could be suitable as a sorbent material for removal of dyes from aqueous solutions.

KEYWORDS : Water treatment ; cationic dye ; methyl green ; shrimp carapace ; adsorption isotherms ; kinetic modelling.

The 5th Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"
Hammamet,Tunisia 21-24 December, 2015

250

MODELLING OF WATER DESALINATION BY ELECTRODIALYSIS PROCESSES

GMAR Soumaya [a], CHAGNES Alexandre [b*], BEN SALAH SAYEDI Ilhem [a], FAUVARQUE Jean-François [c], TLILI Mohamed [a], BEN AMOR Mohamed [a]

(a) Laboratory of Natural Water Treatment, Center of Researches and Water Technologies,P.B 273, 8020 Soliman, Tunisia
(b) PSL Research University, Chimie Paristech - CNRS, Institut de Recherche de Chimie Paris, 11 rue Pierre et Marie Curie, 75005 Paris, France.
(c) Laboratoire d'électrochimie industrielle, Conservatoire National des arts et Métiers (CNAM) de Paris, 2 rue Conté, 75003 Paris, France

ABSTRACT

Water desalination was performes by electrodialysis (ED) in batch recirculation mode by means of cationic and anionic membranes containing sulfonate and ammonium groups, respectively. Variations of sodium chloride (NaCl) concentration in diluate vs. time during ED experiments were recorded at different voltages, flow rates and feed concentration. A kinetic model was developed to describe the variation of NaCl concentration in diluate as a function of time, flow rate, voltage, channel length and thickness of dilute compartment in electrodialyser. A good agreement is found between experimental data and the model.

KEYWORDS: Electrodialysis; Desalination; NaCl; Modelling

DESSALEMENT PAR COMPRESSION DE VAPEUR

SELLAMI Ahlem, KAIROUANI Lakdar

UR Energétique & Environnement
Ecole Nationale d'Ingénieurs de Tunis
Université Tunis ElManar
E-mail : ahlem.sellami@yahoo.fr

RÉSUMÉ

Les techniques de dessalement thermiques sont opérationnelles depuis de nombreuses années, c'est pourquoi il existe plusieurs techniques qui sont améliorées au cours des années: on peut citer multi-stages flash (MSF), distillation à multiples effets (ME où MFD), la compression de vapeur (VC), distillation solaire…..

Le dessalement par compression de vapeur (TVC) réside dans le fait que l'eau de mer est évaporée à partir des rejets thermiques après avoir été préchauffée dans un échangeur récupérateur de chaleur (condenseur), la vapeur produite est comprimée (donc sa température et sa pression augmentent) dans un thermo-compresseur (éjecteur) après avoir été débarrassée des gouttelettes entrainées par un séparateur, par la suite la vapeur se condense à partir d'une source froide et on obtient l'eau douce.

Notre but est l'étude des performances de cycle combiné TVC-ORC, ce cycle est composé des deux sous systèmes : un cycle Rankine organique et un système de dessalement par compression thermique de vapeur.

Ce système proposé est basé sur un apport d'énergie thermiques ; ce qui peut être à partir des déchets des sources de chaleur, de l'énergie solaire où géothermique. Le cycle ORC fournit la puissance pour le système de dessalement et donc élimine la nécessité de l'électricité supplémentaire.

*The 5*th* Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

252

THERMAL DESALINATION PROCESS COMBINED WITH ORGANIC RANKINE CYCLE

TOUJENI Noureddine, KAIROUANI Lakdar

UR Energétique & Environnement
Ecole Nationale d'Ingénieurs de Tunis
Université Tunis ElManar
E-mail : toujenisebti@gmail.com

ABSTRACT

The main purpose of this study is to analyze the performance of a new system which is combined Rankine-vapour compression cycle for cogeneration of electricity and refrigeration system so it can be used for water Desalination Sea, simply make the open ORC cycle. This system uses a low-temperature heat source such as solar energy, industrial waste heat and biomass. Particular attention is paid to the effects of system parameters, including the evaporation temperature, mass flow, temperature and pressure of the hot source of system performance, such as refrigeration capacity, the network efficiency Thermal and COP. The coefficient of performance resulting will be compared with other cooling systems and power system, such as the ORC system or the system turboconpressor Rankine

The 5th *Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

253

REVERSE OSMOSIS DESALINATION PROCESS COMBINED WITH SOLAR ORGANIC RANKINE CYCLE

HAMDI Besma, KAROUANI Lakdar

UR Energétique & Environnement
Ecole Nationale d'Ingénieurs de Tunis
Université Tunis ElManar
E-mail : basma_hamdi09@live.fr

ABSTRACT

In this paper, we will focus on power plants working with Organic Rankine Cycle to generate electricity and use it eventually to desalinate water. This work design and performance calculations are using Fortran/ Refprop computational environment. A small scale solar collector is used to collect the solar radiations. The cycle is composed of solar thermal collector for heat input, expansion turbine for work output, condenser unit for heat rejection, pump unit, and Reverse Osmosis (RO) unit. Performance evaluation has been proceeded on three working fluids which are isobutane, R123, R245fa.

CONTRIBUTION TO THE CLARIFICATION OF SURFACE WATER FROM TUNISIAN CACTUS: CASE WATER DAM OF OUED EL KEBIR IN ZAGHOUAN, TUNISIA

LASSOUED BEN MILED Ghofrane, DJOBBI Bouthaina, BAOUAB Mohamed Hassen, BEN HASSEN Rached.

UR11ES25 Chimie des Matériaux et de l'Environnement, ISSBAT, Université de Tunis El Manar, Tunisie.

E-mail : Ghofrane.benmiled@issbat.rnu.tn

ABSTRACT

The study of the effects of some experimental factors on water dam clarification process of Oued el Kebir, from governorate of Zaghouan in Tunisia, was achieved through the use of indigenous biocoagulant as cladodes Cactus Opuntia ficus indica (OFI). Cactus is used as an alternative to chemical coagulants and flocculants such as aluminum sulfate, ferric chloride or polyelectrolytes. A set, (k = 4), of, qualitative and quantitative potentially influential, input variables has been selected for a screening study. Coagulant mass, coagulant type, initial turbidity and pH are the four factors used in the Hadamard matrix $2^4 // 8$ carried in 8 experiments. Experimental responses studied are coagualtion activity before and after filtration. The design of experiments allowed us to obtain acceptable quality information by varying the factors at a time in few experiments. The results show that the OFI cladodes can be considered as perspective in sustainable development in rural areas where access to drinking water can be a major obstacle to their development.

EFFECT OF FOREIGN IONS ON BORON DETERMINATION IN TUNISIAN BRINES

[1]BEN KHALIFA E., [2]HAMMI H., [2] TRABELSI K., [1]HAMROUNI B.

[1]Unité de Recherche Traitement et Dessalement des Eaux (UR11ES17), Faculté des Sciences de Tunis, Université Tunis El Manar, 2092 Manar II, Tunisie

[2] Centre National de Recherches en Sciences de Matériaux, Borj Cédria

E-mail : benkhalifaeya@gmail.com

ABSTRACT

Boron is an important micronutrient for plants, animals and humans but the excess and the deficiency of this element are harmful. The World's Health Organization WHO recommended a limit value of 2,4 mg. L^{-1} of boron in drinking water.

Tunisian brines are contaminated with boron. These brines contain high concentrations of dissolved salts. Consequently boron quantification can be disturbed due to the interferences phenomena. The aim of this study was to determine the tolerance levels of the ions Mg^{2+}, Ca^{2+}, Na^+, K^+ and SO_4^{2-} in order to prevent these problems.

The effect of these foreign ions was examined using the Azomethine-H method for boron determination in water. Two synthetic brines at different boron concentrations were used to prove the presence of these interferences.

The results obtained indicated that the sulfate ions have no effects on boron determination. However the other ions show significant interferences.

KEYWORDS : Boron, Brines, Foreign ions, Interferences, Tolerance levels.

MODELISATION OF EQUILIBRIUM AND KINETIC STUDIES OF THE FLUORIDE SORPTION ONTO ACTIVATED ALUMINA

MOUELHI M., MARZOUK I., HAMROUNI B.

U.R Traitement et Dessalement des Eaux (UR11ES17), Faculté des Sciences de Tunis, Université de Tunis El Manar, 2092 Manar II – Tunisie.

Tel. / Fax: +21671871282 ; email : mouelhimeral@gmail.com

ABSTRACT

Analysis of isotherm data is important for predicting the adsorption capacity of the sorbent, which is one of the main parameter required for the design of an adsorption system.

The overall goal of this study was essentially to investigate the modelisation of the adsorption equilibrium, kinetic and thermodynamic adsorption of fluoride on the surface of AA.

For this sake, fluoride sorption was studied under three temperatures and data were correlated using several models.

According to the experimental data, for the Freundlich isotherms, values of *1/n* lying between 0 and 1 indicated that the conditions were favorable for adsorption. It is also observed that the k_f values are decreasing with the rise of the temperature.

The variation of the adsorption energy in Temkin model was positive which indicates that the adsorption reaction is exothermic. This observation was confirmed by the negative value of the enthalpy changes ($\Delta H°$).

Besides, two models were applied to describe the kinetics: pseudo-first order and pseudo-second order.

Furthermore, the negative value of $\Delta S°$ for fluoride adsorption onto activated alumina suggests decreased randomness at the solid/solution interface and points towards no significant change occurring in the internal structure of the sorbent through sorption.

KEYWORDS : Defluoridation, Adsorption, Activated Alumina, Kinetic, Thermodynamic.

EFFECTS OF TEMPERATURE ON THE ELECTRICAL CONDUCTION OF POLYCRYSTALLINE SILICON THIN FILMS FOR PHOTOVOLTAIC APPLICATIONS

HADJOUDJA B., MAGRAMENE A., ZAIDI B., CHOUIAL B., FELFLI H., GAGUI S., CHIBANI A.

Laboratory of Semiconductors, Department of physics, University Badji Mokhtar, Annaba, Algeria.

ABSTRACT

Polycrystalline silicon is a material widely used in microelectronics technologies and photovoltaic industry. It's an attractive material for solar cell applications. In this work, we investigate the electrical conduction in polycrystalline silicon thin films as a function of the arsenic doping and the measurement temperature. The obtained results have allowed us to notice that the resistivity of the neutral regions varies with doping, and that its contribution to the overall resistivity is becoming increasingly important with the increase of the implanted dose before becoming dominant at very high doping levels. On the other hand, it has been observed that raising the measurement temperature improves the electrical conduction in polycrystalline silicon thin films by the reduction of the resistivity and the increase of the concentration and the mobility of the free carriers. As a result, the minority carriers will be able to pass more easily through the grain boundaries; these results in improving the photovoltaic efficiency of the solar cells based on this material.

KEYWORDS: *Polycrystalline silicon, grain boundaries, electrical conduction, temperature, photovoltaic applications.*

CRYSTALLINE GROWTH OF CuInSe$_2$ COMPOUND FOR PHOTOVOLTAIC APPLICATIONS

CHOUIAL B., KAMLI K., GAGUI S., HADJOUDJA B., CHIBANI A.

Laboratoire des semi-conducteurs, Département de physique,
Université Badji Mokhtar
Annaba, Algérie

ABSTRACT

With their high absorption coefficient the chalcopyrite structure compounds present a certain number of advantages in the race for low cost solar modules fabrication. In this work, we are interested in the search for optimum parameters for the development of the CuInSe$_2$ compound for Photovoltaic applications. These parameters which consist essentially of temperature, duration and speed of the stages of heating, melting, crystallization and cooling, have been optimized. A scanning electron microscope (SEM) coupled with an energy dispersive spectrometer (EDS) was used to perform quantitative analysis of chemical components of the prepared CuInSe$_2$ compound. This analysis has shown that this compound has good stoichiometry. Analyses by X-ray diffraction were used to study the crystal structure of the obtained CuInSe$_2$ ingots and to determine the different crystallization planes, and the different present phases. These analyzes have shown that the obtained ingots are polycrystalline and have a chalcopyrite structure. The preferential orientation according to the plane (112), which very suitable for photovoltaic conversion, was obtained. On the other hand the lattice parameters a and c have been calculated from the X-ray spectra and the ratio c/a was found to be close to 2.

KEYWORDS : CuInSe$_2$, Optimums parameters, Chalcopyrite structure, Photovoltaic applications.

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet,Tunisia 21-24 December, 2015

259

APPLICATION OF A SOLID PHASE EXTRACTION FOR CHROMIUM SPECIATION IN INDUSTRIAL EFFLUENT USING ELECTROTHERMAL ATOMIC ABSORPTION SPECTROMETRY

NAFTI Mariem [a,b*], HANNACHI Chiraz [b], CHAKROUN Radhouane [a],

HAMROUNI Bechir [b], NOUAÏGUI Habib [a].

[a] UR11ISST01 Laboratoire de Toxicologie Professionnelle, Institut de Santé et de Sécurité au Travail, Tunis, Tunisie.
[b] UR11ES17 Traitement et Dessalement des Eaux, Faculté des Sciences de Tunis, Université de Tunis El Manar, Tunis, Tunisie.
[*] Corresponding author. Tel.: +216 21 141 099; fax: +216 71 571 902
E-mail address: nafti_mariem@yahoo.fr

ABSTRACT

Hexavalent chromium and its compounds are known to be carcinogen for human. This paper describes a method of Cr (VI) determination in industrial effluents by isolation of Cr (VI) using a strong anion-exchange column, and quantification using electro-thermal atomic absorption spectrometry (ET-AAS). The optimization of both SPE separation and ET-AAS parameters were performed.

The developed method was validated. The detection and quantification limits were respectively as low as 0.1 and 0.4 $\mu g \cdot L^{-1}$. The linearity was ranged from 0.5 to 50.0 $\mu g \cdot L^{-1}$, with a regression coefficient exceeding 0.998. Accuracy of the method was checked by the analysis of chromium standard solution certified reference material. The extraction recovery was situated between 95 and 105 %. This method was applied for chromium speciation in tannery effluent samples. Concentrations of total and hexavalent chromium were ranged between 0.78 and 1.5 $g.L^{-1}$ with a mean of 1.13 and between 0.028 and 0.044 $g.L^{-1}$ with a mean of 0.038 $g.L^{-1}$, respectively. Obtained results showed that the developed method is simple, highly sensitive and may provide an alternative for Cr speciation to complicated procedures and high cost analytical techniques which makes analysis of water and waste water shipper and easier.

KEYWORDS: Chromium speciation, solid phase extraction, industrial effluent, electrothermal atomic absorption spectrometry.

INTRUSION MARINE DE LA NAPPE DE GHAR EL MELH (Cap-Bon Tunisie): ÉVALUATION DE LA VULNÉRABILITÉ PAR SIG

TLILI Faouzia[1] et BRIK Bochra[1]

[1] Département de Géologie ; Faculté des Sciences de Bizerte – Zarzouna – Bizerte
[1] Unité de Recherche: géomatique des géosystèmes UR/11 ES 41. FLAH Manouba

RÉSUMÉ

Les zones littorales sont caractérisées par l'apparition des intrusions marines qui peuvent être liées soit à un changement climatique global et planétaire, régional et/ou local, soit à l'action anthropique tel que le cas de la région de Korba. Ce travail consiste à déterminer les dégâts causés par l'intrusion marine dans au niveau de la nappe de Ghar el Melh et ses environs immédiats. Pour se faire, l'approche utilisée est la méthode paramétrique combinée avec les techniques de SIG (méthode dite GALDIT).

La région de Ghar el Melh et ses environs se trouvent au Nord-Est de la Tunisie (Cap-Bon). Ils sont caractérisés par leur climat méditerranéen à hiver modéré et été chaud. Ici, les séries géologiques affleurantes sont le plus souvent meubles (argiles et sables) d'âge Mio-Pliocène et Quaternaire.

La carte de vulnérabilité à l'intrusion marine de la nappe de Ghar el Meleh et l'indice GALDIT ont été obtenues grâce aux données analytiques du ministère de l'agriculture et ceux effectuées à l'INAT (laboratoire de pédologie). Ces données analytiques ont été traitées et cartographiés à l'aide du logiciel ArcGis 10.1.

En déterminant les six paramètres sur lesquels est basée la méthode GALDIT on peut dire que: **1)** le paramètre G, indique que la nappe de Ghar el Melh est semi captive; **2)** le paramètre A, montre que sa conductivité hydraulique est faible; **3)** le paramètre L, désigne sa hauteur par rapport au niveau de la mer. Cette hauteur est faible autour de la lagune de Ghar el Melh et à proximité d'Oued Mejerda; elle est faible à moyenne à l'Est de la nappe et élevée à l'Ouest; **4)** le paramètre D représente les distances 500, 750 et 1000 m par rapport au rivage; **5)** le paramètre I concerne l'impact de l'état actuel de l'intrusion marine montre une conductivité électrique et une teneur en chlorure et un ratio Cl$^-$/ (HCO_3^- + CO_3^{2-}) élevées, avec des zones négligeables de moyen et de faible ratio; **6)** le paramètre T qui évalue l'épaisseur de la nappe montre qu'il s'agit d'un aquifère épais.

L'indice GALDIT de la nappe de Ghar el Melh est égal à 6,1, correspondant à une vulnérabilité moyenne. En revanche, la carte de vulnérabilité montre d'importants dégâts tout le pourtour de la lagune de Ghar el Melh. En s'éloignant de la lagune, la vulnérabilité devient moyenne à proximité de l'Oued Mejerda et fable partout ailleurs.

The 5th Maghreb Conference on Desalination and Water Treatment "CMTDE 2015"
Hammamet,Tunisia 21-24 December, 2015

261

APPLICATION OF RESPONSE SURFACE METHODOLOGY TO OPTIMIZE NITRATE REMOVAL FROM WATER BY ELECTRODIALYSIS

GUESMI Fatma [1],*, AMOURI Sameh [1], LOUATI Islem [1], HANNACHI Chiraz [1],

HAMROUNI Béchir [1]

[1]University of Tunis El Manar, Faculty of Sciences of Tunis, UR11ES17 Desalination and Water Treatment, 2092 Tunis, Tunisia. Tel/Fax. +216(71)871282
* Corresponding author. E-mail address: guesmi_fatma@yahoo.fr

ABSTRACT

The main purpose of this work is to study the removal of nitrate from water using electrodialysis. The influence of several parameters, such as flow rates, initial feed concentration, co-existing anions and initial pH on process efficiency were studied. Nitrate removal by electrodialysis showed to be independent of pH of feed solution. While The flow rate as well as the initial salt concentration and also the coexisting anions on the feed solution play a significant role on the denitrification efficiency.

Response Surface Methodology was applied in the development of statistical analyzing, modeling and interpreting the resulted treatment data of nitrate removal by electrodialysis. Fractional factorial design has been applied for the simultaneous study of the effects of operating parameters on nitrate removal response. The effectiveness of the considered design parameters was well examined to find the optimum experiment condition

KEYWORDS **:** Electrodialysis, Nitrate, Response Surface Methodology, Factrorial design, Optimization

The 5^{*th*} *Maghreb Conference on Desalination and Water Treatment "**CMTDE 2015**"*
Hammamet,Tunisia 21-24 December, 2015

262

EVALUATION OF BORON REMOVAL FROM SEAWATER BY COAGULATION-FLOCCULATION COMBINED TO ADSORPTION

[1]MISSAOUI K., [1]BEN KHALIFA E., [1]BOUGUERRA W., [1]HAMROUNI B.

[1]Unité de Recherche Traitement et Dessalement des Eaux, Faculté des Sciences de Tunis, Université Tunis El Manar, 2092 Manar II, Tunisie

ABSTRACT

According to the WHO regulations (2011), the boron concentration should be reduced to less than 2.4 $\mathrm{mg.\,L^{-1}}$ for drinking water. The purpose of this study is to investigate the feasibility of coagulation-flocculation combined to the adsorption as a pre-treatment process to remove boron from seawater.

Two adsorbent, activated carbon and magnesium hydroxide, were used in combination with optimum coagulant dose to observe their differential effects. Standard jar tests using coagulation and flocculation simulator were carried out to determine the effectiveness of chemical pretreatment for removal of boron. To optimize the experimental conditions of boron removal, the effects of some parameters were studied such as initial pH, coagulation time, mass of activated carbon and molar ratio (Mg/B). The results show that coagulation-flocculation combined to the adsorption on activated carbon and magnesium hydroxide for boron removal strongly depends on the mass of activated carbon and the molar ratio (Mg/B).

At optimal conditions, boron removal by coagulation-flocculation combined to the adsorption on activated carbon and magnesium hydroxide reached to 58% and 82% respectively.

KEYWORDS : Coagulation-flocculation, Adsorption, activated carbon, magnesium hydroxide Boron, Seawater.

The 5th Maghreb Conference on Desalination and Water Treatment CMTDE 2015

Supported by

Ministry of Higher Education and Scientific Research

Ministry of Agriculture, Water Resources and Fisheries

Unité de Recherche Dessalement et Traitement des Eaux

Centre National des Recherches en Sciences des Matériaux