

MINISTERE DE LA DEFENSE NATIONALE

وزارة الدفاع الوطني

ECOLE MILITAIRE POLYTECHNIQUE

Chahid Abderrahmane TALEB



المدرسة العسكرية المتعددة التقنيات
الشهيد عبد الرحمن طالب

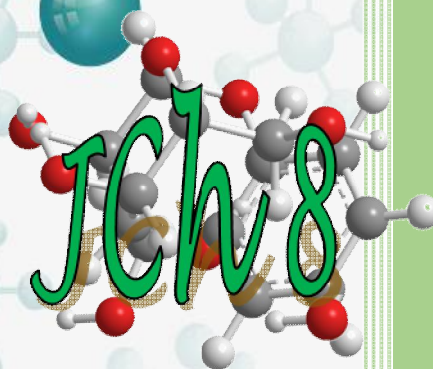
Book of abstracts

8th Chemistry days

الأيام الثامنة للكيمياء

8^{èmes}

Journées de
Chimie



BORDJ EL-BAHRI, ALGIERS, ALGERIA

MARCH 26-27, 2019



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8th chemistry days

The Chahid Abderrahmane TALEB Military Polytechnic School (EMP) is organizing the 8th chemistry days (JCh8) on March 26—27, 2019. This scientific meeting, which is held every other year, provides a good environment for exchanging knowledge among researchers, students and industrials regarding both scientific and technical progress in diverse chemistry areas as well as giving opportunities for new cooperation.

Topics

Communications are in one of the following research areas:

A. Polymers and advanced materials.
B. Chemical processing, environment and renewable energies.
C. Interfacial phenomena and reactivity.
D. Energetic materials and pyrotechnic systems.

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Scientific program

Tuesday, 26 March 2019	
08:00 – 18:00	Registration (Reception desk)
09:00 – 09:30	Opening ceremony (Amphi B)
Amphi B 09:30 – 10:15	Plenary lecture 1: TKX-50: A new High Explosive Developed at Ludwig-Maximilians University (LMU). Prof. Dr. Thomas M. Klapötke , Energetic Materials Research, Department of Chemistry, Faculty of Chemistry and Pharmacy, Ludwig-Maximilians Universität, Munich, (Germany). Chairs : Prof. K. Khimeche and Dr. S. Moussous
10:15 – 10:45	Coffee break (Cedoc Hall)
Amphi B 10:45 – 11:30	Plenary lecture 2: Les méthodes de la Chimie Théorique Comme Alternative et/ou Complément à l'expérience. Prof. Meziane Brahimi , Faculté de Chimie. Université des sciences et de la technologie Houari-Boumediène (U.S.T.H.B.), Algiers, (Algeria). Chairs : Prof. R. Mahmoud and Prof. S. Kouidri-Mostafai
11:30 – 12:30	Poster Session 1 (Cedoc Hall)
12:30 – 14:00	Lunch (VIP lounge)
14:00 – 15:40	Oral parallel sessions 1 (Amphi A and B)
15:40 – 16:30	Poster Session 2
16:30 – 18:30	Coffee break (Cedoc Hall)
16:30 – 18:30	Oral parallel sessions 2 (Amphi A and B)
Wednesday, 27 March 2019	
Amphi B 09:00 – 09:45	Plenary lecture 3: Quelles énergies pour demain? Prof. Jean-Félix Durastanti , Université Paris-Est Créteil (UPEC), (France). Chairs : Prof. D.E. Akretche and Dr. Z. Safidine
09:45 – 10:30	Poster Session 3
Amphi B 10:30 – 11:15	Plenary lecture 4: Green chemistry in organic synthesis. Development of new sustainable chemical processes. Prof. Malika Berredjem , Team manager (Synthesis of Biomolecules and molecular modeling) Chemistry Department, Badji-Mokhtar University, Annaba, (Algeria). Chairs : Prof. N. Belhaneche and Dr. F. Benaliouche
11:15– 12:30	Oral parallel sessions 3 (Amphi A and B)
12:30 – 14:00	Lunch (VIP lounge)
14:00 – 15:00	Oral parallel sessions 4 (Amphi A and B)
15:00 – 16:00	Closing ceremony (Amphi B)

Plenary lectures

Tuesday, 26 March 2019	Plenary lecture 1
Amphi B 09:30-10:15	TKX-50: A new High Explosive Developed at Ludwig-Maximilians Universität (LMU).



Prof. Dr. Thomas M. Klapötke

Energetic Materials Research, Department of Chemistry, Faculty of Chemistry and Pharmacy, Ludwig-Maximilians Universität, Munich, (Germany).

"Published over 800 scientific papers in international peer reviewed journals, 28 book chapters, 11 books and holds 12 patents".

Abstract. The research group of Professor Klapötke at LMU is also looking at explosives with improved performances, which would allow to decrease the ordnance dimensions while maintaining their lethality. We aim at developing a new explosive based on molecules with higher performances but with less sensitivity and toxicity. The TKX-50 explosive performances are already better than those of Hexogen (RDX) and Octogen (HMX) with a detonation speed that exceeds by 20% that of current explosives ($> 9000 \text{ m s}^{-1}$). The critical initiation pressure of TKX-50 based explosive formulations is much higher than that for HMX and CL-20 based explosives, which means a much lower shock sensitivity. According to the results, in the preliminary cytotoxicity assay with E.coli TKX-50 does not show any sign of cytotoxicity in the short-term cytotoxicity test. The results of the mutagenic potential investigation indicated that TKX-50 and its metabolites have no mutagenic effects on all tested strains of *S. typhimurium* and *E. coli*.

Tuesday, 26 March 2019	Plenary lecture 2
Amphi B 10:45-11:30	Les méthodes de la Chimie Théorique Comme Alternative et/ou Complément à l'expérience.



Prof. Meziane Brahimi

Faculté de Chimie. Université des sciences et de la technologie Houari-Boumediène (U.S.T.H.B.), Algiers, (Algeria).

Membre fondateur de la Société Algérienne de Chimie (S.A.C.).

Abstract. Les questions qui m'ont souvent été posées durant ma carrière de quanto-chimiste sont: **A quoi sert la chimie théorique? Est-ce qu'elle peut remplacer l'expérience? Elle est trop compliquée?**

J'essayerai d'argumenter mes réponses, par des exemples bien précis (développés au sein des équipes de recherche 2, 3 et 4 de notre laboratoire ou dans la littérature), en espérant pouvoir transmettre le message que la théorie et l'expérience sont complémentaires et que dans certains cas, la théorie est incontournable. Je commencerai par développer brièvement les bases de la chimie théorique : Mécanique Moléculaire (MM), Mécanique Quantique (MQ) et les méthodes hybrides QM/MM ainsi que leurs domaines d'application. Je passerai ensuite en revue quelques exemples d'applications que j'ai eu à traiter avec mes collaborateurs au sein du laboratoire de Physico-Chimie Théorique et Chimie Informatique (LPCTCI) de la Faculté de Chimie à l'USTHB. Je balayerai les domaines de la Pharmaco-chimie, des nanostructures, de l'utilisation de différents nanotubes comme sièges de réactions chimiques ou de stockage d'énergie. Je m'étalerai aussi sur l'expérience acquise

en collaborant avec les expérimentateurs. Je finirai enfin par quelques autres applications en chimie inorganique, chimie du solide et dans l'étude théorique des systèmes impliqués dans des réactions exothermiques comme les propergols.

Wednesday, 27 March 2019 Amphi B 09:00-09:45	Plenary lecture 3 Quelles énergies pour demain ?
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Prof. Jean-Félix Durastanti

*Chevalier de la Légion d'honneur
Université Paris-Est Créteil (UPEC), (France).*

*Professeur des Universités de classe exceptionnelle (62^{ème} section :
énergétique et génie des procédés) à l'UPEC.*

Abstract. L'objectif de cette présentation est de mettre en évidence les problématiques liées à l'énergie à un moment où l'esprit non-initié est brouillé par la multiplicité des théories souvent défendues de façon peu objective. Il ne s'agit pas ici d'apporter des réponses définitives mais de bien poser les questions à partir d'une analyse étayée de chiffres indiscutables en quelque sorte une espèce de panorama. Les notions de transition et de mix énergétiques seront abordées mais également celle d'innovation de rupture. Dans un premier temps, il ne sera pas inutile de bien identifier le concept d'énergie à travers la manifestation de ses principales formes et de ses principales sources. On abordera notamment la notion de réserve en particulier concernant les énergies fossiles ou le débat sur le traitement des déchets radioactifs. Dans un second temps, nous proposerons une évaluation du potentiel énergétique représenté par les énergies renouvelables non sans dresser une liste d'avantages et d'inconvénients pour chacune d'entre elles. Enfin, cet exposé ne saurait se terminer sans une réflexion sur l'évolution de la consommation énergétique mondiale, les perspectives inspirées par les politiques publiques mises en œuvre ainsi que sur les dernières découvertes porteuses d'espoir ou d'inquiétudes pour l'humanité.

Wednesday, 27 March 2019 Amphi B 10:30-11:30	Plenary lecture 4 Green chemistry in organic synthesis. Development of new sustainable chemical processes.
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Prof. Malika Berredjem

Team manager (Synthesis of Biomolecules and molecular modeling)

Chemistry Department, Badji-Mokhtar University, Annaba, (Algeria).

Abstract. The aim of green chemistry is to develop chemical products and processes that reduce or eliminate the use and synthesis of hazardous substances. Green chemistry searches for alternative, environmentally friendly reaction media and at the same time strives to increase reaction rates and lower reaction temperatures. Today, in many countries, research programs are funded to incorporate one or more of the 12 principles of green chemistry during the implementation a synthesis or a chemical process. They are sometimes developed in the framework of institutes specially dedicated to

green chemistry whose primary objective is its development, diffusion of these processes and their incorporation in fundamental and industrial research. The chemical industry must develop new, rapid, efficient and environmentally friendly synthesis methods to form a range of compounds with a high therapeutic potential, among these processes one can cite; multicomponent reactions, the use of ultrasound and microwaves. Multicomponent reactions thus became the major tool in the industry, allowing the production of various libraries of molecules having related structures. On the other hand, the use of microwave and ultrasound in organic synthesis to accelerate reactions has proven to be a particularly important tool for meeting the Green Chemistry goals of minimization of waste and reduction of energy requirement. In this context, our research is based on the synthesis of biomolecules by multicomponent reaction, under solvent-and catalyst-free conditions using microwave or ultrasound irradiation.

Keywords: Green Chemistry, multicomponent reactions, ultrasound, microwave, organic synthesis.

Oral sessions

Oral sessions 1

OA01. Thermal study of photo-polymerization reaction in polyacrylate/liquid crystal blends by photo-DSC

Z. Hadjou Belaid, D. Beroguiaa, L. Benhebib, F. Z. Abdoune, L. Méchernène and U. Maschke

Laboratoire de Recherche sur les Macromolécules, Département de Physique, Université Aboubakr Belkaïd de Tlemcen, Tlemcen, Algeria.

Abstract. A photo-differential scanning calorimetry (photo-DSC) is a technique which allowed us to verify the results we obtained on the transmission versus time curves of in-situ UV-cured monomer/liquid crystal films. Binary systems composed of Tripropyleneglycoldiacrylate (TPGDA) monomer and a liquid crystal mixture (E7) were used as starting materials in the process of polymerization/crosslinking leading to a phase separation between polymer and liquid crystal. A photo-differential scanning calorimetry experiment is used for different dose of UV light and different light intensities to find the origin of thermal effect observed during the photopolymerization reaction.

Keywords: Polymer Dispersed Liquid Crystal (PDLC), Tripropyleneglycoldiacrylate, E7 liquid crystal, photopolymerization, Photo-DSC.

OA02. Synthesis and characterization of hydroxyapatite by wet method in rich calcium solution

O. Zamoume and R. Mammeri

Faculty of Sciences, Department of Chemistry, University M'hammed Bouguara Boumerdes, Algeria.

Abstract. The hydroxyapatite was obtained after heat treatment (600°C) of powders synthesized by neutralizing a solution of calcium hydroxide Ca(OH)_2 with phosphoric acid H_3PO_4 under atmospheric conditions. The Ca/p molar ratio of the reactants was 2.0. The nature of the solution of phosphoric acid influenced only the particle size distribution of solids products. When the Ca(OH)_2 solution was neutralized with concentrated phosphoric acid the average particle size obtained is about 9.125 μm whereas when the Ca(OH)_2 solution was neutralized with diluted solution of phosphoric acid the average particle size is about 79.405 μm . Agglomerated and spherical particles were formed in the second case. FTIR and DRX analysis have shown that the as -dried powder (at 100°C) was an apatitic calcium carbonate-phosphate with low crystallinity which after sintering at temperature higher than 600°C leads to the formation of a mixture of hydroxyapatite and CaO. No decomposition of hydroxyapatite single phase was observed even at high temperature treatment (1100°C).

Keywords: Hydroxyapatite; Neutralisation; rich calcium solution; thermal stability.

OA03. Investigation on ZnO release from pbat/zno nanocomposite films and their antimicrobial performance

M. Seray and A. S. Hadj-Hamou

Laboratoire des Matériaux Polymères, Département de chimie macromoléculaire, Faculté de Chimie, USTHB, BP 32, El Alia, Alger, Algérie 16111.
s.manelusthb@gmail.com

Abstract. Long-term antibacterial PBAT-ZnO nanobiocomposite films were properly designed via solvent casting method. X-Ray Diffraction, Scanning Electron Microscopy and UV-visible Spectroscopy results confirmed the formation of spherical ZnO nanoparticles randomly dispersed within PBAT matrix. PBAT-ZnO films demonstrated a significant improvement of their antimicrobial and barrier performances. The potential of the biocidal Zn^{2+} ions release from the PBAT/ZnO nanocomposites films was measured by Atomic Absorption Spectroscopy. The results exhibited a gradual increase of the amount of Zn^{2+} ions released. The kinetic study of the release showed that the release's mechanism was governed by the combination between three phenomena: dissolution, diffusion and hydrolytic degradation.

OA04. Studying the enzymatic crosslinking of vegetable biopolymer by NMR spectroscopy

A. Djoullah

Centre de Recherche-Développement de l'Intendance. BP 61 - El-Harrach, Algiers, Algeria.
Djoullah_attef@yahoo.fr

Abstract. Microbial transglutaminase (MTG) catalyses acyl-transfer reactions between carboxamide groups (acyl donors) of glutamine residues and ϵ amino group of lysines (acyl acceptors) in proteins, leading to the formation of ϵ -(γ -glutamyl)-lysine (G-L) crosslinks. The resulting isopeptide bonds contribute to the formation of a stable protein network via intermolecular and intramolecular crosslinks, which improve textural and functional properties of proteins. In this study, a new method based on NMR spectroscopy was developed to detect the G-L isopeptide bonds formed by the enzymatic reaction. Because of the complexity of NMR signals of proteins due to their structures, the method was first developed on a model system (glutamine and lysine) to simplify the detection of the G-L residue. And then, the results were applied on the real protein matrix (pea globulin). MTG treatment of model system led to the appearance of a new resonance on NMR spectrum which is originated probably from the ϵ -methylene protons of lysine residues covalently linked to glutamine. The comparison between NMR spectra of MTG-treated and untreated pea globulin with MTG-treated model system permitted to identify the G-L isopeptide signal. The G-L isopeptide signal is also observed in the NMR spectra of native pea globulin (untreated which MTG), indicating that the isopeptide is naturally present in pea proteins. However, the superimposition of NMR spectra of MTG-treated and untreated pea globulin shows a higher intensity of G-L isopeptide signal for MTG-treated samples. The increased signal intensity evidences the enzymatic reaction and permits to quantify the G-L isopeptide.

Keywords: biopolymer, NMR, crosslinking reaction.

OA05. A Green Synthesis and Polymerization of N-alkyl Methacrylamide Monomers with new chemical approach

S. Derkaoui, S. Haoue and M. Belbachir

Department of Chemistry, Faculty of Science, Laboratory of Polymer Chemistry, University of Oran1
Ahmed Benbella., Oran, Algeria.
derkaoui.samira@gmail.com

Abstract. In the present work we have developed a novel procedure to synthesize Poly N-alkyl Methacrylamide by using a heterogeneous silica catalyst that can effectively catalyze amide synthesis and anionic polymerization, without production of toxic by-products. The polymerization of N-alkyl Methacrylamide monomers formulated as Methacrylamide, 1,4-bis(Methacryloyl)Piperazine, N-Methacryloylmorpholine and N-Phenylmethacrylamide are carried out using an environmentally friendly catalyst a proton exchanged montmorillonite clay, in an ice bath. We have synthesized the monomers by the condensation of primary amine ammonia and aniline or heterocyclic secondary amines such as piperazine and morpholine with methacrylic anhydride catalyzed by a green catalyst "Maghnite H⁺" in bulk at room temperature by replacing a toxic reactant acryloyl chloride and triethylamine which are used in previously published studies. This new approach is even more interesting since this synthesis is carried out in bulk at 0 °C for 2 hours, obtaining a better yield around 85% and selectivity to the product 100%. The Poly (N-alkyl methacrylamide) structure are characterized and confirmed by Infrared Spectroscopy (FTIR), ¹H nuclear magnetic resonance (NMR) spectroscopy and Thermal properties of the polymers were determined using thermogravimetric analysis (TGA).

Keywords: Green synthesis; Montmorillonite clay; N-Alkylmethacrylamide; anionic polymerization; Methacrylic anhydride.

OB01. The Application Of Plackett And Burman's Design To The Study Of Factors Affecting The Photo-Fenton Catalytic Degradation Of The OMW

H. Iboukhoullef and H. Kadi

Laboratoire de Chimie Appliquée et Génie Chimique, Université Mouloud Mammeri, Tizi-Ouzou, Algérie.

bhamidam@yahoo.fr

Abstract. The olive oil manufacturing process yields large quantities of aqueous wastes, collectively known as 'olive mill wastewaters' (OMW). Photo-Fenton catalytic process was applied for OMW treatment using UV lamp. For the purpose of examining of the factors affecting the oxidation of OMW, a screening study by Hadamard matrix type Plackett and Burman was conducted. The effects of various operating parameters such as type of catalyst (Fe (II), Cu (II)), agitation speed (300, 700 rpm), pH (2, 5), dilution (60, 80) and UV irradiation (with, without) were studied. It is demonstrated that Fenton's process can effectively degrade organic matter in OMW. The results revealed that the best conditions of phenolic compounds degradation were copper as a catalyst, stirring speed: 300 rpm, pH: 2, dilution: 60 times and presence of UV light.

Keywords: OMW, photo-Fenton, phenolic compounds, experimental design.

OB02. Study of the chemical stability of a Synroc B containing pseudo-brookite, by the MCC1, MCC2 and microwaves tests

F. Aouchiche, N. Kamel, S. Kamariz, D. Moudir, Y. Mouheb and A. Arabi

Algiers Nuclear Research Center, 02, Bd Frantz Fanon ,BP 399 , Algiers, Algeria.

Aouchiche.fairouz@hotmail.fr

Abstract. Synroc B is a polyphasic ceramic dedicated to the confinement of many lanthanides and actinides. A Synroc B with 40 % pseudo-brookite, 36% zirconolite and 24% perovskite, was synthesized by sintering at 1200°C. Several standard leaching tests were conducted to assess the material chemical stability. The leachates were analyzed by X ray fluorescence spectrometry. The following matrix elements: Ca, Ce, Ti, Zr, Al, and Fe, are considered. For both MCC1 and MCC2 tests, the most dissolved element is Ca, with about 0.1 and 0.5% of the total Ca in the material, respectively. The other elements concentrations are below these values, especially those belonging to pseudo-brookite, such as Fe and Ti. Finally, a third test of microwave mineralization gave 26 % of the initial Ca content in the mineral. One can conclude that the addition of pseudo-brookite to Synroc B significantly increases its chemical stability.

Keywords: Synroc B, MCC1, MCC2, XRF, pseudo-brookite, chemical stability.

OB03. Bioremediation of drill cuttings- a pilot scale study

K. Ighilahriz, M. Khodja, S. Haddadi, A. Benchouk and H. Boutamine

Central Direction Research and Development, SONATRACH Avenue du 1er Novembre - 35000 Boumerdès (Algeria).

Kahina.IGHILAHRIZ@Sonatrach.dz

Abstract. The present paper exposes the feasibility of bioremediation by landfarming of drill cuttings. Poultry manure was used as organic substrate to amend the soil; bentonite clay was used as a mineral stimulant. The experience took place in Hassi Messaoud (southern Algeria). Homogenized sample of the hydrocarbon drill cuttings was inoculated with adequate amount of organic and mineral stimulant into different ratios of contaminated pollutants/substrates. The specification for each excavation was 1 m × 2 m × 1 m for length, breadth and depth respectively. TPH degraded sharply, averaging 80% after 5 months. The ecotoxicity tests was assessed by following the seed germination rate of *Triticum durum* Desf and *Hordeum vulgare*. The results showed 0% germination rate for the contaminated soil versus 40% for the treated soil.

Keywords: TPH, bioremediation, landfarming, toxicity test, poultry manure.

OB04. Analysis of mixing efficiency in a T shaped micromixer

H. Bendriss, D. Chlef, B. Bensebia, D. Tabti and S. Kouadri Moustefai

Laboratory of Water, Energy and Green Chemistry. Faculty of Technology. Hassiba Benbouali
University of Chlef. Chlef, Algeria.
kouadrimostefa@yahoo.fr

Abstract. The aim of this work is to characterize the mixing quality of water and ethanol in a rectangular T junction micro-mixer. The micro-mixer dimensions are 400µm hydraulic diameter, 1.6mm feeds length and 4cm central canal extent. The CFD Fluent code allowed us to implement simulations in the case of a steady state laminar flow of incompressible Newtonian fluid. In this case, the governing equations of mass and momentum are solved by using the finite volume method. All simulations were performed in a 2D scheme. The model predicts flow velocity profiles, pressure, and mass fractions of all components versus positions. The results showed that the velocity profiles are well established after a few tens of microns and the flow of Poiseuille plant is verified. In the intersection zone of the two liquids feeds and for the lowest velocities, the mixing is in progress before reaching the central channel. For an inlet velocity range of 0.0002 to 5m/s, the mixing fractions are comprised between 80% and 100%.

Keywords: Process intensification; Micromixer ; CFD ; liquid phase; water - ethanol.

OB05. Physicochemical, electrochemical and theoretical study of some organic compounds as corrosion inhibitors of 316L stainless steel in 1M HCl

Y. Boughoues, M. Benamira and L. Messaadia

Laboratory of Materials Interaction and Environment (LIME), University of Jijel, Algeria.
m_benamira@univ-jijel.dz

Abstract. Corrosion prevention plays an important role in the field of scientific research. In this context, researchers and industrials work together to develop an alternative and innovative solution to prevent metals and alloys from corrosion. The use of inorganic and organic inhibitors is one of the best methods due to their cost effectiveness and ease of application in industry. In this work, we synthesized and characterized by physicochemical and electrochemical techniques some organic compounds in order to study their inhibitory efficiency of 316L stainless steel in hydrochloric acid solutions. The inhibitive study was evaluated by potentiodynamic polarization and electrochemical impedance spectroscopy (EIS). The effect of concentration and temperature has also been studied. The results obtained confirm the inhibitory activity of corrosion of these organic compounds. Quantum DFT parameter analyses confirm the protective effect against 316L stainless steel corrosion. A correlation between the experimental study and the theoretical study has been established. Finally, the different results obtained through the different approaches are in good agreement with each other and provide a global picture and study of the phenomenon studied in order to better understand and find an appropriate solution to a problem that affects the economy and the environment.

Keywords: Corrosion, 316L stainless steel, Organic inhibitors, EIS, DFT.

OB06. Spectroscopic study of a Cs-Rb co-doped perovskite, dedicated to the radioactive alkali elements confinement

K. Hasnat, N. Kamel, Y. Mouheb, S. Kamariz and A. Arabi.

Chahid Abderrahmane Taleb Polytechnic Military School, Department of Chemical Process
Engineering, Bordj El-Bahri, Algiers.

Abstract. A perovskite co-doped with Cs-Rb, with the general formula $\text{Ca}_{1-x}\text{Ce}_{0.09}\text{Rb}_{0.04}\text{Cs}_y[(\text{Zr}_{0.50}\text{Ti}_{0.45})\text{Al}_{0.05}]\text{O}_3$, $x=0.33-0.53$, $y=0.2-0.4$, was synthesized by sintering at 1150°C during 16 h. The phase identification, performed by X-ray diffraction analysis showed a successful synthesis process. The perovskite mineral was identified as the main phase of the final product, with over than 84%. It corresponds to the JCPDS 00-022-0153 of CaTiO_3 skeleton. An excess of Zr appears as $(\text{Ln}_{0.1}\text{Zr}_{0.9})\text{O}_{1.95}$ mixed oxide, where Ln is a lanthanide, associated to Ce. The lattice parameters of the doped perovskite were calculated. Fourier transform infra-red spectroscopic

analysis showed the main absorption bands of material' bonds, such as Ti-O, Zr-O, Al-O, etc. The study highlighted a suitable co-doping of perovskite with both the two employed alkali elements.

Keywords: perovskite, Cs, Rb, confinement, radioactive waste, XRD, FTIR.

Oral sessions 2

OB07. Effect of dissolved-oxygen and hydrogen peroxide on the performances of TiCo_2O_4 and CoFe_2O_4 spinels in photocatalytic degradation of methylene blue under UV light

S. Barama, A. Barama, N.A. Laoufi, N. Fodil-Cherif and A. Davidson

Laboratoire Matériaux Catalytiques et Catalyse en Chimie Organique (LMCCCO), USTHB BP32 El Alia, 16111 Bab Ezzouar, Algiers, Algeria.
Siham_barama@yahoo.com

Abstract. In this work, photocatalytic activity of TiCo_2O_4 and CoFe_2O_4 spinels was tested in the degradation of Methylene blue dye (MB) under UV light. The two photocatalysts were synthesized by co-precipitation method and characterized after calcination at 900°C by: X-rays powder diffraction (XRD), surface area (BET), Scanning Electron Microscopy (SEM), X-rays photoelectronic spectroscopy (XPS) and UV-Vis Spectroscopy. The photo-degradation of MB is studied in aqueous solution with hydrogen peroxide (H_2O_2) and molecular dissolved oxygen under UV-light. For both samples, XRD patterns showed only peaks characteristic of (220), (311), (400), (422), and (511) and (440) reflections of cubic spinel type lattice with $fd\text{-}3m$ space. From XPS analysis, large difference was found in surface composition of the catalysts. For CoFe_2O_4 , which correspond to the higher photocatalytic activity, an O-enrichment of the surface was evidenced. The influence of dissolved-oxygen and hydrogen peroxide, on the degradation of MB (30 mg.L^{-1}) after 240 min of UV illumination, was investigated. Based on our results, obtained in the presence of CoFe_2O_4 nanoparticles, it was found that photo-degradation of MB under UV irradiation achieved $\sim 65\%$ with $\text{H}_2\text{O}_2/\text{H}_2\text{O}$ compared to $\sim 91\%$ with $\text{O}_2/\text{H}_2\text{O}$ after 200 min of UV irradiation. These results showed clearly that the dissolved-oxygen plays a determining role in the photocatalytic degradation. Owing to the fact that H_2O_2 acted as hydroxyl radicals and peroxide anion ($\bullet\text{OH}$; $\bullet\text{O}$) while O_2 produced superoxide anion ($\bullet\text{O}_2$), the O_2 addition is chosen to assist and enhance the photocatalytic degradation of MB over the two catalysts.

Keywords: Methylene Blue, Photocatalysis, Spinel.

OB08. Pretreatment of Seawater using Precipitation agents to reduce Scale formation in distillers

K. Dahmani and M. Belloul

University Centre of Relizane Ahmed Zabana, Institute of Sciences and Technology, BP Relizane, 48000, Algeria.
khedidja.dahmani@hotmail.fr

Abstract. The objective of this study is to investigate the scale formation in multi stage flash distillers. The scale is a result of the precipitation of insoluble species including calcium sulfate as well as calcium carbonate and hydroxide magnesium. The solution of the problem involves a pretreatment of seawater before introduce into distillers. The pretreatment is based on the removal of the calcium and magnesium cations from seawater, using precipitator agents as: soda ash, potassium hydroxide, and mixture of soda ash with potassium hydroxide at different temperature of 25, 35, 50, and 100°C . Pretreatment achieved by a mixture of potassium hydroxide and soda ash in seawater gave the best results. The results of this work show that by mixture soda ash (10g/L) and potassium hydroxide (3g/L) at temperature of 100°C favor the precipitation of calcium and magnesium ions. The calcium and magnesium concentrations in seawater were completely reduced.

Keywords: desalination, scale, temperature, soda ash, potassium hydroxide.

OB09. Conversion of methane over LaNiZnO₃ Perovskite Catalysts

D. Sellam, D. Touati, K. Ikkour, S. Dekkar and M. Halouane.

Laboratoire de Recherche de Chimie Appliquée et Génie Chimique, Université M. Mammeri de Tizi-Ouzou, Algérie.
sellam_dj@yahoo.fr

Abstract. Carbon dioxide reforming remains the main way of the valorisation of natural gas because both of CH₄ and CO₂ greenhouse gases contributing to global warming. Numerous metals like Ni, Co, Fe or noble metals (Pt, Rh, Pd, Ir) have been reported to be active for dry reforming of methane. Noble metals are known to be active and stable catalysts but, their cost limited their widespread industrial applications. Ni is more promising since Ni-based catalysts are relatively inexpensive. Nickel is more susceptible to coking and deactivates more rapidly than noble metals so many studies have been done to reduce this issue. Efforts have been made to synthesize Ni catalysts resistant to carbon deposition by introducing the metal into structure like perovskite type oxides (ABO₃). This present work investigated preparation and characterisation of mixed oxides LaNi_{1-x}Zn_xO₃ (X = 0, 0.2, 0.8 and 1) perovskite-type as catalysts for dry reforming of methane to synthesis gas (CO/ H₂). These systems are prepared by the self-combustion method using glycine as ignition promoter. The formation of perovskite structure of the prepared catalysts was confirmed by XRD and FTIR characterizations. These systems were tested in methane dry reforming reaction to produce syngas (CO+ H₂) at 750°C. The better activity is given by LaNi_{0.8}Zn_{0.2}O₃. This activity was attributed to high dispersion of metallic nickel crystals (19 nm) and the high surface area (27 m²/g).

Keywords: Methane, catalyst, Perovskite.

OB10. Catalytic oxydation of a toxic organic dye by H₂O₂ using a catalyst based on well dawson type heteropolyacid

S. Bencedira and O. Bechiri

University of Badji Mokhtar, BP12 - 23000 Sidi Amar, Annaba, Algeria.
Selmaben30@yahoo.fr

Abstract. Abstract. The objective of this work is to develop an innovative technique of advanced oxidation process (OPA), based on generation of radical's hydroxyl (•OH), for the homogeneous oxidation Acid Fuchsine (AF) from aqueous medium by hydrogen peroxide (H₂O₂) activated using Cobalt fixed on recyclable well Dawson type heteropolyacid 'HP2W15Mo₃O₆₂, 20H₂O'. In this study, experiments were conducted on AF solutions to evaluate tow essential operating conditions that the most affect this kind of catalytic oxidation process; namely 'the mass of the catalyst and the concentration of the hydrogen peroxide'. The efficiency of AF degradation expected 97.97 % for under 0.001 g of catalyst mass and 49 µM of H₂O₂ concentration at pH equal to 6 and room temperature. These result showed that the use of the cobalt incorporated in well Dawson type Heteropolyacid structure 'HP2W15Mo₃O₆₂, 20H₂O' activator of H₂O₂ for •OH generation is an economic and green solution for the removal of AF.

Keywords: Heteropolyacid, Toxic dye, H₂O₂.

OB11. Magnetic solid-phase extraction of aromatic amines using hybriide nanopaticles

M. Naous and S. R. Bravo

Ibn Khaldoun University, BP 78 zaâroua 14000, Tiaret, Algeria.
elzahraadz@yahoo.fr

Abstract. Magnetic solid-phase extraction based on iron oxide nanoparticles (MNPs) has received increased attention over the past few years because of its simplicity and its easy and rapid isolation of analytes from samples using a magnetic field¹. A major general advantage of "surfmers" for magnetite nanoparticles (MNP) functionalization is the excellent stability of coatings based on chemisorption. This particular structure offer regions of different polarity for solubilization while keeping intact their structure during solute elution, this is due to the multiple retention mechanisms provided by these

amphiphilic molecules (e.g., dispersion, hydrogen bonding, polar, ionic, etc.)². In this work, we have shown the great extraction capabilities exhibited by the hitherto unexplored combination of magnetic nanoparticles and oligomeric micelles. The proficiency of these sorbents to expand the usually restricted range of extractable polarity from log K_{ow} values above 4 up to highly hydrophilic negative values has been proved by the extraction of 19 aromatic amines in textiles, prior to their determination by LC-MS/MS. Extraction took 5 min and absolute recoveries for 17 aromatic amines.

Keywords: Magnetite, Oligomeric Micelles, Extraction, Aromatic Amines, Liquid Chromatography.

OB12. CuO-TiO₂ catalysts prepared by emulsion and impregnation for visible light photocatalytic degradation of methylene blue pharmaceutical waste

W. Chettah, S. Barama, M. S. Medjram, A. Davidson and A. Barama

Laboratoire de Génie Chimique et Environnement de Skikda (LGCES), Université-20Aout-1955-de-Skikda, Skikda, Algeria.
siham_barama@yahoo.com

Abstract. In this current study, three TiO₂ based photocatalysts were prepared and tested in photo-degradation of methylene blue (MB) under a visible-light. It is well known that in photocatalytic reactions, anatase TiO₂ is generally ineffective with visible light but very effective with ultraviolet irradiation. TiO₂ is used here as support and has been obtained from a mixture of not-calcined and calcined amounts of commercial titanium Millennium-PC500. Calcined-amount is obtained after thermal activation at 400°C, under air for 3 h. The role of calcination is to create another degree of crystallization more interesting than that of commercial precursor. Photocatalysts were prepared by adding copper nitrate or oxide (3 weight %) to the support suspended in water according following methods: (1) impregnation, (2) emulsion using P123 (copolymer) (3) emulsion using TRITON-X100 (organic surfactant). The obtained solids noted 3Cu/a-TiO₂, 3Cu-P123/a-TiO₂ and 3Cu-TX100/a-TiO₂ are calcined at 500°C and characterized by: XRD, BET surface, HR-SEM/EDX, UV-visible spectroscopy. XRD patterns of all samples were identical to that of the support, showing only the diffraction lines of TiO₂ anatase. Further analysis by Rietveld refinement demonstrates the presence of Cu nanoparticles in superficial layers of support. From reactivity results of catalysts, it was found that under visible-irradiation with H₂O₂ as oxidant and at 270 min, the degradation achieved ~99% for 3Cu-TX100/a-TiO₂ while about 97% for 3Cu-P123/a-TiO₂ against 89% for 3Cu/a-TiO₂ and 62% for a-TiO₂. The photocatalytic activity, in MB-dye degradation, depends on the preparation method, the best activity was observed with the catalyst obtained by emulsion using TRITON-X100.

Keywords: Photo-degradation, Copper species, Methylene Blue.

OC01. Bi/α-Bi₂O₃/TiO₂ nanotubes arrays heterojunction for highly efficient photocatalytic applications

L. Rekeb and L. Hamadou

Laboratoire de Physique et Chimie des Matériaux LPCM, Université Mouloud Mammeri de Tizi-Ouzou, UMMTO, Algeria.
leylarekeb@hotmail.com

Abstract. α-Bi₂O₃/TiO₂ nanotube arrays (α-Bi₂O₃/TiNT) and Bi/α-Bi₂O₃/TiNT photocatalysts have been successfully fabricated by anodization combined with electrodeposition methods. UV-Vis diffuse reflectance spectroscopy revealed that the combined consequence of both Bi and α-Bi₂O₃ in the as-synthesized ternary composite considerably enhanced optical properties with significant red shift. This activity is attributed to the more efficient charge separation/transportation and the presence of Bi with strong plasmon resonance (SPR) effect. Moreover, the photocatalytic (PC) performances of the prepared samples were examined by the photocatalytic oxidation of methylene bleu (MB) under visible light irradiation. The Bi/α-Bi₂O₃/TiNT photocatalyst showed higher photocatalytic activity than that of α-Bi₂O₃/TiNT and TiNT.

Key words: Bi/α-Bi₂O₃/TiNT heterostructure, surface plasmon resonance, photocatalytic degradation.

OC02. Characterization, Thermodynamic and Kinetic Studies of Artemisia essential oil as an Eco-Friendly Inhibitor of pure aluminum corrosion in hydrochloric medium

N. Hechiche, D. Boughrara, L. Hamadou, A. Kadri and N. Benbrahim

Laboratoire de Physique et Chimie des Matériaux (LPCM), Université Mouloud MAMMERI de Tizi-Ouzou, BP 17 RP, 15000, Algérie.
hechiche.n@outlook.fr

Abstract. Artemisia herba alba essential oil (AHAEO) was investigated as green inhibitor for aluminum corrosion in molar hydrochloric acid solution. It was obtained by hydrodistillation of the aerial parts. It was analyzed by gas chromatography (GC) and gas chromatography –mass spectrometry (GC-MS). The chemical analysis revealed that the major chemical compounds of AHAEO were 1,8-Cinéol (8,006%), α -Thujone (7.817%), β -Thujone (6.577%), Chrysanthénone (12.403%), Camphor (26.165%). The inhibition properties of the oil were determined by weight loss measurement and potentiodynamic polarization. The results indicate that the inhibition efficiency increases with increasing oil concentration and decreases with increasing temperature. The analysis of the weight loss results suggest that the oil compounds adsorb by physical adsorption mechanism and follow the Langmuir adsorption isotherm while according to the potentiodynamic polarization measurements, AHAEO acts as cathodic type inhibitor.

Keywords: Aluminium, Artemisia oil, corrosion inhibition, GC/MS, potentiodynamic polarization.

OC03. DFT studies of Procaine-hydrochloride β -cyclodextrin complexation

M. Azayez, T. Fergoug, Y. Bouhadda, N. Meddah araibi, H. Boudjournes and F. Chater

Laboratory of Physical Chemistry of Macromolecular and Biological Interfaces (LCPMIB), University of Mascara Mustapha Stambouli, Mascara, Algeria.
amdali2002@yahoo.fr

Abstract. Quantum-chemical calculations were performed to study the complexation reaction involving procaine hydrochloride and beta cyclodextrin (β -CD) in the gas phase. The semi empirical method PM3 was chosen to optimize the structures of the free Procaine and free β -CD and the during the inclusion process of inclusion of Procaine into the cavity of β -CD for forming the complex of 1:1 stoichiometry. In order to refine the results, we proceeded by an optimization using the method ONIOM [B3LYP/6-31G (d,p): PM3]. Given the energy profile, the configuration of the complex formed indicates that the benzene ring is completely included in the hydrophobic cavity of the β -CD. The ONIOM method gives the energy of the most stable complex and the deduced thermodynamic parameters have shown that the procaine/ β -CD complex is enthalpically favorable. The analysis of natural bond orbital (NBO) indicates that the procaine/ β -CD complex is stabilized by Van der Waals interactions.

Keyword: host-guest inclusion, procaine, β -cyclodextrin, PM3, ONIOM, NBO.

OC04. Regeneration of porous carbonaceous materials by hybrid process: chemical-thermal desorption under microwave radiation

Dj. Djedouani, and M. Chabani

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.
ddjedouani@usthb.dz

Abstract. Numerous regeneration techniques exist, with varied performances depending on the adsorbent and the adsorbate. Without regeneration, spent coal is classified as waste to be incinerated. At present, the regeneration of adsorbent under microwaves is an emerging technique, widely studied at the laboratory scale. The chemical regeneration of the activated charcoal CAPH in batch and under microwave radiations is then studied. The effectiveness of the operation is verified with a re-adsorption test, under the same conditions as the first adsorption. The results obtained are compared with those

obtained with fresh coal. A good regeneration of the coal is observed, when the chemical washing is assisted by the microwave radiations. The quantitative comparison between the two coals shows a difference in capacity and retention that does not exceed 20%. In addition, the microwave heating of the soda mixture + CAPH increases the overall dielectric losses of the system, which then leads to a faster rise in the temperature of the saturated CAPH, which represents a gain in time and consequently a gain in energy. Microwave-assisted chemical regeneration is a very interesting way to make adsorption a competitive clean-up process.

Keywords: Activated carbon, regeneration, microwave, adsorption.

OC05. Comparative study between MgO-impregnation and mechanical mixture effects on the CO₂ adsorption over NaY zeolites

H. Bekhti and Y. Boucheffa

Laboratoire d'Etude Physico-Chimique des Matériaux et Application à l'Environnement (LEPCMAE),
USTHB, Algiers, Algeria.
h_bekhti@yahoo.com

Abstract. MgO-Impregnated NaY zeolites and mechanical mixture are prepared from NaY zeolite, using MgO as a basic agent. Textural parameters are determined by N₂ adsorption desorption isotherms at 196 °C. The isotherms of impregnated zeolites exhibit type Ia isotherm, while mechanical mixtures show a combination of the type Ia and IVa. CO₂ adsorption over these modified zeolites is studied at 30, 35, 40, 45 °C. Results show that 2% of MgO-impregnation and 5% of mechanical mixture seem to be the better rates for the CO₂ retention. The evolution of the isosteric heats reveals the heterogeneity of adsorption sites of modified zeolites. In addition, most of models used in this work to fit experimental isotherms showed a good correlation with the adsorption isotherms. This correlation is in the following order: dualsite Langmuir multisite Langmuir Sips Toth Jensen Seaton UNILAN Langmuir Freundlich.

Keywords: CO₂ Adsorption, Impregnated NaY Zeolite, Mechanical Mixture.

OC06. Validation of a modified carbon sensor by nanostructured materials for isoproturon trace analysis in water

S. Amra, T. Bataille, S. Bourouina-Bacha, M. Bourouina, and D. Hauchard

Faculté des Sciences, Université de Bejaia, Bejaia, Algérie.

Abstract. A new electrochemical sensor based on nanostructured carbon paste electrodes (CPEs) is developed for the sensitive detection of Isoproturon in water. The CPEs were nanostructured by incorporation of carbon nanotubes (NTCs) and synthesized copper oxide nanoparticles (CuO). They were characterized using the voltammetric methods. Electrochemical experiments showed that the adsorption of Isoproturon onto (GC-NTC-CuO)-CPE associated with nanomaterials (NTCs and CuO) provided remarkable analytical performances of the sensor such as a large quantification range from 2 - 200 µg/L with a detection limit of 0,1 µg/L of isoproturon and no interferences of some another pesticides tested. The sensor was successfully used to determine isoproturon at level trace concentration in water indicating that it is suitable for the monitoring of this pesticide.

Keywords: Carbone Paste Electrode, nanostructured composite material, traces analysis, isoproturon.

Oral sessions 3

OB13. Removal of azo dye from aqueous solution by adsorption onto activated clay. Part I: Kinetic study and adsorption isotherm

B. Hayoun, S. Terki, H. Messaoudi, M. Bourouina and S. Bourouina-Bacha

University A-Mira of Béjaia, Béjaia, Algeria.
hayba.bahdja@gmail.com

Abstract. The study of adsorption of eriochrome black T (EBT) was carried out in a batch reactor. It consisted of the optimization and the modelling of the removal of EBT by adsorption on an activated bentonite. The use of a design of experiments (DOE) approach, in this case the response surface methodology (RSM), allowed the determination of the influence of the principals' effects and the interaction of the operational parameters on the rate of the adsorption. The results describe correctly the influence of the experimental parameters on the adsorption rate and the predicted values were in good agreement with the experiment data. The analysis of variance (ANOVA) showed that the proposed model was highly significant. The response surface methodology (RSM) used to optimize the amount of EBT adsorbed acting on the experimental conditions indicates that this method is a reliable for determining the optimum operating conditions of the dye adsorption process on the clay.

Keywords: adsorption, clay, eriochrome black-T, DOE, RSM, optimization.

OB14. Structural, mechanical and tribological characterization of Al-Si thin film

K. Chema, S. Hassani, M. Gaceb and M. Kezrane

University of Medea, LMP2M, University center, Medea, Algeria.
khaledchemaa@yahoo.com

Abstract: the objective of this work is to study how to decrease energy losses by friction in pistons of internal combustion engines. Aluminum-Silicon film (87 at. % of Al and 13 at. % of Si) was deposited on 304 stainless steel substrate by Physical Vapor Deposition (PVD) evaporation process. Structural, mechanical and tribological characterizations of the film were carried out and compared to piston skirt samples made of Al-Si eutectic alloy. XRD results showed that the film has an amorphous form, Al and Si peaks have been observed. SEM images showed that the film has a thickness of about 1.2 μm , and that the film has a dense structure with fine pores. The film showed a hardness mean value of 6.7 GPa and a maximum value of 8.8 GPa. The film showed also a mean value of Young's modulus of about 202 GPa. Tribological tests on the Al-Si film showed significant results comparing with piston skirt samples. The friction coefficient values were about three and half times lower (from $\mu \approx 0.52$ for reference piston skirt samples to $\mu \approx 0.15$ for coated sample).

Key-words: Al-Si, thin films, piston skirt, internal combustion engines.

OB15. Techno-Economical Optimization of Autonomous Hybrid PV/Wind/Fuel cell Power System

M. Douak and Z. Aouachria

Laboratory of Applied Energetic Physical, Univ. Batna 1, Algeria.
zeroual.aouachria@univ-batna.dz

Abstract. The electricity demand to supply building houses is rising in all over the world, due to the growth of population, and economic advances, more than 80% of electricity used is coming from fossil fuel, which is considered as a main cause of green gas emission and climatic changes. The integration of renewable energy sources in building is imperative to avoid the energy crisis and the environment pollution. Solar and wind energy are the two viable renewable sources in the world, they have a good compensation characters between each other, but the stochastic nature of them makes the optimization and the sizing of such systems a very complex task, the present paper present a techno-economic study of PV/Wind/FC hybrid power system (HPS) to supply an off grid house located in

Adrar region (Algeria). The main objective of this study is the design an optimal (HPS), through the combination between the loss of power supply probability (LPSP) method and the total annual cost (TAC) of energy. The results obtained shows that the cost of electricity produced by wind/fuel cell system is more economically viable than those produced by PV/fuel cell or PV/wind/fuel cell system.

Keywords: Hybrid systems; PV/wind/fuel cell; Optimization; Power Supply Probability.

OC07. Degradation of tetracycline hydrochloride using electrochemical assistant Fe^{3+} /activated peroxydisulfate

A. Ledjeri, I. Yahiaoui and F. Aissani-Benissad

Laboratoire de Génie de l'Environnement (LGE), Faculté de Technologie, Université de Bejaia, 06000, Bejaia, Algérie.
Ledjeri.amina@gmail.com

Abstract. Degradation of tetracycline (TC) in aqueous solution using sulfate radicals was investigated using the peroxydisulfate (PDS) only, electrochemical process, and electrochemical assistant Fe^{3+} /activated PDS process. It was found that the electrochemical assistant Fe^{3+} activated PDS process performed best in the degradation of TC. The major factors affecting the degradation efficiency of TC by $\text{EC}/\text{Fe}^{3+}/\text{S}_2\text{O}_8^{2-}$ process on Pb/PbO_2 electrode were examined. Effect of current density and initial tetracycline concentration were investigated. The results indicated that the removal efficiency of TC increased with increasing current density ($1\text{--}40\text{ mA cm}^{-2}$) and decreases with tetracycline initial concentration ($0.06\text{--}0.21\text{ mM}$). This effect is attributed to the competition of TC and electrogenerated intermediate compounds for the consumption of oxidizing $\text{SO}_4^{\bullet-}$ radicals. The optimal operating conditions were therefore 40 mA cm^{-2} current density, 10 mM PDS concentrations, 2 mM Fe^{3+} , and 0.06 mM TC. Indeed, under these conditions the degradation of TC yield was 100% within 40 min.

Keywords: Tetracycline, Electrochemical oxidation, Sulfate radicals.

OC08. Adsorption of acid dyes from aqueous solutions onto acid-activated marble powder

H. Saidia

Université 20 Août 1955, BP26 - 21000 Route d'El Hadaiek, Skikda, Algeria.
hasna-sai@hotmail.fr

Abstract. Industrial Wastewater contains several type of dye, causing serious environmental hazard. Therefore, Adsorption is one of advanced and effective treatment processes in the removal of pollutants from effluents gives better results. This research was check the ability of a low-cost material Marble Powder (MP) which are considered as a waste in the industry of the marble available in Skikda which has proven to be a promising adsorbent has a best capacity for the adsorption of each dye in removing too acid dyes: acid dyes: Bezanyl Yellow (Acid Yellow 5G) and Nylomine Green (Acid Green 27) which are often met in the aqueous effluents of textile industry of tannery. The study is followed by modifications of the textural properties of the Marble Powder (activated) It could be successfully applied in the field of the purification and removal of contaminants from wastewaters of tannery industry, in order to remove two acid dyes. An improvement of the capacity of MP installed compared to MP no activated. The surface characterization of acid-activated MP was performed using the FTIR technique. The adsorption kinetics was investigated using the parameters such as contact time, pH, and temperature, solution initial dye concentration, and acid activation to provide information about the adsorption characteristics of activated marble powder.

Keywords: Activated Powder Marble, acid dyes, adsorption kinetic.

OC09. Structural, vibrational and thermodynamic properties of $(\text{NH}_4)_2\text{SO}_4$ and NH_4NO_3 : Ab initio study

S. Bourahla and S. Kouadri Moustefai

Laboratory for Theoretical Physics and Materials Physics, Hassiba Benbouali University of Chlef, Hai Essalem, Chlef, Algeria

Abstract. Structural, vibrational and thermodynamic properties of inorganic aerosols, including ammonium sulfate $(\text{NH}_4)_2\text{SO}_4$ and ammonium nitrate NH_4NO_3 have been investigated at the periodic ab initio quantum mechanical level with the CRYSTAL code, which is based on Gaussian basis sets. Local density (LDA), gradient-corrected (PW91), and hybrid (B3LYP) density functionals have been used and the results are compared with experiment. All three functionals reproduce the equilibrium geometry of these crystals to a high level of accuracy. The calculations of frequencies and thermodynamic properties gave a mean absolute deviation from experiment of few percent for B3LYP, clearly showing that this functional performs extremely well in this case.

Keywords: Ab initio, Ammonium sulfate, Ammonium nitrate, Structural, Vibrational modes, Thermodynamic properties.

Oral sessions 4

OD01. FOX-7-based melt-cast explosives compositions

A. Belaada and W. A. Trzciński

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.

amelbelaada1@gmail.com

Abstract. Low sensitive melt-cast explosive compositions based on 1,1-diamino-2,2-dinitroethene (FOX-7) and containing TNT, NTO, Al and wax were prepared and tested. Sensitivity to impact, friction, shock wave and jet impact were determined, thermal stability and ignition temperature were established. Some detonation properties of the compositions were investigated. The heat of detonation was measured using a calorimetric bomb. Detonation pressure and velocity were determined in a plate-denting test. The results of a cylinder test were used for determination of the Gurney energy, detonation pressure and energy, and the JWL equation of state for the detonation products. The results of sensitivity tests and the detonation characteristics of the FOX-7-based compositions indicate that these compositions are promising as main charge fillings destined for insensitive munitions.

Keywords: FOX-7, low-sensitive explosives, melt-cast explosives.

OD02. Which temperature to be used in liquidus line prediction for SLE investigation by DSC? Consistency tests and Uncertainty evaluation

S. Chelouche, D. Trache, K. Khimeche

UER Procédés Energétiques, Ecole Militaire Polytechnique, EMP, BP 17 Bordj-El-Bahri, Algiers, Algeria.

salim.chelouche@gmail.com

Abstract. The solid-liquid equilibria (SLE) of two binary mixtures of organic stabilizers for energetic materials viz, N-(2-methoxyethyl)-p-nitroaniline + 2-nitrodiphenylamine (S1) and N-(2-methoxyethyl)-p-nitroaniline + 1,3-diethyl-1,3-diphenylurea (S2) have been determined using differential scanning calorimetry at three heating rates β (0.5, 1, and 2 $\text{K}\cdot\text{min}^{-1}$). The liquidus line has been predicted using four characteristic points of the mixture melting curve as follows: the maximum peak temperature (T_{top}), the temperature proposed by the German Society of Thermal Analysis (T_{GTEFTA}), the inflexion point temperature (T_{inf}), and the endset temperature (T_{endset}) obtained at $\beta=1 \text{ K}\cdot\text{min}^{-1}$ and by extrapolating the three heat flow curves at $\beta=0 \text{ K}\cdot\text{min}^{-1}$. The melting temperatures of pure compounds

and their respective eutectics have been identified from the onset temperature obtained at $\beta=0 \text{ K}\cdot\text{min}^{-1}$. The quality of the prediction has been evaluated by the computation of the global quality factor from SLE consistency tests and by the estimation of the uncertainty associated with each characteristic temperature. It was found that the inflection point displays the highest quality factors and the lowest uncertainties. Moreover, and for practical purposes, the inflection temperature obtained at $\beta=1 \text{ K}\cdot\text{min}^{-1}$ generated more consistent data and lowest uncertainties than the other temperatures obtained even at $\beta=0 \text{ K}\cdot\text{min}^{-1}$.

Keywords: Solid-liquid equilibria, eutectic, DSC, consistency tests, uncertainties.

OD03. Beni-Messous wastewater, a beneficial MFC fuel and a credible renewable energy source

M. Azri, I. Tou and M. Sadi

Centre de Développement des Energies Renouvelables (CDER), Bouzaréah, Algiers, Algeria.
y.azri@cder.dz

Abstract. Currently, the search for new clean and renewable sources of energy is growing more and more. In this context, for a decade, several research teams have been working on a new device: "Microbial Fuel Cell", which allows to convert the chemical energy contained in the organic matter in different medium including wastewater into electrical energy. The electrochemical reactions catalysis in PACM is performed by microbial biofilms adhered to the electrodes surface. The electro-active biofilms bacteria use a mechanism close to cellular respiration to exchange their electrons with the electrode conductive surfaces. The objective of this study is to form electroactive biofilm, from microbial biodiversity found in wastewater activated sludge at the imposed potential 0.155V/ECS. A voltage value reaching 200mV had been produced as well a characterization of the microbial cell through the evaluation of 40 μ W power and an internal resistance system about 453 Ω .

Keywords: Microbial Fuel Cell, electrodes, biofilm, polarization curves, electrochemistry.

OC10. Preparation and characterization of Ti_3AlC_2 MAX phase and Al_2O_3 - GdAlO_3 Nano powders for the manufacturing of Al_2O_3 - GdAlO_3 - Ti_3AlC_2 ceramic composites

A. Henniche and J.H. Ouyang

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.
Henniche.abdelkhalek@yahoo.com

Abstract. Al_2O_3 - GdAlO_3 ceramic oxide has emerged as a potentially high-performance candidate for the development of high temperature structural application, such as gas turbines and aircraft engine. This is due to its flexural strength of about 700MPa, practically independent from room temperature up to 1800°C. Along with this line, the development of layered ternary Ti_3AlC_2 compounds belonging to the family of dual behavior materials known as MAX phase has recently witnessed a surge of efforts. Their outstanding set of properties, combining the characteristics of metals and ceramics, makes the Ti_3AlC_2 a promising element for high temperature structural components. In this work, we focus on the preparation of Ti_3AlC_2 and Al_2O_3 - GdAlO_3 for future use in the consolidation of Al_2O_3 - GdAlO_3 - Ti_3AlC_2 composites. Whereas, Ti_3AlC_2 MAX phase was prepared from commercially available by press-less sintering Ti, Al and graphite. First, the effect of different stoichiometric molar composition is investigated. The powders of irregular shaped were obtained by drilling the samples. The planetary ball milling was performed to reduce the particle size and to synthesize spherical-shaped Ti_3AlC_2 nanopowders with less than 100nm. Meanwhile, an efficient and flexible chemical co-precipitation method has been used to synthesize nanoscale Al_2O_3 - GdAlO_3 powders with eutectic composition. The as-synthesized powders exhibit a highly dispersive and homogeneous distribution with an average particle size of 50 nm. The phase transition in the resulting powders strongly depends upon the calcination temperature. GdAlO_3 undergoes complete crystallization after calcination at 1050°C, however, diffraction peaks of α - Al_2O_3 are found at a relatively high calcination temperature of at least 1250°C.

Keywords: MAX phase, Al_2O_3 - GdAlO_3 , Eutectic composition, chemical co-precipitation, morphology.

OC11. Methylene blue dye removal through adsorption onto multi-wall carbon nanotubes decorated with amorphous barium oxide nanoparticles

A. K. Bhakta, S. K. Sahid Hussain, P. C. Pais, P. Martis, R. J. Mascarenhas, S. Belkhiri, J. Delhalle and Z. Mekhalif

arvind.bhakta@unamur.be

Abstract. This work presents an extensive study on the effect of various parameters (concentration, solvents, infrared (IR) irradiation, salts and temperature variation) on the decoration of multi-wall carbon nanotubes (MWCNTs) with barium oxide nanoparticles (BaO NPs). A simple and effective technique involving IR irradiation and diazonium chemistry was used to decorate MWCNTs with BaO NPs. The materials were characterized using XPS, RAMAN, EDX, TEM, PXRD, TGA and UV-Vis spectrophotometry. A homogeneous distribution of amorphous BaO NPs onto MWCNTs was observed in the size range of 3-18 nm having a Gaussian mean diameter of ~11.7 nm. TGA results showed that nanoparticles have catalytic effect on the decomposition of MWCNTs at lower temperature. Methylene blue (MB), a model pollutant, is used to demonstrate the environmental applications of the hybrid material for the decontamination of pollutants in water. The present method is valid for large-scale preparations which make it very interesting for nanotechnological applications.

Keywords: Multi-wall Carbon Nanotubes, Methylene Blue, Barium Oxide Nanoparticles.

OC12. Electrochemical impedance spectroscopy study of AISI 304 stainless steel in electropolishing conditions

S. Detriche, J.F. Vanhumbecq, J. Delhalle and Z. Mekhalif

Laboratory of Chemistry and Electrochemistry of Surfaces, University of Namur, Rue de Bruxelles, 61,
5000 Namur, Belgium
Simon.detriche@unamur.be

Abstract. Electropolishing is a powerful and efficient method for polishing metallic surfaces. It can be successfully applied to morphologically complex surfaces and additionally leads to corrosion resistance and passivation enhancement. From a mechanistic point of view, electropolishing proceeds via anodic levelling and brightening. The levelling is a mass-transport dependent process resulting from a higher dissolution rate of the surface peaks caused by an accumulation of charges due to point effect. Brightening occurs when the dissolution process becomes independent of the crystallographic structure of the metal or the alloy. Many studies deal with the electropolishing of stainless steels (AISI 316L, 304, 430), an important class of alloys. These studies focus either on practical applications, or on systematic evaluations of the influence of electropolishing parameters (electrolyte nature, temperature, geometry, flow,...) on the surface characteristics (roughness, brightness, corrosion resistance). However, only a few studies deal with the links between the proposed electropolishing mechanisms and the resulting surface condition. Electrochemical Impedance Spectroscopy (EIS) is a very powerful technique for probing the electrochemical interface and gaining insight into the mechanisms responsible for the polishing. In this work, inspired by the approach proposed by Landolt and co-workers, we report on results linking the EIS data recorded during electropolishing with the resulting surface characteristics (roughness and morphology). The influence of electrolyte composition, processing parameters and steel chemistry on EIS-traces and surface characteristics is discussed. The morphological, chemical and impedance data are combined to establish tentative dissolution mechanisms at various applied potentials.

Keywords: Electrochemical Impedance Spectroscopy, Stainless Steels, Electropolishing.

Poster sessions

Poster Session 1

P1S1. Synthesis and characterization of conductive polymer composite based on polypyrrole and surface treated graphene: Application to chemical sensing of nitrogen oxides.

D. Guettiche, A. Mekki, B. Lakard, F.M Tighilt, S. Sam, S. Belhousse and R. Mahmoud.

Ecole Militaire Polytechnique, BP 17, Bordj El Bahri 16111, Alger, Algérie.

Abstract. The main objective of this work is to carry out the chemical synthesis and the characterization of conducting polymers composite based on polypyrrol combined with pristine and surface-treated graphene, through the elaboration of different samples namely *PPy / GNP*, *PPy / GO* and *PPy / GO-OH*, in order to be used as sensitive elements in a homemade chemiresistive module, for an on-line detection of nitrogen oxides vapors. All the necessary steps for the realization of the chemiresistive module, ranging from the elaboration, characterization and performance evaluation were studied. The sensitive elements based on the prepared composite was subjected to several structural and morphological characterizations, particularly by *FTIR*, which has allowed the identification of the elongation vibrations and deformations of functional groups in *PPy* and in its composite with graphene. Moreover, Raman spectroscopy has also confirmed the structure of *PPy*-Graphene, while *XRD* analysis has indicated the dispersion quality of the *PPy* in the both graphene matrixes, and it has revealed their clear effect on the crystalline properties of composites. After performing several target gas injections (*NO*, *NO₂*) in static and dynamic mode, all parameters related to the selectivity, sensitivity, limit of detection and the response time, were determined at ambient temperature.

Keywords: Conducting polymers; surface treated graphene; polypyrrol, Nitrogen oxide sensing.

P2S1. Enzyme-free glucose sensor based on Copper particles /polyaniline composite film

O. Belgherbi, D. Chouder, D. Lakhdari and L. Lamiri

Research Center in Industrial Technologies CRTI, P.O.Box 64, Cheraga 16014, Algiers -Algeria.
o.belgherbi@crti.dz

Abstract. Modified polymer films with metal particles incorporated into the matrix by potentiostatic deposition are known as possible electrocatalysis applications. This work presents some results concerning the electrooxidation of glucose at modified polymer thin film electrodes of copper-polyaniline (Cu-PAni) prepared on an Indium tin oxide (ITO) substrate. The morphology analysis of the Cu-PAni composite films shows that copper particles were uniformly dispersed over the polymer surface. The response to glucose of this composite material was tested by cyclic voltammetry and chronoamperometric method in 0.1 M NaOH solution. The results show good performances and indicated a sensitive oxidation peak current of glucose on the modified electrode.

Keywords: Electrochemical deposition, polyaniline, copper particles, Nonenzymatic sensor, Glucose.

P3S1. Impact study of new formulations based on Poly vinyl chloride (PVC)

N. Lardjane, F. Hamitouche, H. Habchi. Laribi, N. Belhaneche-Bensemra

Laboratoire des Sciences et Techniques de l'Environnement. Ecole Nationale Polytechnique, BP 182
El- Harrach, Alger, Algérie.
nadiaalar@yahoo.fr

Abstract. The aim of this work is the impact study of new formulations based on poly vinyl chloride (PVC). For that purpose semi-rigid and plasticized sheets were realized, three plasticizers were considered: the di-octyle phtalate (DOP), the di-iso décyle phtalate (DIDP) and the di-iso nonyle adipate (DINA), epoxidized sunflower oil (ESO) was used as a thermal stabilizer. Tests of lixiviation were carried out in two simulators mediums, the acetic acid solution and distilled water at 50°C while being based on the phenomenon of variation of mass. The ageing of the PVC in the soil was

investigated on site in a garden soil (Tizi Ouzou, Algeria)) for six months. The biodegradation process was investigated by scanning electron microscopy. The results showed that both nature and content of the plastisizer influence the Biodegradation and the migration of the additives.

Keywords: PVC, Plasticizer, ageing, migration, biodegradation.

P4S1. Using Different Compatibilization Approaches In Eva/Starch Composites

H. Hamadache, H. Djidjelli, J. A. Jofre-Reche and J. M. Martín-Martínez

Laboratoire des Matériaux Polymères Avancés (LMPA), Université de Abderrahmene Mira, Route de Tara Ouzammour, Béjaia 06000, Algeria.

Abstract. For improving the compatibility biocompostability composite ethylene-co-vinyl acetate (EVA)/starch, two different compatibilization approaches has been proposed: addition of polyethylene-grafted maleic anhydride (PE-g-MA) and reactive extrusion with maleic anhydride (MA) and benzoyl peroxide (BPO) followed by. EVA/starch composites were prepared in twin-screw extruder. The crystallinity of non-compatibilized composites increased by increasing their starch content, but the crystallinity of PE-g-MA compatibilized composites increased upon adding up to 20wt% starch. The thermal stability of EVA/starch composites decreased by increasing the amount of starch, but the addition of PE-g-MA compatibilizer increased their thermal stability. On the other hand, the in situ grafting increased the thermal stability of the composites, in greater extent by increasing their starch content. Furthermore, the mechanical properties of compatibilized EVA/starch composites were improved, more noticeably by increasing their starch content. The improved properties of compatibilized composites were ascribed to the improved interfacial interactions between starch.

Keywords: Reactive extrusion, PE-g-MA, EVA/starch composite.

P5S1. Electrochemical preparation of a sensitive layer of polypyrrole on QCM in an ionic liquid medium

B. Mettai, A. Mekki, S. Kouadri Moustefai, W. Kermouche, H. Lagha, F. Merdj, A. Abdi and R. Mahmoud

Laboratoire eau-environnement, Université Hassiba Ben Bouali, Chlef, Algérie.

Abstract. Today, chemical gas sensors offer a large number of advantages over the various conventional techniques used to identify and measure the concentration level of different vapors in the atmosphere. The selection and evaluation of the specific material involved in the sensing mechanism plays an important role in the development of a gas sensor. Indeed, amongst all materials used in field of gas sensing, the range of organic layers based on sensitive polymers knows a huge keen interest, especially the class of conducting polymers such as polypyrrole, polyaniline and polythiophene, which have attracted a numerous attentions owing to their ease of synthesis, excellent stability under harsh environmental conditions, and tunable characteristics allowing them to withdraw benefits of their combination possibility with other materials under a system of composites, in order to achieve new functionalities and applications. The purpose of our contribution is the use of sensitive materials based on polymers in order to carry out and test a device for the detection of toxic gases. In this context, our work is focused on the electropolymerization and the structural and morphological characterization of thin layers of polypyrrole/carbon nanotube nanocomposite synthesized in ionic liquids type deep eutectic solvent deposited on QCMs. Following the results obtained by the various tests to determine the performance parameters of our sensor and the effect of temperature, this latter showed better performance than those found in previous studies.

Keywords: detection, chemical sensors, toxic gas, ionic liquids.

P6S1. Electrodeposition of a Composite Material Film Based on Polypyrrol/Ag Particles on a Flexible Substrate: Application on the Detection of Volatile Organic Compounds

F. Merdj, A. Mekki, D. Guettiche, B. Mettai, W. Kermouche, A. Abdi, Z. Safidine, S. Kouadri Moustefai and R. Mahmoud.

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.

Abstract. The main objective of this work is to develop a chemiresistor gas sensor based on polypyrrole/Ag particles thin layers prepared by an electrochemical technic in a DBSA solution for the detection of volatile organic compounds (VOCs). These layers are electro-deposited by Cyclicvoltammety CV. The steps required to develop the sensor, from the synthesis, the characterization to the performance evaluation, were studied. The synthesized polymer films have been subjected to several structural and spectral characterizations, including FTIR, Raman spectroscopy and SEM, which have highlighted the role of the treatment of the substrates surfaces by the silane agent. In addition, the work required the realization of a chemiresistor measurement platform to carry out sensitivity tests on the target gases (NH₃, NO₂, methanol, ethanol, dichloromethane, CO₂). After several injections in static and dynamic mode, all parameters relating to selectivity, sensitivity, detection limit, response time and reproducibility were determined at room temperature. The influence of environmental conditions was also studied. The tests carried out showed encouraging results confirming work previously realized, in terms of response time and detection limit.

Keywords: Electropolymerization, Polypyrrole films, Ag particles, chemiresistor, ITO substrates.

P7S1. Electrochemical and characterization of Palladium-modified Polybithiophene electrode for the electrocatalysis detection of glucose

L. Lamiri, B. Nessark, O. Belgherbi, C. Dahchar, R. Yekhlef and S. Laidoudi

Research Center in Industrial Technologies CRTI, Thin Films Development and Applications Unit - (UDCMA) -Setif, Algeria.

lamiri.lila@yahoo.fr

Abstract. In this work we are interested to prepare composite materials by electropolymerization of bithiophene (BT) an indium tin oxide glass (ITO) electrode in acetonitrile containing lithium perchlorate as supporting electrolyte (CH₃CN/LiClO₄ 0.1 M), the incorporation of palladium particles (Pd) on the polybithiophene film was performed by the immersion of the modified electrode in a palladium solution. The characterization of polybithiophene-metal modified electrode obtained was carried out by cyclic voltammetry, electrochemical impedance spectroscopy and scanning electron microscopy (SEM). The electrochemical reactivity of the prepared modified electrode was tested towards the oxidation of glucose in 0.1 M NaOH solution using cyclic voltammetry.

Keywords: electrodeposition, composite materials, palladium, polybithiophene, glucose

P8S1. Synthesis and characterization of an intelligent material (Polyurethane with Shape memory)

A. Boudjellal, K. Khimeche and S. L. Hafsaoui

Direction des fabrications militaire, MDN, Alger, Algérie.

Abstract. Shape Memory Polymers Composite SMPCs are materials classified in the family of intelligent materials. The type of polymer and the reinforcement introduced into the manufacturing processes of this type of material play a very important role in these properties. Even the processes of stimulating elaborate composites occupy a large part of the scientific work for having programmed the memory of materials. In our work, a method of synthesis of a thermally stimulated shape memory polyurethane, followed by a characterization by DSC, FTIR, UV and SEM to determine the properties of this type of materials. Another study on the process of recovering the initial form by thermal stimulation was followed in order to have the possible applications.

Keywords: Shape Memory Polymers Composite SMPCs, Stimulation, Intelligent Materials, reinforcement.

P9S1. Elaboration and characterization of carbone-polymeric membranes. Application for pharmaceutical micropollutant removal from waters

F. Boukrra, M. Nadour and A. Benaboura

Laboratoire de Synthèse Macromoléculaire et Thioorganique Macromoléculaire, Faculté de Chimie.

Abstract. In this work, carbon-polymeric membranes were synthesized by an immersion-precipitation method using polysulfone (PSf) as membrane matrix, methylcellulose (MC) as pore forming agent and commercial powdered activated carbon (PAC) as adsorbent additive. All the components were dissolved in N-methylpyrrolidone (NMP) to prepare the casting solutions. The effect of PAC on the structure and the performance of the membranes were studied. The obtained membranes were characterized by Scanning Electron Microscopy (SEM). The efficiency of the carbon-polymeric membranes in the treatment of water was carried out by filtration tests of water containing model molecules of drugs representing the effluents of the pharmaceutical industry. The results of different analyses showed an improvement in membrane performance by the incorporation of MC and PAC into the membrane matrix. SEM analysis showed an asymmetric structure for all membranes, more porous with the presence of more regular finger-like pores compared to the pure PSf membrane. The removal of organic micropollutants has been proven by water filtration tests.

Keywords: Carbon-polymeric membrane, Ultrafiltration, Powdered activated carbon, Pharmaceuticals.

P10S1. Synthesis, structural study and thermal stability of terbium and samarium complexes with 1,10-phenanthroline

R. Maouche, S. Belaid, B. Benmerad, S. Bouacida and O. Guillou

Laboratoire de Physico-Chimie des Matériaux et Catalyse, Campus Tagua Ouzemmour, Université Abderrahmane Mira, Bejaia, Algérie.
roza8013@gmail.com

Abstract. Two lanthanides complexes with the formula $[Ln(phen)_2(NO_3)_3]$ ($Ln = Sm(1), Tb(2)$, phen = 1,10-phenanthroline) were synthesized by slow diffusion and characterized structurally by single crystal X-ray diffraction and IR spectra. The two complexes crystallize isostructurally in the monoclinic space group $P2_1/n$. Each Ln(III) atom is surrounded by four N atoms from two bidentate-chelated phen ligands and six O atoms from three chelating (NO_3) nitrate groups. The IR spectra of the two complexes show characteristic bands of coordinated phen, the coordination mode of ligands is confirmed by apparition of new bands around 400 and 500 cm^{-1} assigned to Ln-N and Ln-O bonds. The thermal properties of these complexes have been studied. The TG/TD experiments confirm absence of water molecules in the structure. The complexes show a thermal stability until 290 °C.

Keywords: lanthanides complexes, phenanthroline, crystal structures, thermal stability.

P11S1. Advanced Materials Based of Polymer Used for Repairing in Civil Engineering

G. Mirouzi, A. Houada and B. Redjel

Physical & Chemistry department school Superior the Teacher of Teaching Technological (ENSET)
Azzaba Skikda, Algeria.
mirasseg@gmail.com

Abstract. This research deals with polymer mortar, different polymer mortar formulations, with polyester matrix binders, were developed and optimized regarding three points flexural strength property. A polyester resin reinforced with a graded mixture of coarse and fine sands is used as a binder to design the polymer mortar. An empirical methodology (for the planning of the experiments and the analysis of results) were applied for that purpose. That the optimum polymer content that guarantees obtaining a polymer mortar with the highest mechanical performances and the lowest cost is about 35%. The physical and short-term mechanical properties of developed formulations were studied and thoroughly characterized by means of various physical and mechanical tests. Obtained results showed that the above techniques can be applied with success for polymer mortar materials for

repair. Different types of fibers were used for repair (Glass fiber, carbon fiber, and Polyester resin). Repair by the polymer mortar proves to be better and more efficient than that by the all alone resin.

Keywords: Polymer, mortar, polyester, formulations, used for repair.

P12S1. Experimental comparison between the different ranges of PLA feedstock 3D printing and their influence on the mechanical properties of printed parts

M.S. Razali and K. Khimeche

Institut De Recherche Et Développement En Industrie Et Technologies De Défense, Blida, Algérie.
sdkmosta87@gmail.com

Abstract: Additive manufacturing processes are now increasingly used in industry. Among the various existing technologies, filament deposition (Fused Deposition Modeling), seems the most promising for the design of mechanical parts based on thermoplastic polymers. Parts made using the FDM technique are nowadays mainly high value-added parts, where the industrial sectors mainly concerned are: the medical world, the aeronautics and the automobile industry. A wide range of polymer feedstock exists in the 3D printing market as a raw material, where the microscopic structure is related to the processing conditions and the thermomechanical treatments performed during the manufacture of the filaments. In order to take into account the influence of the physical and chemical properties of the commercial polymer filaments, as well as the shaping conditions on the mechanical properties of the final part designed by FDM, an experimental comparison between three ranges of commercial PLA dedicated to the FDM method, in order to predict the final mechanical and microstructural properties of the parts designed by this method. The results of the analyzes: FTIR, DSC and tensile test; have shown a divergence in the mechanical and structural properties, which is maybe in direct relation with the choice of the raw material especially when the supplier does not give enough technical detail on the commercial raw material.

Keywords: 3D printing, naturel PLA feedstock, tensile strength.

P13S1. Synthesis and characterisations of PS/PANI composite material prepared by in situ process disstined for antistatic field

F.Z. Hamlaoui, N. Naar, M. Bouchelaala, and A. Benaboura

Laboratory of Macromolecular Synthesis and Thio-Organics Macromolucular, USTHB; Faculty of Chemistry, Bab Ezzouar, Algiers, Algeria.
hamlaoui.f@outlook.fr

Abstract. This work involves the development of composite containing polyaniline which is a polymer intrinsic conductor as reinforcement and polystyrene as matrix. The composite was prepared by in situ polymerization. The realized composite combines the electrical properties of the PANI with mechanical properties assured by the thermoplastic used. Since PANI is synthesized by interfacial chemical oxidative polymerization in the presence of ammonium persulfate (APS) as the oxidant and 5-sulfosalicylic acid (SSA) as dopant and by its structure, the literature confirms its utility in industrial applications. This later synthesis is proposed in order to study the physicochemical comportment of the PANI in the proposed dopant. The polystyrene is polymerized by emulsion method, sodium dodecyl sulfate (SDS) was utilized as emulsifier and APS as reaction initiator. The samples prepared were analyzed by various characterizations techniques: Spectroscopic (FTIR) to confirm the characteristic structure and interactions of the various formulations prepared, thermal (ATG), and electrical conductivity. The results improve the physical, chemical and electrical properties, respectively. This material is developed for the antistatic domain.

Keywords: Polyaniline, Polystyrene, in situ polymerization, Conductivity.

P14S1. Electrochemical and corrosion behaviors of lead-acid battery in the presence of polyaniline hydro-soluble in 0.5 M H₂SO₄ medium

N. Boudieb, M. Bounoughaz and Z. Safidine

University M'Hamed Bougara, Boumerdes-UMBB, Laboratory of Polymers Treatment and Forming, Boumedes, Algeria.

Abstract. The effect of polyaniline hydro-soluble on the current collector in lead-acid battery is performed in order to improve the life of the battery and to protect the collector against corrosion. The polyaniline used in this study is commercial. The electrochemical behavior of the current collectors in the absence and in the presence of PANI hydro-soluble is evaluated by electrochemical techniques: Cyclic Voltammetry, Electrochemical Impedance Spectroscopy (EIS) and polarization curves (Tafel plots) recorded in 0.5 M H₂SO₄ aqueous solution. Long-term cycling is performed by cyclic voltammetry in 0.5 M H₂SO₄ medium. From the results, it's found that the use of polyaniline hydro-soluble in 0.5M H₂SO₄ protects the lead metal within good anticorrosion proprieties. The peaks matching to the oxidation of lead to lead sulfate obtained by voltammetry is decreased for the lead electrode in the presence of polyaniline hydro-soluble compared to the lead electrode without PANI hydro-soluble in acidic solution.

Keywords: Lead acid-battery, polyaniline hydro-soluble, corrosion,electrochemical techniques.

P15S1. Study of the adsorption of a dye on a silica gel derived from the kaolin siliceous by-products

D. Ingrachen-Brahmi, H. Belkacemi and L. Ait Braham-Mahtout

Chemistry Department, Laboratory of Materials Technology and of Process, University of A. Mira, Bejaia, Algeria.
dadraa12@yahoo.fr

Abstract. Silica gel is used in several applications, such as air moisture removal, as a treatment agent for effluents. In this study, silica gel was synthesized from Algerian siliceous by-products (sand) collected from Tamazert ore. The prepared and the synthesized silica gels exhibited pore diameters exceeding 17Å and surface areas up to 477 m² /g, comparable with those described in the literature and commercial silica gel. N₂ adsorption isotherms showed that the silica gels prepared from Algerian sands are mesoporous materials with high adsorption capacities. To understand better their adsorbent properties and applicability on an industrial scale, this gel was tested for methylene blue (MB) absorption. Maximum decolorization rates (up to 80% after a contact time of 180 min) occurred with product synthesized at pH 2. The adsorption mechanism fitted better with a Langmuir model, revealing a monolayer coverage process of MB molecules over the gel surface, and the adsorption kinetics of the dye on these materials is well described by the second order model.

Keywords: siliceous by-product, silica gel, capacity, methylene blue, dye absorption

P16S1. Textural properties and carbon dioxide adsorption enhancement of Mordenite zeolite synthesized in the presence of a new organic template

Z. Farouk, M. Hachemaoui, B. Bensafi and N. Chouat

Laboratoire de chimie des matériaux, Université Oran 1 Ahmed Ben Bella, Oran, Algérie.
bensafibb@hotmail.com

Abstract. Recently, a great attention has been given to the adsorption and separation of CO₂. Carbon dioxide is the main greenhouse gas, which causes a severe global warming. Industrially, the most used adsorbents are metal-organic frameworks, activated carbons, silica and alumina. In the last recent years, zeolites have been found suitable materials for this polluting gas elimination. Their structure, high surface area and physic-chemical properties such as hydrothermal and mechanical resistant made of them good adsorbents. In this work, Na-mordenite zeolite synthesis with remarkable mesoporosity was successfully synthesized by soft templating method in the presence of *N,N*-dimethylaniline as novel organic template and characterized with several techniques (XRD, SEM and

BET). The prepared material was tested in environment protection. In the first it was ion exchanged by two alkali metal cations (K⁺, Cs⁺). Intracrystalline diffusion and alkalinity of zeolites were attributed high adsorption capacities of CO₂. Carbon dioxide capturing capacity increased in the sequence Cs-MOR>K-MOR>Na-MOR.

Keywords: Meoporous mordenite, Soft templating, Alkali cations, CO₂ adsorption.

P17S1. Removal of Organic Pollutants from Wastewater by New Granules (Fe-PIOCG) With Gluten

A. Louadi, O. Bouras, B. Cheknane and F. Zermane

Laboratoire Eau Environnement et Développement Durable, Université Saad Dahlab-Blida 1, Blida, Algérie.

Louadjamel1@gmail.com

Abstract. This study focuses on the preparation by compaction-granulation method of gluten as binder and iron-pillared montmorillonite (Fe-PIOC) using different percentages of binder. Mechanical and physical characteristics of these news granules were connected to the dynamic adsorption properties of malachite green (MG). The effects of dynamic adsorption parameters such as bed depth, initial concentration and inlet flow rate were investigated. The breakthrough curves were exploited by the Thomas and Yoon and Nelson models using nonlinear regression. The corresponding results showed a good agreement with the experimental results obtained indicating that the model predictions were appropriate for the design of the column.

Keywords: Compaction-granulation; Pillared clay; Friability; Malachite Green.

P18S1. Rapid Separation of flavonoids from dichloromethane extract of *Centaurea melitensis* L. (Asteraceae) by Fast Centrifugal Partition Chromatography and antibacterial activity

N. Mezache, F. Rahmouné and H. Laouar

Faculty of Sciences, Department of chemistry, University of Setif 1, Algeria.

mezachenadjet@yahoo.fr

Abstract. The *Centaurea* (Asteraceae) genus is known to contain phenolic compounds, including flavonoids which are generally associated with significant activity. To develop an efficient preparative isolation procedure for bioactive compounds with a high-yield, fast centrifugal partition chromatography (FCPC) was optimized to purify hispidulin **1** (5,7,4'-trihydroxy-6-méthoxyflavone) and eupafolin **2** (5,7,3',4'-tetrahydroxy-6-méthoxyflavone), major constituents from *Centaurea melitensis* L. dichloromethane extract in a single step at the same time as compared to fractionation from this semi-polar extract by conventional solid-liquid chromatography procedure. The purification yield, purity, time and solvent consumption per procedure are described. The structures were established on the basis of UV, 1D and 2D NMR and mass spectroscopy analysis. The antibacterial activity was evaluated on the dichloromethane extract and their two flavones isolated. Therefore, *Pseudomonas aeruginosa* ATCC 27853, which is classified among the most resistant bacteria (*Gram-negative*), is founded sensitive to eupafolin **2** at a concentration of 1500 µg/mL.

Keywords: Centrifugal Partition Chromatography, Flavones, *Centaurea*, Asteraceae, Antibacterial activity.

P19S1. Durability of ultra high performance fibered concretes in two acidic environments

F. Ait Medjber and M. Saidi

Unité de Recherche Matériaux, Procédés et Environnement, Université M'Hamed Bougara.
Boumerdes, Algérie.
farida.pcmc@gmail.com

Abstract. The objective of this research is to study the durability of specimens of a high-performance fiber-reinforced concrete (UHPFC) in two aggressive media concentrated at 10% (nitric acid, hydrochloric acid) for a period of one month. The study of durability has shown that specimens made from pozzolan-substituted cement have better chemical resistance in both acidic solutions (the loss of mass decreases with the increase of pozzolan substitution rate), so UHPFC prepared with 0% pozzolan have low chemical resistance to attack nitric acid with a loss of mass of 3.97%. On the other hand, in the hydrochloric acid solution the low chemical resistance is presented by the test pieces made with 10% pozzolan since they display 5.49% mass loss.

Keywords: chemical resistance, durability, mechanical characterization.

P20S1. Feasibility study of CO₂ absorption process using ionic liquid as solvent

N. Amiri, H. Benyounes and I. Touaibia

Université des sciences et de la technologie d'Oran USTO-MB, département de Génie chimique,
Oran, Algérie.

Abstract. Ionic liquids (ILs) have shown great interest to be used as liquid absorbents for CO₂ capture because of advantages such as non-volatility potentially that makes ILs "green" solvents. ILs would not contaminate the atmosphere, even in small amounts; they have high CO₂ solubility and low energy requirements for regeneration.

In this work, CO₂ separation process using the ionic liquid 1-hexyl-3-methylimidazolium tetracyanoborate ([hmim][TCB]) as physical solvent was investigated to substituting organic solvent dimethyl ether of polyethelene glycol (DEPG) called "Selexol" by simulation using Aspen plus V.8.0. The vapor-liquid equilibria of CO₂ and CH₄ in presence of [hmim][TCB] was modeled with the NRTL activity coefficient model, and the binary interaction parameters of CO₂ + [hmim][TCB] and CH₄ + [hmim][TCB] were fitted to the experimental data. Results show that [hmim][TCB] ionic liquid could be an excellent alternative to conventional solvents for CO₂ separation, especially for gas streams with low and moderate acid gas content. New design of the regeneration system has been proposed to improve solvent regeneration.

Keywords: CO₂ Capture, Ionic liquid, Physical absorption.

P21S1. Feasibility study of pressure-swing distillation process for separation of formic acid – water - acetic acid

B. Mahida and H. Benyounes

Laboratoire de chimie physique de matériaux, catalyse et environnement, USTO, Oran, Algérie.

Abstract. The separation of the ternary mixture formic acid - acetic acid - water into three high-purity products is difficult due to the presence of binary and ternary azeotropes that divide the ternary diagram into four distinct distillation regions. Fortunately, the compositions of these azeotropes change significantly with pressure. The pressure-swing distillation process was proposed for the separation of this ternary system. The process simulations were carried out using Prosim Plus 3 software. The effects of the number of theoretical stages, feed stage and reflux ratio were investigated to optimize the operating parameters of the pressure-swing distillation. The best operating process parameters were defined for systems containing 30% mol. in formic acid, 60% mol. in water and 10% mol. in acetic acid. It has been found that, the water can be distilled in the first column operating at the pressure of 1.961 bar, then the formic acid can be separated at pressure 0.067 bar in the second one and acetic acid can be obtained in the bottom product of the third column operating at 1.013 bar. The

three obtained products in the three distillation columns have a high purity of more than 99.9% in mole fraction. The distillate of the third column was recycled back to the first column.

Keywords: Vapor - liquid equilibrium, Binary Azeotrope, Pressure swing distillation.

P22S1. Separation of ethanol – water mixture using ionic liquids

M. Addouni and H. Benyounes

Laboratoire de chimie physique de matériaux, catalyse et environnement, U.S.T.O, Oran, Algérie.
mokhtaria003@yahoo.fr

Abstract. The aim of the present work has been focused on the design of liquid-liquid extraction and liquid-vapor extractive distillation processes for the separation of ethanol-water using ionic liquids. For this purpose, 1-butyl-3-methylimidazolium ([BMIM][NTF2]) and 1-Ethyl-3-methylpyridinium Ethyl Sulfate ([EMpy][EtSO₄]) has been chosen as separating agent. A comparative study among processes of extraction using the [BMIM][NTF2] combined with extractive distillation, and extractive distillation using [EMpy][EtSO₄]. The UNIQUAC and NRTL models were used to correlate respectively the LLE of the ternary systems at 30°C and the NRTL model for LVE under the atmospheric pressure using Simulis Thermodynamic software.

Keywords: Ionic liquid, UNIQUAC model, Liquid – liquid extraction.

P23S1. Influence of hydrogen bonding network on the vibrational spectroscopic and dielectric properties of new imidazolium based ionic liquids

M. Boumediene, B. Haddad, R. Omeiri and H. Tahi

Department of Chemistry, Faculty of Sciences, University of Saida - Dr. Moulay Tahar- Algeria.
m.boumediene68@gmail.com

Abstract. Since about three decades ago, ionic liquids have been increasingly recognized as potentially useful materials in a wide field of applications. The recent years have seen a strongly growing research effort regarding these new materials. Currently, only a few Algerian laboratories are working on these compounds, most of them using conventional methods. In the present work, two new ionic liquids based on 1-butyl-3-alkylimidazolium [C₄C_nIm⁺] [X⁻], (where n can take the values: 0 or 1) containing the chloride [Cl⁻] anion were synthesized. The method is based on the alkylation reaction of 1-methyl-imidazole and imidazole as precursors. The obtained "ILs" are characterized by ¹H-NMR, ¹³C-NMR and FT-IR spectroscopy. Also, the influence of presence of the hydrogen bonding network between the both cations and the chloride anion are known to govern the molecular as well as physico-chemical properties. In particular, the cation-anion interactions were investigated in both ILs by means of NMR and IR measurements, with a particular attention to the occurrence of hydrogen bonding. Both techniques indicate that hydrogen bonding is stronger in the sample containing 1-butylimidazolium chloride [C₄Im⁺] [Cl⁻]. Moreover, the preferred site for hydrogen bonding is the C (2) proton of the imidazolium ring; however, also the C (4)/ C (5) and N---H protons of imidazolium ring participate to the hydrogen bonding. Additionally, In order to decide whether these ionic liquid could be successfully used as electrolyte for electrochemical applications, the conductivity and dielectric relaxation properties of these "ILs" have been investigated according to the frequency at different temperatures.

Keywords: Ionic liquids - imidazolium - vibrational spectroscopy - dielectric properties.

P24S1. Removal of Malachite green cationic dye from aqueous solutions by UV/Persulfate process and effect of various water constituents

N..Mechehoud, C. Djelloul and I. Amallal

Laboratory of Chemistry of Materials and Living, Activity and Reactivity, University of Batna, Batna, Algeria.

naima.mechehoud@univ-batna.dz

Abstract. Recently, advanced oxidation process based on the sulfate radicals ($\text{SO}_4\cdot^-$) has received growing attention as a promising alternative for the degradation and mineralization of organic pollutants in water and sediment owing to its advantages of highly stable reactivity, widely operative range and relatively low cost. In this work, Malachite green is initially treated by UV254 and persulfate activated by UV254 (UV/PS). The addition of PS facilitated the decomposition of MG due to sulphate radical formation and notably, the presence of 80 mg PS brought about a nearly complete mineralization after 25mn. The influence of several parameters such as initial substrate concentration (7-500) mg.L⁻¹, pH (2-10), temperature (25-65)C° and initial oxidant concentration on the degradation of Malachite green was assessed. Additionally, the impact of natural matrices (seawater and natural waters) on the degradation rate of this dye was clarified. The degradation of the dye was strongly sensitive to the operational conditions. The natural matrices enhanced the degradation of the dye.

Keywords: Persulfate, Malachite green, mineralization.

P25S1. Study of structural and optical properties of porous thin a-SiC:H films for optical energy

A.Boukezzata, B. Mahmoudi, H. Menari and S. Kaci

Centre de Recherche en Technologie des Semi-conducteurs pour l'Energétique (C.R.T.S.E), Algiers, Algeria.

assiab2006@yahoo.fr

Abstract. The Porous layers of hydrogenated Amorphous Silicon Carbide thin films (PASiC) was formed by anodization of a-Si_{0.72}C_{0.28}H in HF/ethylene glycol (ETG) solution at current density of 50 mA/cm² for 45 s. The optical and structural properties of a-Si_{0.72}C_{0.28}H thin films deposited by DC magnetron co-sputtering using single silicon crystal, 6H-SiC targets have been investigated. The as-obtained PASiC thin films were characterized by scanning electron microscopy (SEM), infrared spectroscopy (FTIR), spectrophotometer UV, Raman spectroscopy, Secondary ion mass spectroscopy (SIMS) and photoluminescence. We demonstrated the utility and the application of a-SiC through the fabrication of a Schottky photodiode based onto a-Si_{0.72}C_{0.28}H and PASiC thin films. A spectral response (SR) value of 36 mA/W has been obtained at $\lambda = 900$ nm for a Schottky photodiode based on Pd/PASiC/pSi/Al. It was noticed that the porous surface has a strong effect on the sensitivity of the realized heterostructure.

Keywords: thin films, electrochemical etching, porous amorphous SiC, spectral response

P26S1. The physico-chemical characterization of the rejects resulted from the gold ore treatment

A. Baziz and N. Bouzidi

Laboratoire de Technologie des Matériaux et de Génie des Procédés, Université A/MIRA-Bejaia, Algeria.

bazizamina@gmail.com

Abstract. Gold mine rejects are the waste materials generated after extraction of gold ore, the disposal of which is a major environmental problem for the mining industry. At Amesmesssa mine (El Hoggar, Algeria); where mining has carried out for over 15 years, about 2 million tons of mill tailings has been accumulated each year. This work reports about the characterization of two types of reject products from the different steps of processing chain. These two rejects are the marginal stock (SM) generated by the mining operations of the Amesmesssa mine and the reject generated at the

downstream end of the gold ore treatment named RAT. Several investigations were carried out based on the characterization of solid rejects from gold ore processing. The chemical and physical analysis of the two rejects mainly revealed the dominance of quartz and especially the existence of heavy metals (Fe, Pb, Zn, Cr) for the RAT reject detected by x-ray diffraction and x-ray fluorescence, as well as the high degree of finesse indicated by laser diffraction. These physico-chemical investigations indicate the importance of the treatment of these rejects to preserve the environment.

Keywords: Gold ore , Reject, Environment.

P27S1. Inhibition of corrosion by a synthetic derivative of pyrazole on the corrosion of mild steel in an aggressive medium and his studies of quantum chemistry

F. Boudjellal and H. B. Ouici

Department of Chemistry, Faculty of Science, University of Saida, Algeria.
fayssal_1982@yahoo.fr

Abstract. Nitrogen-containing heterocycles are cyclic organic compounds in which one or more types of atoms are found. They are usually carbon and a heteroatom such as oxygen, nitrogen, phosphorus, sulfur, phosphorus, arsenic and silicon. The nomenclature of heterocycles is made by international conventions defined by the International Union of Pure and Applied Chemistry (IUPAC). Heterocyclic compounds are classified according to the nature and number of heteroatoms (saturated heterocycles and partially saturated heterocycles, widely used in chemistry for a large number of cycles) and the number of rings (5- and 6-membered heterocycles). Interdisciplinary fields such as the corrosion inhibitor In this work, the five-chain nitrogen heterocycle was first synthesized, characterized and their influence on corrosion to avoid the degradation of metals.

Keywords: Synthesis, Characterization, Five-chain nitrogen heterocycles, corrosion inhibition

P28S1. Application of Sodium Methyl Ester Sulfonate Anionic Surfactants as Corrosion Inhibitors for Carbon Steel in Oilfield Injection Water

A. Asselah, A.M. Chaouche, A. Toudji and A. Tazerouti

Université de M'Hamed Bougara, Département du Génie des Procédés, Avenue de l'indépendance -
Boumerdès, Algeria.
asselah.amel@yahoo.fr

Abstract. In this study, the anticorrosive properties of a series of sodium methyl ester sulfonate anionic surfactants (Φ -MES) on a carbon steel "API 5L X70" were estimated in an oilfield injection water from a well of Hassi R'Mel region- Algeria, and are compared to those of sodium dodecyl sulphate. This class of surfactants was synthesized from fatty acids by photochemical process and exhibits good physicochemical properties and good biodegradability. The inhibition corrosion was evaluated by means of loss weight and linear polarization corrosion rate (LPR) technics. The results suggested that the studied surfactants were a good inhibitors. Inhibition efficiency was found to increase with increase in concentration and chain length. Adsorption of inhibitors on the carbon steel follows Langmuir adsorption and the mechanism of adsorption is governed by physical forces.

Keywords: Oilfield Injection Water, Corrosion, Surfactants.

P29S1. Partial phase diagram and micellar properties of Tetracaine hydrochloride from thermal conductivity measurements

C. Zemat, T. Fergoug, Y. Bouhadda, F. Chater and A. Belfedal

Laboratoire de Chimie physique des biomolécules et interfaces biologiques, Université de Mascara, Mascara, Algeria.

lpcmib@univ-mascara.dz

Abstract. Solubilisation and micelle formation of tetracaine-hydrochloride (TC,HCl) in aqueous solution has been studied by thermal conductivity. Parameters such as the critical micelle concentration, *cmc*, Kraft temperature, *TK*, and the change of solubility with temperature were investigated. A partial phase diagram of Tetracaine hydrochloride in water was also explored and micellization process discussed.

Keywords: Conductivity; tetracaine-hydrochloride (TC,HCl); Krafft temperature; Phase diagram

P30S1. Effect of kaolin on textural, structural and adsorption properties of Ca-exchanged A zeolite.

M. Guerza, F. Benaliouche, M. A. Benachabane and Y. Boucheffa

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.

Guerza.mouna@gmail.com

Abstract. The effect of kaolin on textural, structural and adsorption properties of calcium-exchanged A zeolites is examined with a view to using zeolite-kaolin mixtures as adsorbents for the hemostatic applications. The zeolite/kaolin samples are prepared by physical mixing of pure calcium-exchanged A zeolite with appropriate amounts of purified kaolin powder. The pure form of kaolin raw material containing mainly rich well-crystallised kaolinite is obtained via physical-chemical treatments. The kaolin loading rate in the A zeolite samples ranges from 5 to 25 wt.%. The use of diatomic nitrogen molecule as an adsorptive for surface area and porosity determinations show that the addition of kaolin particles on A zeolite induces a specific interactions with surface functional groups and consequently can block the entrances of narrow micropores of A zeolite. The retention capacities for the water molecules and the nature of the interactions responsible for water binding are studied by temperature-programmed thermal desorption technique, performed on thermogravimetric unit. The water adsorption capacity shows a clear dependence on the chemical nature of the zeolite surface and on the textural properties. Both porous volume and water retention capacity estimated during water desorption from adsorbents pores decrease with an increase of kaolin loading rate. The interactions responsible for water binding are closely related to the hydrated cationic species of the zeolite surface and the loading rate of the kaolin in zeolite. Steric effects also should be considered for the adsorption patterns.

Keywords: Zeolite, kaolin, adsorption.

P31S2. Effect of Current Density on the Microstructure and Morphology of the Nickel Coatings

A. Boukhouiete, S. Boumendjel and J. Creus

Laboratoire de Métallurgie Physique et Propriété des Matériaux, Université Badji-Mokhtar, Annaba, Algeria.

amelboukhouiete@yahoo.fr

Abstract. The aim of this research work was to study the effect of deposition current density on microstructure and surface morphology of electrodeposited nickel coatings. For this purpose, nickel deposits have been synthesized by direct current from watts bath without additive, in order to limit the incorporation of pollutants resulting from surface adsorption or electro-activity of these compounds. Nickel deposits have been investigated by Scanning electron microscopy and X-ray diffraction. Cyclic voltammetry was also used to gain information on the general behavior of the deposition. The optimum

conditions of deposition were established and the influence current density on the grain size, surface morphology and crystal orientation was determined.

Keywords: Nickel, Electrodeposition, Microstructure, Morphology Current Density.

P32S1. The influence of the deformation in cold rolling formatting on the characteristics of the oxide layer obtained by anodization on the ALUMINIUM alloy of TYPE 2024

S. Benamirouche, A. Abdi and M.A. Belouachrani

Laboratoire d'Electrochimie et de Corrosion, Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria. Sofia_bene@yahoo.fr

Abstract. The objectives of this work is to study the influence of the rolling treatment on the corrosion behavior of 2024 aluminum-alloy specimens anodized in sulfuric bath. The elaborated specimens without and with rolling treatment have been deeply characterized using optic microscopy (OM), scanning electronic microscopy (SEM), X-ray diffraction (XRD) and differential scanning calorimetry (DSC). The corrosion behavior was studied in NaCl solution 3% by performing the polarization plots and by electrochemical impedance spectroscopy.

Keywords: Aluminum alloy, Corrosion, anodizing, SIE, Bode diagram, Nyquist diagram, equivalent electrical Circuit: R (CR/QR), Rolling.

Poster Session 2

P1S2. Thermal and structural characterization of hardwood lignin obtained by Kraft and Organosolv processes

M. Fodil Cherif, D. Trache and F. Benaliouche

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.
fodilcherif1977@gmail.com

Abstract. Lignin is the most abundant polymer in the form of phenolic macromolecules with a complex structure. Its study continues to inspire the enthusiasm of scientific community. In this study, hardwood lignin is obtained from eucalyptus by using Organosolv and Kraft processes. The objective of this work is to investigate the features of the isolated lignins by comparing the chemical and thermal properties. The infrared spectroscopy analysis confirms the existence of different monolignols. For thermal stability, thermogravimetric technique (TG) is used from an ambient temperature to 700°C with heating rate of 10°C/min in a nitrogen environment. The obtained results showed that the decomposition of both extracted lignins is commonly governed by devolatilization and the formation of different chemicals. It was also revealed that the employed extraction methods slightly affected the chemical and thermal properties.

Keywords: Biomass, Hardwood, Organosolv lignin, Kraft lignin, characterization.

P2S2. Properties of pure and Mn doped ZnO nanopowders by co-precipitation method

A. Boumezoued, K. Guergouri, M. Zaabat and B.Regis

Laboratory of Active Components and Materials, University Larbi Ben M'Hidi of Oum El Bouaghi,
Algeria.
amal.boum4@gmail.com

Abstract. Pure and Mn doped zinc oxide nanopowders have been synthesized by co-precipitation method. The obtained powders after calcinations in air at 500°C were consolidated and sintered using conventional furnace. The obtained powders were characterized by X-ray diffraction, SEM images and Hall measurements. The effect of Mn concentration on the microstructure on the density and on the electrical properties was successfully investigated. The studied nanopowders have : a high density of 7.26 (g/cm³) for 5%Mn powder. The XRD results indicate that pure and Mn doped ZnO powders are solid solutions crystallizing in pure wurtzite structure, and consisted of a mixture of nanoparticles with an average grain size between 11.68 and 39.12 nm. The grain size increases with increasing Mn concentration and reaches its highest value at 5 mol% Mn and increases with increasing particle size. On the other hand the increase of Mn concentration leads to an increase of the density and leads also to an increase of the charge carrier concentration of Zn % mol MnO.

Keywords: Zinc oxide, manganese, nanopowders, Co-precipitation.

P3S2. Structural and electronic study at the DFT and TD-DFT level of new gold (III) complexes of bio-pharmacological interest

Y. Arbia and M. Brahimi

Laboratory of Theoretical Physico-Chemistry and Computer Chemistry, Faculty of Chemistry. USTHB,
Algiers. Algeria.
arbiayassamina@yahoo.com

Abstract. The last decade has witnessed a significant increase in the biological applications of metal complexes due to their key role in therapy. Indeed, these metal ions are known for their ability to bind with nucleic and change their conformations and biological functions. The effectiveness of platinum complexes as anti-cancer agents can be listed as one of the most remarkable successes among inorganic drugs. Gold (III) complexes are iso-structural and iso-electronic with platinum (II) complexes. These complexes generally have interesting cytotoxic and anticancer properties, but their development has so far been severely hampered by their stability in the physiological environment. As part of this work we carried out a theoretical study of the new gold (III) complexes. This theoretical study will allow us to focus on the entire structural and electronic properties as well as their thermodynamic stability and reactivity in order to understand and then propose the right molecules likely to be potential drugs candidates. This work is carried out at the DFT and TD-DFT level with bases 6-311+G (d,p) for light atoms and LANL2DZ for the metal ion. The theoretical results will be compared with those obtained experimentally.

Keywords: coordination metals, gold (III) complexes, DFT and TD-DFT.

P4S2. Hydrolytic degradation ability of poly(L-Lactide) achieved by adding poly(methyl methacrylate)

N. Boudaoud and H. Satha

Laboratory of Silicates, Polymers and Nanocomposites (LSPN), University of 8 Mai 1945, Guelma,
Algeria.
nouna2188@hotmail.com

Abstract. The hydrolytic degradation of poly(L-lactic acid)/poly(methyl methacrylate) (PLLA/PMMA) blends was carried out by the immersion of thin films in buffer solutions (pH=7.24) in a shaking water bath at the temperature of 60 °C for 38 days. The PLA/PMMA blends (0/100; 30/70; 50/50; 70/30; 100/0) were obtained by melt blending using a Brabender internal mixer and shaped into thin films of

about 150 μm thickness. Considering that PMMA does not undergo hydrolytic degradation, the PLLA hydrolytic degradation was followed via thermal parameters (differential scanning calorimetry (DSC)) and morphology of the films (scanning transmission electron microscopy (STEM)). The results revealed, a completely different degradation pathway of the blends depending on the polymethacrylate/polyester weight ratio. DSC data let suggest that, during the hydrolysis, at higher PMMA content, the polyester amorphous chains, more sensitive to water, is degraded before to able to crystallize while with higher PLLA content, the crystallization is favoured leading to more resistant sample to hydrolysis. In other words, and quite unexpectedly, increasing the content of water-sensitive PLLA in the PLLA/PMMA blend does not mean *de facto* faster hydrolytic degradation of the resulting materials.

Keywords: polymer blend, hydrolytic degradation, crystallization.

P5S2. Development and characterization of carbon chamotte mixtures during sintering

A. Belbali and K. Loucif

Laboratory of non-metallic materials, institute of optics and precision mechanics, Ferhat Abbas University Setif1, Algeria.
belbaliassia21@gmail.com

Abstract. Silicon carbide has hardly used a natural existence. It is an artificial material essentially synthesized for the needs of technology. It belongs to the class of materials generally referred to as wide-gap semiconductors. It is the subject of numerous studies because of its interesting physical and chemical properties (high thermal and electrical conductivity, strong resistance to oxidation and radiation, high thermal and mechanical resistance, good chemical inertia ...) and which offer it a vast potential for application. The development of a silicon carbide from a carbothermic reaction of the chamot of kaolin was the subject of our study. Silicon carbide is the product of a reaction between the residual silica of the kaolin transformations and the added carbon, and consequently to reduce the rate of the glassy phase. The latter is in the form of cristobalite between 1000-1400 ° C and in the form of an amorphous phase above 1400 ° C. The chamotte -10% carbon weight mixtures were processed and sintered at 1350 ° C for 2 hours, 5 hours and 10 hours. The spectra of XRD show that the presence of mullite as main compound by a peak centered at 21 ° C and cristobalite, the disappearance of the latter as the temperature of the treatment increases, against we notice on the results porosity the significant increase in open porosity and constancy of density.

Keywords: chamot, SiC, carbothermic reaction, Sintering, Refractory.

P6S2. Effect of Alkali Treatment On The Mechanical And Morphological Properties Of Polypropylene/Wood Flour Composite

F. Kabache and S. Nekkaa

Laboratoire Physico-Chimie des Hauts Polymères, Université Ferhat ABBAS Sétif -1-, Sétif, Algeria
Kabfay07@outlook.fr

Abstract. In recent years, due to growing environmental concerns and the depletion and price of oil, there has been a growing renewal of interest in fibers derived from natural sustainable sources, as a result of their potential use in high performance composite materials. Many types of natural fiber have been identified as having appropriate mechanical properties for structural applications. However, natural fibers are hydrophilic in nature and exhibit poor interfacial adhesion between fiber and matrix. Modification of the fiber surface by chemical methods, such as alkalisation, benzylation and acetylation, has been used by researchers to improve this shortcoming. In this work we have study the effect of the wood flour's addition and their mercerisation treatment (5%w NaOH) on the properties of polypropylene/wood flour (PP/WF) composite. The results of mechanical properties show a decrease in impact resistance of the composite with the increase of wood floor content. However, a certain improvement of this mechanical property after the modification was observed. In addition, according to the results of microscopy with atomic force AFM, the roughness of PP/WF composites decreases with the alkaline treatment of the floor's surface.

Keywords: Composite, Surface Treatment, Mechanical Properties, Wood Flour.

P7S2. Chemical synthesis of polyaniline and study of its effectiveness corrosion inhibition of API 5L Gard X60 steel in acid medium

D. Ghemati, N. Boudieb and D. Aliouche

Laboratory of Polymers Treatment and Forming. F.S.I, M'Hamed Bougara University, Boumerdes, Algeria.
ghemati_d@yahoo.fr

Abstract. The objective of this work is the synthesis of polyaniline PANI, then the study of its effectiveness corrosion inhibition of API 5L Gard X60 steel in acid medium, The polymer synthesis was carried out chemically from aniline. The radical polymerization reaction is initiated by ammonium persulfate. The synthesized polymer is characterized by FTIR spectroscopy and UV / Visible and DRX. Electrochemical tests: linear polarization resistance, Tafel and impedance tests were performed to evaluate the corrosion inhibition efficiency of poly aniline. The characterization indicates that the polyaniline form obtained is emeraldine salt, it is the form doped with chloridic acid , with a semi-crystalline structure. The results of the electrochemical tests obtained show that this polymer acts as an anodic inhibitor by forming a protective film on the anode surfaces by blocking the electrochemical reaction of dissolution of the metal. The corrosion rate and the corrosion current decrease with the increase of the PANI mass in sulfuric acid medium, while the polarization resistance and the protective efficiency increase. A maximum efficiency 97% for a mass of 0.4g PANI; these results allow the possibility of using this type of polymer in the protection of pipes and tanks for storing hydrocarbons against corrosion.

Keywords: Polyaniline, Polymerization, Corrosion.

P8S2. Photo-thermal oxidation of polypropylene modeling of carbonyl index using artificial neural network

H. Maouz, L. Khaouane, S. Hanini, Y. Ammi, and M. Laidi

Laboratory of Biomaterials and Transport Phenomena (LBMPT), University of Médéa, Médéa, Algeria.
maouz.hadjira@yahoo.com

Abstract. The aim of this work is to use multilayered perceptron artificial neural network (MLP-ANN) to modeling the carbonyl index during the photo-thermal oxidation of polypropylene (PP). A set of 87 data points is used to test the neural network. 80 % and 20% of the database were used for the training and the test of the model respectively. The best fitting training data was obtained with the architecture of (3 inputs neurons, 11 hidden neurons, and 1 output neuron). Quasi-Newton (trainbfg) training algorithm, logarithmic sigmoid transfer function and linear transfer function were used at the hidden and output layer respectively. The optimized ANN was obtained with a high correlation coefficient of $R=0.999$ and root mean square error $RMSE=0.00016$ during the generalization phase. The comparison between the experimental and calculated results show that the ANN model is able of predicted the carbonyl index during the photo-thermal oxidation of polypropylene.

Keywords: carbonyl index, photo-thermal oxidation, polypropylene, neural networks.

P9S2. Effect of hybridization material on buckling analysis of composite plates on elastic foundation using new theory of trigonometric deformation

K. Benselama, N. El meiche, E. Adda Bedia and A. Tounsi

Département Génie civil, centre universitaire Ahmed Zabana de Relizane, Algérie.
kh.benselama@hotmail.fr

Abstract. This paper presents the effect of hybridization material on variation of critical buckling load with different cross-ply laminates plate resting on elastic foundations of Winkler and Pasternak types subjected to combine uniaxial and biaxial loading by using two variable refined plate theories. Governing equations are derived from the principle of virtual displacement; the formulation is based on a new trigonometric shape function of displacement taking into account transverse shear deformation

effects vary parabolically across the thickness satisfying shear stress free surface conditions. These equations are solved analytically using the Navier solution of a simply supported. The influence of the various parameters geometric and material, the thickness ratio, and the number of layers symmetric and antisymmetric hybrid laminates material has been investigated to find the critical buckling loads. The numerical results obtained through the present study with several examples are presented to verify and compared with other models with the ones available in the literature.

Keywords: Buckling; hybrid, Cross-ply laminates; Winkler and Pasternak; Elastic foundation; two variables plate theory.

P10S2. Study of the immiscibility SBS/PCL polymer blend

D. Metref and L. Metref

Centre de recherche nucléaire de Draria, Alger, Algérie.
metref_driss@yahoo.fr

Abstract. Polymer blends are currently a very important area of research and development in the field of plastic materials, since we are improving different chemical and mechanical properties that only one polymer can not possess. Polymers rarely lead to miscible mixtures and their miscibility depends on both their structure and their molecular weight. A first approach to their miscibility can be made from thermodynamics and the calculation of the free enthalpy of mixing. As for the immiscible polymers, one often has a dispersed phase in another. In order to improve the dispersion and the mechanical properties, it is possible to use compatibilizers which are generally copolymers synthesized independently of the mixture or generated in situ during mixing. The dispersion can also be improved by a judicious choice of mixing tools (extruder screw profile ...). The quality of the dispersions can be evaluated by making films. If these are transparent, it may be an indication that the polymers present are miscible. This first approach may be supplemented by further analyzes: measurements of glass transition temperatures, melting and study of the amorphous or crystalline nature of the polymers in question.

Keywords: Immiscibility, poly- ϵ -caprolactone (PCL), Styrene-butadiene-styrene (SBS).

P11S2. Study of the thermal stability for shape memory polymers

L. Metref, S.L. Hafsaoui and Z. Safiddine

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Alger, Algérie.
l.metref@hotmail.com

Abstract. Shape memory polymers represent a new category of new intelligent materials that have the ability to respond to and recover from large deformation after application of a particular external stimulant. These materials show enormous potential for innovation because from their original properties and behaviors, they can be used in many applications and technological challenges. In order to use these materials for very specific applications, the optimization of their parameters responsible for triggering the memory effect is a necessity that led us to study them. The TAM III micro-calorimeter was used to evaluate the thermal stability of several SBS/PLA samples as well as virgin mixture and mixture which was tested for shape memory effect at various temperatures. This is by estimating the heat flux values derived from the thermograms obtained at the end of the experiments. The choice of temperatures is related to the transition temperature of this mixture.

P12S2. Characterization of Algerian Eucalyptus tannins for a potential use in resin and foam formulation

M. Amari, K. Khimeche and A. Pizzi

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.
amari-medjda@hotmail.fr

Abstract. Increasingly high demand for composite materials is being recorded, creating a dilemma, especially for researchers. For some time now, a lot of work has been done on bio-sourced resins, derived from local plants such as eucalyptus in order to replace synthetic resins in the production of composites. Recently, there has been a growing interest in tannin resins for their low cost and also for their availability. Tannins are natural phenolic compounds, which have been extensively researched for the development of a wide range of industrial applications. First, the Algerian Eucalyptus tannins have been extracted by varying different extraction times, extraction temperature, solvent concentration, stage extraction and liquid-solid ratio. The phenolic composition of Algerian Eucalyptus barks was studied. FTIR (Fourier Transformed Infrared Spectroscopy), NMR (Nuclear Magnetic Resonance) and TGA/DSC (Thermogravimetric analysis) were used to examine Eucalyptus tannins. Analyses showed that Eucalyptus barks are rich in condensed tannins, especially in procyanidin and prodelphinidin tannins. The reactivity to formaldehyde test (Stiasny number) showed the possible use of Eucalyptus tannins in resin and foam formulation.

Keywords: Eucalyptus, tannin, resin, foam, NMR, FTIR, TGA.

P13S2. Green composite adsorbent (biopolymer-activated carbon): synthesis and application for methylene blue removal

A. Boucherdoud, B. Bestani, D. Kherroub, N. Benderdouche and O. Douinat

Laboratory of structure, development and application of molecular materials, University of Mostaganem, Algeria.

Abstract. A new composite adsorbent of biopolymer and activated carbon was prepared by ionic gelatinization method at ambient in order to eliminate methylene blue dye from aqueous solution in continuous mode using a controlled glass column. The prepared composite adsorbent was characterized by infrared spectroscopy (IRTF) and scanning electron microscopy (SEM-EDX). Effects of the parameters on dye adsorption such as bed height, initial concentration and flow rate were also studied. Obtained results show that the bed service time increases with increasing bed height and decreases with the increase of the initial concentration and the flow rate. The adsorption dynamics of methylene blue obeys Thomas model with a correlation coefficient $R^2 = 0.99$. The Thomas model shows an increase of the absorbed capacity q_e according to the initial concentration and the flow rate, while this model's constant KTH decreases according to the concentration range.

Keywords: Composite adsorbents, biopolymer, activated carbon, methylene blue, adsorption.

P14S2. Removal of azo dye from aqueous solution by adsorption onto activated clay. Part II: response surface methodology approach.

B. Hayoun, O. Deflaoui, S. Terki, H. Messaoudi, M. Bourouina and S. Bourouina-Bacha

University A-Mira of Béjaia, Béjaia, Algeria.
hayba.bahdja@gmail.com

Abstract. The study of adsorption of eriochrome black T (EBT) was carried out in a batch reactor. It consisted of the optimization and the modelling of the removal of EBT by adsorption on an activated bentonite. The use of a design of experiments (DOE) approach, in this case the response surface methodology (RSM), allowed the determination of the influence of the principals' effects and the interaction of the operational parameters on the rate of the adsorption. The results describe correctly the influence of the experimental parameters on the adsorption rate and the predicted values were in good agreement with the experiment data. The analysis of variance (ANOVA) showed that the

proposed model was highly significant. The response surface methodology (RSM) used to optimize the amount of EBT adsorbed acting on the experimental conditions indicates that this method is a reliable for determining the optimum operating conditions of the dye adsorption process on the clay.

Keywords: adsorption, clay, eriochrome black-T, DOE, RSM, optimization.

P15S2. Preparation and Characterization of new local clays from Ghardaïa (Algeria) for their potential uses in wastewater treatment

S. Athman, M. Boufatit and F. M. Azizi

Laboratoire d'Electrochimie-Corrosion, Métallurgie et Chimie Minérale, Faculté de Chimie, USTHB, Alger, Algérie.

athmansouad@yahoo.fr

Abstract. Representatif samples of natural clay materials from Ghardaia have been selected, prepared, characterized and used for the removal of heavy metal ions from aqueous solution. The structure and physicochemical properties of the raw and acid activated samples were characterized by powder X-RayDiffraction (XRD), Fourier TransformInfraRed (FT-IR) spectroscopy technics and Scanning electron microscopy (SEM).Physico-chemical parameters such as adsorbent dose, equilibrium contact time, was studied in a serie of batch adsorption experiments at 25°C. The obtained results revealed that the removal percentages of Cu^{2+} and Ni^{2+} ions were varying between 90 % and 70 % for 35 min. The values of thermodynamic parameters, ΔH° , ΔS° and ΔG° indicated that the adsorption of these ions was spontaneous and exothermic process in nature.

Keywords: Natural clay, Cu^{2+} , Ni^{2+} , Removal, Kinetic, thermodynamic

P16S2. Ab-initio calculations of Optoelectronic Properties of $\text{Al}_x\text{Ga}_{1-x}\text{N}$ semiconductors

A. Kafi, F.Z. Driss Khodja, F. Saadaoui

Laboratory of Technology of Communications - Laboratory of Physico-chemical Studies, University of Saïda 20000 Saïda, Algeria.

fdrisskhodja@yahoo.fr

Abstract. This paper communicates structural and optoelectronic properties of $\text{Al}_x\text{Ga}_{1-x}\text{N}$ ($x = 0, 0.25, 0.5, 0.75$, and 1) alloys, this properties have been calculated using the full-potential augmented plane wave FP-LAPW method based on the density functional theory DFT, within the generalized gradient approximation GGA-PBEsol. The calculated lattice parameters are in good agreement with the previous experimental and theoretical results. The modified beck-Johnson potential TB-mBJ is used to investigate the electronic and optical properties. Direct bandgap change to indirect bandgap with increasing in Al concentrations was found for this material. Furthmore, the dielectric function, reflectivity, absorption coefficient and refractive index are presented and discussed in detail. The peak in the imaginary part of the dielectric function and the absorption edge are found to have a remarkable blue-shift with the increase of Aluminum concentration. These theoretical studies predict that this compound could be efficient material for optoelectronic applications and need further experimental and theoretical studies.

Keywords: semiconductors, $\text{Al}_x\text{Ga}_{1-x}\text{N}$ alloys, DFT, optoelectronic properties, structural properties.

P17S2. Electrochemical Determiation of Pyrogallol at Aluminum Oxide Modified Paste Carbon Electrodes

L. Taouri and M. Bourouina

Departement of Chemistry, University of Bejaia, Algeria.

nassimalydia35@gmail.com

Abstract. Paste carbon electrode modified with aluminum oxide (Al_2O_3 -PCE) have been used for the detection of pyrogallol (PG). The electrocatalytic oxidation of PG at the Al_2O_3 -GPE was investigated

by cyclic Voltammetry (CV), and differential pulse Voltammetry (DPV). The modified electrode showed an anodic oxidation pic in a round of +0.75 V. Under optimum experimental conditions using differential pulse Voltammetry, the sensor showed a linear calibration plot in 1–1000 μM of pyrogallol, sensitivity of $6.58 \times 10^{-4} \mu\text{A} \cdot \text{L} \cdot \text{mol}^{-1}$, and a detection limit of 5 μM after 10 min accumulation.

Keywords: pyrogallol, modified carbon paste electrode, differential pulse Voltammetry, cyclic Voltammetry

P18S2. Extractive distillation of Ethanol-Water using a mixture of organic solvent and ionic liquid as entrainer

F. Guella and H. Benyounes

University of Sciences and Technology of Oran Mohamed Boudiaf, Oran, Algeria.
guella.fadia11@gmail.com

Abstract. In this work, an extractive distillation process of ethanol-water separation was investigated using a solvent design consisting of ethylene glycol and an ionic liquid mixture. Two imidazolium-based ionic liquids were proposed, (1-ethyl-3-methylimidazolium acetate), [EMIM][OAc] and (1-ethyl-3-methylimidazolium dicyanamide), [EMIM][DCA]. The vapor-liquid equilibrium of the ethanol/water azeotropic mixture in the presence of the solvent was predicted by the NRTL model. A rigorous simulation of the extractive distillation process was carrying out. The design parameters of the separation process such as: reflux molar ratio (R), feed stage (NF), solvent stage (NE), solvent-to-feed molar ratio (FE/F) and ionic liquid concentration in the solvent mixture were evaluated. The sensitivity analysis was performed to visualize the effect of the solvent-to-feed ratio (FE/F) and the reflux ratio (R) on the purity of ethanol. The purity of ethanol in the distillate must be higher than 99.9 mol%. The energy consumption on the reboilers of both extractive distillation and regeneration columns has been optimized.

Keywords: Ionic liquids, Extractive distillation, Ethanol/water mixture.

P19S2. Volatile fatty acids analysis in anaerobic digestion of cattle manure

M. Saber, N. Tirichine, M. Fedailaine, L. Kadir, M. Khitous, S. Abada, A. Saidi, K. Moussi and M. Aziza

Centre de Développement des Energies Renouvelables, Algiers, Algeria.
m.saber@cder.dz

Abstract. Methanization of biowaste under anaerobic conditions leads to the generation of biogas which, after purification, could be valorized for the production of biofuel, electricity and / or heat. Energy recovery by anaerobic digestion of waste from an agricultural farm was studied. The anaerobic digestion of 7 kg of waste was carried out in a thermophilic reactor working in a wet way. The cumulative total amount is 127 l with an average methane content of 56%. The control of volatile fatty acid demonstrate the production and the consumption of different acids in the digestate. The concentration of acetic acid reach a very small value at the final step of the reaction.

Keywords: Volatile fatty acids, agricultural waste, anaerobic digestion, biogas, thermophilic digester.

P20S2. Synthesis of acetylisoniazid and validation of the detection method by HPLC

L. Yahia Cherif, D. Sadouki and S. Tazibet

Hopital Centrale de l'Armée, Ain naadja, Algiers, Algeria.

Abstract. The work presented aims to synthesize acetyl isoniazid (AcINH) chemically by acetylation of Isoniazid (INH). The latter is a medicine against any type of tuberculosis and the synthesized molecule is the metabolite of this drug in the body. To achieve this, an optimization of the synthesis of acetyl isoniazid is necessary, by carrying out several methods of synthesis and modifying several parameters, which are: the volume ratio between acetic anhydride and pyridine, the evaporation's temperature of our mixture, and the purification of our synthesis. The characterization of this reaction

product will be by: UV, GC / MS, TLC, and HPLC / DAD was carried out while optimizing the operating conditions. Finally, quantification of the drug and its synthesized metabolite was performed using high performance liquid chromatography. Calibration curves were carried out successfully. The application of the validation is carried out and a study of the stability of the two molecules has also been carried out. The results obtained show that the synthesis of acetylisoniazid has taken place. Indeed, an identification of this molecule is carried out using its mass spectrum obtained by GC / MS. Optimal conditions for the synthesis and characterization of this molecule have also been established.

Keywords: Isoniazid, acetylisoniazid, Characterization, Validation.

P21S2. Activated Carbon Coated Magnetite Nanoparticles as a Heterogeneous Catalyst for Dye removal

S. Halladja H. Ayadi and F. Djaghroud

Université 20 août 1955, B.P 26 El Haddaïk, Skikda, Algeria.

s.halladja@univ-skikda.dz

Abstract. Recent developments in water waste treatment have led to an improvement of the degradation processes of organic pollutants in aqueous medium. The heterogeneous Fenton process is particularly attractive for the removal of poorly biodegradable organic compounds such as the dyes that used in textile industry. In this study, we focused on the preparation of a purified carbon / magnetite composite (CP-Fe₃O₄) by the hydrothermal method using a local and inexpensive charbon. Then, the CP-Fe₃O₄ synthesized material was applied in the removal of Methylene Blue (BM). The textural, structural properties of the CP-Fe₃O₄ composite were characterized using different techniques such as X-ray diffraction (XRD), scanning electron microscopy (SEM). The experimental result shows that the use of the system (CP-Fe₃O₄ / H₂O₂) reached the almost total decolorization of the methylene blue dye. Evaluation of the effect of composite dose, H₂O₂ dose, BM concentration and temperature demonstrated that these parameters affect considerably the decolorization yield of the methylene blue dye. Although, the system has a higher activity, its stability and reuse remain very noteworthy.

Keywords: Composite, Dye, Heterogeneous Fenton, Magnetite

P22S2. Determination of liquid-liquid equilibrium for ternary system {water + ethanol + ethyl acetate} at 293.15 K

A. Aidaoui and A. Hasseine

Université Mohamed Khider, Biskra, Algeria.

ahlem.aidaoui@yahoo.com

Abstract. Phase equilibrium of the ternary system {water + ethanol+ ethyl acetate} was measured experimentally at 293.15 K and under atmospheric pressure. The liquid-liquid equilibrium data are represented in ternary diagrams by binodal curves and tie-lines. Refractive index measurement was employed to determine the concentration of all species in each phase. Reliability of the experimental data was ascertained by applying the Othmer-Tobias and the Bachman equations. In addition, distribution coefficients and separation factors of the studied ternary system were calculated using the equations from the experimental liquid-liquid equilibrium data and discussed in detail.

Keywords: Liquid-liquid equilibrium, Ethanol, Binodal curve, tie-lines, Correlations.

P23S2. Predicting the effective thermal conductivity of Alumina/water and Alumina/Ethylene glycol nanofluids using artificial neural network

W. Grine and M. E. Benhamza

Laboratory of Industrial analysis and Materials Engineering. University 8 May 1945, Guelma, Algeria.

grine.wassila@univ-guelma.dz

Abstract. The aims of the present study are to develop and validate an artificial neural network (ANN) approach to estimate the thermal conductivity ratio (TCR) of Alumina/water and Alumina /EG nanofluids as a function of temperature, volume fraction and diameter of the nanoparticle. For the purpose of evaluating the accuracy of the proposed model by ANN for both of Alumina /water and

Alumina /EG nanofluids, root mean square error (RMSE) and regression coefficient (R^2) are utilized. The presented correlation relationship estimates empirical data very well. However, the artificial neural network for Alumina /EG has a higher regression coefficient and lower error compared to Alumina /water nanofluid. The results indicate that these two new models have great ability to predict thermal conductivity and show excellent agreement with the experimental results.

Keywords: Nanofluid, Thermal conductivity, Artificial Neural Network.

P24S2. Ethanol production from paper waste

W. Tadmourt, K. Khiari and L. Tarabet

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.
Wahiba.tadmourt@g.enp.edu.dz

Abstract. Production of liquid biofuels has been as a sustainable option to overcome the problems associated with rising prices and diminishing reserves of crude oil and global warming. Ethanol is a clean alternative fuel and a renewable bio-based resource. The second generation of bioethanol is produced from lignocellulosic feedstock. Paper waste is an attractive resource which is abundant available in Algeria. This study focuses on the conversion of paper waste to bioethanol using two processes: hydrolysis of cellulose and hemicellulose to produce reducing sugars, and fermentation of the sugars to ethanol. The result shows that this waste can be converted into bioethanol 80° in concentration with a yield of 11ml per 50g of the substrate.

Keywords: bioethanol, lignocellulosic feedstock, paper waste.

P25S2. Activated carbon prepared and used as a filter for volatile organic compounds retention

N. Yousfi, H. Fettaka and S. Tazibet

Institut de Recherche et Développement en Industrie et Technologies de Défense, Blida, Algérie.
Yousfi.Nacer@yahoo.com

Abstract: This study aims to investigate the efficiency of activated carbon as a filter for volatile organic compounds. An activated carbon is prepared using a mixture of olive residue and zinc chloride at a temperature of 450°C. The porosity of the prepared carbon is investigated using N₂ isotherms at -196 °C. Long-range order is studied by X-ray diffraction (XRD). The investigation of the carbon functionalities is carried out by Boehm titration and Fourier transformed infrared spectroscopy (FTIR). The efficiency of the activated carbon elaborated toward cyclohexane is tested using gas chromatography.

Keywords: Olive residue, Activated carbon, Surface functional groups, Adsorption.

P26S2. Extraction of aromatic compounds from water using a mixed solvent

F. Rabhi and H. Sifaoui

Laboratoire de Physico-Chimie des Matériaux et Catalyse (LPCMC), Université A. MIRA de Bejaia, Bejaia.
fadhila_rabhi@yahoo.fr

Abstract. The pollution of water in its various areas of existence (oceans, seas, rivers and groundwater) in the whole world in general and the third world countries in particular is a fact. This pollution is either of industrial origin, agriculture or household wastes. The industry generates organic and inorganic pollutants such as hydrocarbons, pharmaceuticals and heavy metals. Agriculture generates pesticides, herbicides and household waste such as sanitary products and detergents. The protection and the decontamination of water from these various effluents is a challenge to be taken up by the scientists in general and the chemists in particular, so as pollution grows, ways to combat it have grown too. The present study, which is part of this objective, consists on the extracting of the aromatic compounds (phenol and salicylic acid) from the aqueous solution using the organic solvents

and a mixture solvents (organic solvent + ionic liquid) at 303, 15 K and under the atmospheric pressure. Several parameters (temperature, pH and the nature of the solvent), were studied in order to evaluate their influence on the extraction of phenol and salicylic acid from water and to determinate the experimental conditions to obtain an optimal extraction. The values of the distribution, selectivity coefficients and the yield (%), Indicate that the optimal extraction was obtained with octanol compared to dichloromethane (DCM), dichloroethane (DCE), at 303.15 K, and the mixed solvent (DCM + 1-ethyl-3-methylimidazolium hexafluorophosphate ([Emim][PF₆])) ameliorate the extraction of phenol and salicylic acid from an aqueous solution as showing in figs (1) and (2).

Keywords: Liquid-liquid extraction; ionic liquid, aromatic compounds.

P27S2. Thermal desorption of water over Ca-LTA zeolite-Diatomite based adsorbents

F. Baba, F. Benaliouche, F. Ait Ihaddadene and Y. Boucheffa

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.
Fayza.baba1@gmail.com

Abstract. In this study, the thermal desorption of water molecules on hydrated zeolite-diatomite based adsorbents are investigated using thermogravimetric and derivative thermogravimetry (TG-DTG) analyses. The zeolite-diatomite adsorbents are prepared by physical mixing of commercial Ca-exchanged LTA zeolite with appropriate amounts of purified diatomite powder. The pure form of diatomite is obtained from raw diatomite by applying both chemical and thermal treatments. The diatomite loading rate in the adsorbent samples ranges from 15 to 25 wt.%. The water desorption isotherms are measured by heating the adsorbent samples from 20 to 350°C at different heating rates. According to TG and DTG profiles, two main distinct temperature regions of water loss are observed. The first weight loss is located in 80-130°C temperature range, which can be attributed to the loss of weakly bound water molecules. The second weight loss observed in the range of 160-350°C is ascribed to the stronger bound water molecules to the cations that are located in zeolite cavities and diatomite pores. The apparent activation energies values for the water desorption on Ca-exchanged zeolite, calculated by using Kissinger and Ozawa methods are in close agreement. The value of both activation energies and enthalpy of the prepared samples seems to depend on the diatomite loading rate. Indeed, the increase of diatomite loading rate in adsorbents lead to the decrease of activation energy and enthalpy values particularly for sample containing 15w% of diatomite. These results highlight clearly the complexity of water desorption kinetics on the zeolite and diatomite pores.

Keywords: Zeolite, diatomite, adsorption.

P28S2. Interfacial Adhesion behavior of sputtered titanium thin films deposited onto steel substrates

R. Gheriani and D. Slimani

Laboratory of Radiation, Plasma and Surface Physics (LRPPS), Faculty of Mathematics and Sciences of matter University of Ouargla, Algeria.

ragheriani@yahoo.fr

Abstract. The good mechanical properties and high bond strength between the coating and the substrate is one of the properties needed for an increased durability. These properties are highly dependent on several parameters such as the previously treatment received by the substrate before deposition also on physicochemical phenomena occurring at the interface during and after deposition under the effect of heat treatments. In the present paper, we have investigated the relationship between the nature and composition of steel substrates and their reaction with titanium coatings as well as its effect on the adhesion behavior. To avoid the failure of adhesion observed in recent work caused by the direct deposition of carbon as amorphous carbon or hydrocarbon species directly from the gas or from the plasma for deposition of TiC films on steel substrates, we have used a cathodic sputtering system for deposit pure titanium thin films onto 42MnV7 steel substrates containing 0.49% mass of carbon. After vacuum annealing at 400 to 1000°C temperatures range. The observations and results show the formation and growth of titanium carbide (TiC) proportionally with the annealing

temperature, as well as a good adhesion of coatings with their substrates within the annealing temperature range between 400 and 600°C. In the case of the samples annealed at higher temperatures, the results show the cracking and detachment of coatings mainly at high temperatures as a result of a bad Adhesion. These observations are accompanied with strong diffusion of the steel alloying elements towards the external layers.

Key words: Interfacial Adhesion, Steel, Titanium.

P29S2. Electrochemical Evaluation of *n*-Butanolic Extract of *Taxus Baccata* as Corrosion Inhibition for Carbon Steel in Acidic Medium

K. Hanini, M. Benahmed, S. Boudiba, I. Selatnia, S. Akkal and H. Laouer

Laboratory of active molecules and applications, Tebessa University, Tebessa, Algeria.

hanini_kari@yahoo.fr

Abstract. The aim of this work is the evaluation of *n*-butanolic extract (BE) obtained from the aerial part of "*Taxus Baccata*" as corrosion inhibitor for carbon steel in HCl solution (1N), using electrochemical techniques (potentiodynamics polarization, electrochemical impedance spectroscopy SIE). The SIE curves showed an increase in the size of the impedance spectrum and hence increase in charge transfer resistance (which is inversely proportional to the corrosion current) according to the increasing of inhibitor concentration proofing the formation of a protective layer. The polarization curves revealed that the BE is mixed type. The experimental results show that the BE is a good corrosion inhibitor and the increasing of its concentration leads to an increase of corrosion inhibition effectiveness of carbon steel which reached 83.28 % for a concentration of 700 ppm at 293K.

Keywords: *n*-butanolic extract, corrosion inhibitor, carbon steel.

P30S2. Comparative study on electrodeposition and characterization of Ni, Co and Ni-Co thins layers on platinum substrate

A. Boukazoula, A. Abdi, R. Bendrimia, Y. Mechelouf

Laboratory of electrochemistry and corrosion, polytechnic military school, PB 17, BEB 16046, Algiers, Algeria,

Boukazoula_a@yahoo.fr

Abstract. The aim of this work is to develop thin layer deposits of nickel, cobalt and nickel/cobalt-alloy on a platinum substrate. The experiments are performed in a sulphated bath using electrochemical techniques. The influence of the concentration, pH, time, current density and applied potential on the electrodeposition process has been demonstrated by cyclic voltammetry, chronoamperometry and chronopotentiometry. The best deposits are obtained under diffusionnel regime for 120 s. The diffusion coefficients of Ni²⁺ and Co²⁺ were evaluated by chronoamperometry. The μ -XRF revealed a deposit of anomalous type for Pt-Ni/Co with lower nickel content. The SEM characterization revealed a homogenous solid phases formed by very fine particles.

Keywords: Thin layer deposit, electrodeposition, nickel-cobalt deposits, anomalous deposit.

P31S2. Determination of polythiophene thermoelectric properties deposited in thin layers on a flexible ITO substrate

Z. Bekkar Djelloul Sayah, A. Mekki, F. Delaleux, O. Riou and J.F. Durastanti

Ecole Militaire Polytechnique, BP17 Bordj El-Bahri, 16046 Alger, Algérie.

bekkar_zakaria@yahoo.fr

Abstract - In this study, an experimental setup was developed to determine the Seebeck coefficient for an electrodeposited Polythiophene, doped with different concentrations of lithium perchlorate (LiClO₄) on a flexible ITO substrate using potentiostatic mode (imposed potential = 12 V / ECS). Thermoelectric performances were evaluated by measuring the electrical conductivity, thermal conductivity, Seebeck coefficient and the merit coefficient (ZT) at room temperature. Fourier Transform Infrared Spectroscopy

characterization(FTIR) was carried out on the sample which exhibits better thermoelectric performance, like the polythiophene doped with 0.2 M LiClO₄.

P32S2. Adsorptive desulfurization of diesel fuel using Ni- exchanged ZSM-5

N. Dif, F. Benaliouche, B. Boukoftane and Y. Boukoberine

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.

dif.nabi@gmail.com

Abstract. ZMS-5 zeolite was loaded with nickel using two different methods, solid and liquid state ion exchange. X-ray fluorescence (XRF) and atomic absorption spectrometry (SAA) measurements revealed that the Ni loading levels depended strongly on the modification technique. The X-ray diffraction (XRD) and N₂ sorption characterizations indicated good conservation of the initial structure and texture of zeolite after modification. The total pore volume and specific surface area decreased with the increasing of nickel amount. Adsorptive desulfurization tests under mild conditions was conducted in batch experiments using a model diesel fuel containing thiophenic form of sulfur compounds and a real diesel fuel with a total sulfur content of 231 ppmw and 600 ppmw, respectively. The total sulfur in the sample was determined before and after desulfurization tests using XRF. The results showed that thiophene removal from model fuel is highly dependent on the amount of Ni. The adsorption capacities were 2.50 and 1.08 mg/g for Ni-ZSM-5-S and Ni-ZSM-5-L. While, the sulfur adsorption capacities of real diesel fuel increased to 3.02 and 2.66 mg/g respectively. The use of thermogravimetry–differential thermogravimetry (TG-DTG) to study thiophene retention indicates clearly that very strong chemical interactions exist between the adsorbate and adsorbent.

Keywords: Desulfurization, adsorption, ZSM-5 type zeolite, thiophene.

Poster Session 3

P1S3. A Homogenous Material Composed of PVC and EVA Applied in Thermal Conditions and Resistant to Gamma Irradiation up to 50 KGy

N. Boutouchent-Guerfi, and A. Benaboura

Laboratoire Synthèse Macromoléculaire et Thio-Organique Macromoléculaire, (USTHB), 16046 Algiers, Algeria.

benaboura@hotmail.com

Abstract. The interest of our work is to create a new material resistant to gamma irradiation up to 50 KGy using PVC with some additives and EVA. It ranks among new polymer material with remarkable combination of properties, such as heat resistant, low moisture uptake, mechanical and morphological properties compliant. Moreover, the structure of a polymer with a homogenous matrix enables its use as a material acceptable for particular applications such as coating of cables and insulation in nuclear centers. In this work, the PVC and EVA at 10% is to combine the useful properties to develop a product resistant to thermal aging at 80°C and gamma rays up to 50 KGy. In the first stage, physical, thermal, dielectric and morphological tests were carried out on PVC and PVC/EVA/10%. Then, the effect of aging on mechanical properties (tensile strength, elongation at break and Young modulus) and the changes induced in the thermal analysis and morphology due to gamma radiation was investigated from 10 KGy to 50 KGy. The results revealed that the gamma irradiation affected considerably the PVC properties but the mechanical, thermal and morphological properties of PVC/EVA/10% was improved, which puts a new material applied in thermal conditions and resistant to gamma irradiation up to 50 KGy.

Keywords: Ethylene vinyl acetate, gamma radiation, mechanical stress, poly (vinyl chloride).

P2S3. In-situ preparation of polyurethane-clay nanocomposites in the presence of Maghnite as an inorganic reinforcement for multifunctional mechanical properties

T. Boulaouche, D. E. Kherroub, K. Khimeche, A. Benzerafa and M. Belbachir

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.
boulaouche-tarik@hotmail.fr

Abstract. For the first time, polyurethane-based composites/nanocomposites (PU-Magx) were synthesized using Maghnite as an inorganic reinforcement. Maghnite is a smectite-type laminar clay with a specific surface area of 786 m²/g. It is characterized by a relatively higher SiO₂/Al₂O₃ ratio compared to other world clays. The interfacial cations of Maghnite can be active sites during the reaction, which gives it a catalytic aspect. This was the reason why in-situ polymerization method was chosen for PU-Magx synthesis. The X-ray diffraction (XRD) study showed that the organophilic Maghnite (Mag-CTAB), treated with cetyl trimethylammonium bromide, exhibits a very large interlayer distance compared to sodium Maghnite (Mag-Na) and raw Maghnite. Different PU-Magx formulations were prepared by introducing 1, 3, 5, 7 and 10% of Mag-CTAB. The chemical structure of pure PU and PU-Magx has been confirmed by infra-red (IR) and ¹H MAS NMR spectroscopy. The dispersion of the sheets in the PU matrix were studied by transmission electron microscopy (TEM). The Young's modulus and the yield strength were calculated in order to evaluate the mechanical behavior of PU-Magx.

Keywords: Polymeric matrix; Clay; reinforcement; Polyurethane; Maghnite

P3S3. Development and in vitro Release Study of 2-Amino-benzothiazole Loaded Microspheres

M. Mouffok, A. Merdoud, A. Mesli and N. Chafi

Physical and Organic Macromolecular Chemistry Laboratory (LCOPM), Faculty of Exact Sciences,
Djillali Liabes University of Sidi Bel-Abbes, Algeria.
meriem20015@gmail.com

Abstract. The aim of the present study is the preparation and development of prolonged drug release microspheres based on 2-aminobenzothiazole-loaded cellulose derivatives microspheres for controlled release. Microencapsulation by simple emulsion (O/W) solvent evaporation method was carried out to prepare these formulations using two cellulose derivatives as matrices: ethylcellulose (EC) and cellulose acetate butyrate (CAB). The optimization of the experimental parameters such as the polymer/solvent ratio, the matrix type, stirring speed and the number of blades was studied to get high encapsulation efficiency of drug. The effect of the selected parameters on microsphere characteristics, as well as the release rate was investigated. SEM analysis showed spherical microspheres. The effective actual entrapment of 2-ABZT were confirmed by FTIR spectroscopy and X-ray diffraction. The encapsulation efficiency was improved when the polymer concentration increased reaching 89.48%. We have obtained microspheres in the range of 61-278 μ m with EC by varying process conditions and closed to 113 μ m with CAB. The *in vitro* release kinetics of the cation of 2-ABZT were established at 37°C in simulated gastric medium pH 1.2 and the obtained data were analyzed according to Fick's law.

Keywords: Microencapsulation, Drug Release, Diffusion.

P4S3. Study of thermal and mechanical behavior of bionanocomposites films based on PLA and PHBV

F. Z. Yakdoui and A. S. Hadj Hamou

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.
Yakdoui.fz@gmail.com

Abstract. This research reveals the development of poly (lactic acid) (PLA) and poly-(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV) reinforced with TiO₂ nanoparticles. The PLA/PHBV/nanoparticles bionanocomposites films were produced by melting extrusion method. The effect of the addition of TiO₂ on thermique, mechanical and antimicrobial properties of bionanocomposites was investigated. The results revealed that the developed bionanocomposites films showed improved mechanical , antimicrobial properties. Therefore, the developed bio-based composite incorporated with inorganic nanoparticles TiO₂ exhibits better properties as compared to the polymer blend PLA/PHBV.

Keywords: PLA, PHBV, TiO₂ nanoparticles , thermial , mechanical properties

P5S3. Study and Characterization of Composites Materials Based on Thermoplastic matrix and natural fiber

H. Aouat, A. Boukerrou, D. Hammiche, H. Djidjelli, Y. Grohens and I. Pillin

Laboratoire des Matériaux Polymères Avancés (LMPA), Faculté de Technologie, Université Abderrahmane Mira, Bejaia, Alegria.
hassinaaouat@yahoo.fr

Abstract. Composites reinforced with natural fibers have attracted the attention of several researchers, because of their low cost, low density and availability, ease of implementation and high specific properties, etc. The main objective of the present work was to study the effect of benzoylation and PVC-g-MA on the mechanical, thermal and properties of PVC/OHF composites. In this context, we are interested for developing two types of composites, modified and unmodified, with different rate of olive husk flour namely 10, 20 and 30%. The treated and untreated OHF were characterized by Fourier Transform Infrared spectral analysis. The Composites obtained by extrusion were characterized by mechanical tests.

Keywords: olive husk flower, composites, PVC-g-MA, benzoylation

P6S3. Effect of the micromechanical models on the bending of FGM beam using a new hyperbolic shear deformation theory

N. Zouatnia and L. Hadji

Department of Civil Engineering, University of Tiaret, Algeria.
nissa.hadji@gmail.com

Abstract. In this paper, a new refined hyperbolic shear deformation beam theory for the bending analysis of functionally graded beam is presented. The theory accounts for hyperbolic distribution of the transverse shear strains and satisfies the zero traction boundary conditions on the surfaces of the functionally graded beam without using shear correction factors. In addition, the effect of different micromechanical models on the bending response of these beams is studied. Various micromechanical models are used to evaluate the mechanical characteristics of the FG beams whose properties vary continuously across the thickness according to a simple power law. Based on the present theory, the equilibrium equations are derived from the principle of virtual work. Navier type solution method was used to obtain displacement and stresses, and the numerical results are compared with those available in the literature. A detailed parametric study is presented to show the effect of different micromechanical models on the flexural response of a simply supported FG beams.

Keywords: FG Beams, Micromechanical models, Bending, Navier solution

P7S3. Effect of porosity on mechanical response of a functionally graded beams

L. Hadji, N. Zouatnia and A. Safa

Department of mechanical Engineering, Ibn Khaldoun University, Tiaret, Algeria.
had_laz@yahoo.fr

Abstract. This work presents a free vibration analysis of functionally graded metal–ceramic (FG) beams with considering porosities that may possibly occur inside the functionally graded materials (FGMs) during their fabrication. A new displacement field containing integrals is proposed which involves only three variables. Based on the suggested theory, the equations of motion are derived from Hamilton's principle. This theory involves only three unknown functions and accounts for parabolic distribution of transverse shear stress. In addition, the transverse shear stresses are vanished at the top and bottom surfaces of the beam. The Navier solution technique is adopted to derive analytical solutions for simply supported beams. The accuracy and effectiveness of proposed model are verified by comparison with previous research. A detailed numerical study is carried out to examine the influence of natural frequencies on the free vibration responses of functionally graded beams.

Keywords: Free vibration; Functionally graded materials; Integral; Hamilton's principle.

P8S3. Ammonium sensing using a facile chemical polymerization polyaniline-strontium composite film

S. M. Benhouhou and A. Mekki

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.
benhouhou93@gmail.com

Abstract. The present work consists on the preparation of polyaniline–strontium (PANI–Sr) composite film via an in situ facile chemical polymerization of aniline in presence of SrNO_3 deposited on biaxially oriented polyethylene terephthalate (BOPET) flexible substrates, with prior surface treatment using (3-aminopropyl) trimethoxysilane aiming to enhancing the film adhesion and reaching a specific morphology. The characterization of the obtained PANI–Sr films were carried out using FTIR. Their electrical conductivity was measured by the usual four probes technique. Obviously, the obtained films have shown a higher conductivity compared to the pristine polyaniline film. Moreover, this improved character has been exploited in order to test the film's sensitivity toward different types of gases. The obtained results put a high selectivity and sensitivity to the ammonia gas over the other tested vapors.

Keywords: Polyaniline-strontium composite, ammonia, gas sensor.

P9S3. Polyaniline nanoparticles: microemulsion synthesis using sds as a surfactant

M. Bounedjar, A. Mekki, N. Naar and H. Chabane

Ecole Militaire Polytechnique, BP 17 Bordj El Bahri 16046, Alger, Algérie.
strokche@yahoo.fr

Abstract. Polyaniline (PANI) was synthesized by an “hybrid microemulsion polymerization” method in the presence of two sulfonic acids, such as dodecylbenzenesulfonic acid (DBSA), Naphthalene Disulfonic Acid (NDSA) in the presence of anionic surfactant Sodium Dodecyl Sulfate (SDS), the reaction was carried out at 18°C. Influence of SDS and dopant natures on size and conductivity of PANI nanoparticles were investigated. From the studies, ammonium peroxydisulfate (APS) was added drop-wise, through an addition funnel, at a rate of 0.1ml per 2 minute. The reaction time was 5 hours (300 min). The obtained PANI was subjected to various characterizations techniques such as: FTIR, DSC, and conductivity measurements. The morphology was characterized by scanning electron microscopy. It was found that the SDS micelles affect the formation morphology and size as well as physical properties of the nanoparticles. Room-temperature conductivity for the PANI ranges from 36 to 80 S/cm. PANIs have a good thermal stability, high conductivity, nanoparticles morphology (200-350 nm) for DBSA+SDS system and (190 - 250 nm) for NDSA+SDS system.

Keywords: Polyaniline, Nanoparticles, Micro-emulsion polymerization.

P10S3. Stability of Hassi-Messaoud asphaltenes in media of different polarities

K. Kradra Brahma, D. Bendedouch, Y. Bouhadda, F. Bouanani and A. Sardi

Laboratoire de Chimie Physique Macromoléculaire, Département de Chimie, Université d'Oran, Oran, Algérie.

brahma_khadidja@yahoo.fr

Abstract The aim of this work is to explore the flocculation behavior of asphaltenes (extracted from a deposit recovered from a Hassi-Messaoud oil well) in solution in toluene according to the polarity of the flocculating medium. The flocculation thresholds related to the addition of two flocculating agents of different polarities (n-heptane and acetone) for three asphaltenic concentrations are obtained by means of near infra-red absorption spectrophotometry. The Hildebrand solubility parameters of the flocculated asphaltenic fractions are deduced using the Donnagio method based on the Flory-Huggins theory. The results obtained indicate that the interactions between the flocculated asphaltenic molecules within the toluene/acetone mixture are weaker than those in the toluène/n-heptane mixture.

Keywords: Asphaltenes, Hassi-Messaoud, Flocculation, Close IR spectrophotometry, Solubility parameter.

P11S3. Study and development of polymer blends; PP / PP-G-MAH / PLA / Pro-oxidants

F. Hayoune and S. Zitouni

Polytechnic military school, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.

Fouzia211@hotmail.fr

Abstract. Mixing polymers to obtain a new material with interesting properties according to the desired applications is a very powerful approach especially from an economic point of view. In this work, PP polypropylene was mixed with PLA polylactic acid to study the properties and biodegradability of the mixture. Since this mixture is immiscible, a PP-g-MAH compatibilizer has been added in order to reinforce the interface between the polymers. The results obtained confirm the effectiveness of compatibilization of the blends by PP-g-MAH where an improvement of the mechanical and rheological properties has been observed. The addition of prooxidants, which are complexes of transition metals; they are commonly used as an attempt to facilitate the degradation of polymer blends mixed with these stearates by microorganisms.

Keywords: polymer blends, biodegradable, PP/PLA, stearates.

P12S3. Mechanical and microstructural characterization of polyurethane foams

N. Boumdouha, Z. Safidine, A. Boudiaf, A. Oukara, D.E. Tria and A. Louar

Ecole Militaire Polytechnique BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.

boumdouhanouredine@gmail.com

Abstract. For the manufacture of polyurethane foam having a certain density, we seek to control as much as possible the development of the microstructure. Therefore, the final product could exhibit the desired properties for a notable application in non-lethal projectiles. These last warheads based on these alveolar materials must be able to put out of harm's way a target without causing a permanent injury or a fatal outcome. The mechanical characterization was carried out by dynamic drop weight test, on a machine designed and carried out locally; the mechanical properties of polyurethane foams are highly dependent on density, cell structure (size and shape) and percentage of open and closed cells. It may occur that the foam has a preferential orientation in the cell structure. In order to visualize of the semi-opened cells of the alveolar polymer, this later is described by Raman spectroscopy analysis. It appears that the cellular polymer has stubborn regular cellular structures with noticeable overlap reversibility.

Keywords: Polyurethane Foam, Drop weight tests, Non- lethal Projectiles, Raman spectroscopy analysis.

P13S3. Study of the adulteration of olive oil by Fourier Transform Infrared Spectroscopy and chemometric methods

K. Bekkar, R. Oumeddour and S. Nigri

Industrial Analysis Laboratory and Materials Engineering, University 8 May, 1945. Guelma, Algeria.
bekkar.khaoula@yahoo.fr

Abstract. Because of the importance of oleiculture in the agricultural field, it is highly significant to study this culture in order to improve the outputs and to help the farmers to produce good quality of olive oil in Algeria. The prices of the olive oil are high compared to the other edible oils. Therefore, the temptation of not very scrupulous people to operate an adulteration by less expensive oils to increase the profits must be fought. The objective of this work is to study and quantify the effect of edible oils addition; like sunflower oil, rapeseed oil, corn oil and soya oil on the spectroscopic characteristics of the olive oil. The Fourier Transform Infrared spectroscopy has been developed for analysing olive oil adulterated with edible oils. This technique is often used by combining chemometric methods to highlight the spectrum parties' modifications by even minor modifications of the composition. In order to quantify the edible oils percentage; an approach of adulteration prediction based on these two methods was developed.

Keywords: Adulteration, Chemometrics methods, Edible oils, FT-IR, Olive oil

P14S3. Group Contribution Estimation of the Physical Properties of Hydrocarbons

O. Rebas, B. Boutra, K. Battou, N. Skander and E.C. Chitour

Laboratory of Valorization of Fossil Energies, Department of Chemical Engineering, Polytechnic National School, Algiers – Algeria.
rebasouardia@yahoo.fr

Abstract. The present research consists in the establishment of new group-contribution correlations with interactions to estimate three physical properties: freezing points, surface tensions and viscosities at 210°F of pure hydrocarbons as normal paraffins, isoparaffins, olefins, alkyne, naphthenes and aromatics. The averages absolute deviations (AAD) obtained between tabulated and calculated values are respectively 4.7 %, 0.8 % and 0.8 % for the freezing point, the surface tension and viscosity at 210°F.

Keywords: Hydrocarbons, group contribution, interactions, freezing points, surface tensions, viscosity at 210°F.

P15S3. Contribution to the phytochemical study and antibacterial effect of phenol and flavonoid contents in *Trigonella foenum-graecum* L. from Algeria

K. Hachama, A. Khadraoui, A. Hellal, L. Touafri and M. Sahmadi

Laboratory of the natural substances valorization, Djilali Bounaama University.
hachama_k@yahoo.fr

Abstract. The present work aims to evaluate the presence of polyphenols and flavonoids in *Trigonella foenum-graecum* (fenugreek) seeds extracts, grown in south of Blida, northern Algeria, to study its antimicrobial activities via: *Escherichia coli*, *Klebsiella pneumonia* and *Staphylococcus aureus*, by the diffusion method in agar medium, and appreciate its antioxidant activities by the DPPH method. The seed powder was extracted with ethanol in a soxhlet extractor, followed by a series of extractions with three solvents namely (ether petroleum, ethyl acetate and n-butanol). Shibata reaction and chromatography (TLC) tests showed the presence of flavonoids in all samples. The quantitative determination of total polyphenols showed the richness of polyphenol butanol extract 30.120 µg GAE / g (microgram gallic acid equivalent / gram) and 0.564 mg / ml of flavonoids. The expression of the results of the antibacterial activity showed that the n-butanol extract (24.75%) is active on all the strains tested and that the petroleum ether extract (26.78%) is more active against *Klebsiella*

pneumoniae. Finally the results of the antioxidant activity test showed that butanolic extract with high activity with IC_{50} equal to 1.546 mg / ml.

Keywords: antibacterial, antioxidant, *Trigonella foenum-graecum*.

P16S3. Treatment of Tannery Effluent by Electrooxidation Process using Sodium Persulfate as Catalyst

A. Benhadji and M.Taleb Ahmed

Laboratory of Reaction Engineering, USTHB, Algiers, Algeria.
amelbenh@yahoo.fr

Abstract. The treatment of tannery effluent by electrochemical techniques involving eletrooxidation was studied varying different parameters such as current density (0.08 to 0.18 A.cm^{-2}), reaction time (1 to 4 h) and catalyst concentration (0 to 1 g.L^{-1}). The results show that 90% of COD removal was obtained with a current density of 0.18 A.cm^{-2} after 2h of treatment; whereas about 50% of COD removal was achieved in the presence of sodium persulfate (1 g.L^{-1}) with a current density of 0.18 A.cm^{-2} during 1 h of treatment.

Keywords: Electrooxidation, sodium persulfate, COD

P17S3. Modeling of water transport in soil column

H. Bouredji, A. Merzougui, S. Rennane and N. Bendjaballah-Lalaoui

Laboratoire des Matériaux Catalytiques et Catalyse en Chimie Organique, USTHB, Alger, Algérie.
bouredjih@gmail.com

Abstract. In this paper, we used the advection dispersion equation (ADE) to describe water transport through a saturated sand column. A numerical solution for ADE is obtained using the finite volume method (FVM) based on the tri-diagonal matrix algorithm (TDMA). The dispersion coefficient is estimated using the simulated annealing algorithm (SA). Numerical solutions are verified using the measured values obtained by S. Semra (2003) at various flow rates. The results show that the advection dispersion equation gives a better description to the breakthrough curves (BTCs) with lower values of root mean square error (RMSE) and higher values of determination coefficient (R^2). Also, the dispersion coefficient increases with the flow rate and it is dependent with the pore velocity by the equation: $D_L = aU_b$.

Keywords: Advection Dispersion Equation, Simulated Annealing, Breakthrough Curves.

P18S3. Removal of cationic methylene blue dye from aqueous solution by modified montmorillonite

H. Rezala, D. Bounaama

University of Khemis-Miliana, Faculty of Science and Technology, Thenia El Had Road, Khemis-Miliana, Algeria.
rezala_houria@hotmail.com

Abstract. In this work, we proceeded to the preparation of cetyltrimethylammonium bromide pillared montmorillonite from deposits of Maghnia in western Algeria. These materials have been tested in the Methylene Blue adsorption. The effects of the various parameters such as the contact time, solution pH, adsorbent dosage and temperature on the Methylene Blue adsorption were investigated and were found: 4 hours, pH 13, 1 g/L and room temperature, respectively. The results obtained showed that the adsorption kinetics could be well described by the pseudo-second order kinetic model, cetyltrimethylammonium bromide pillared montmorillonite gave a better adsorption capacity compared to the starting montmorillonite and the thermodynamic results indicated an exothermic and a spontaneous process.

Keywords: Adsorption, Methylene Blue, CTAB intercalated clay.

P19S3. Degradation of paracetamol in dynamic mode in a reactor with a spiral geometry by photo catalytic material

H.Ghoualem and F. Naitali

Laboratory of Electrochemistry-Corrosion, Metallurgy and Inorganic Chemistry, USTHB, Algiers.
Algeria.

hghoualem@usthb.dz

Abstract. Heavy metals, organic dyes, pesticides, drugs are known to be frequent pollutants that threaten human health and the environment. The study of the photocatalytic degradation of micro pollutants (secondary pollution), including the pharmaceutical compound reveals a great importance for the process of degradation and environment. The presence of pharmaceuticals in aqueous matrices was confirmed since the 70 s, many recent studies show the universality of the presence of pharmaceutical compounds in aquatic. The accumulation of drug residues, used in health centers, households and veterinary medicine, in natural environments can have adverse consequences on aquatic environments. This work aims to study the elimination of a non-steroidal anti-inflammatory drug by the photo-catalytic process. The monitoring of the degradation was carried out in the presence of a ZnO photo catalytic material in a spiral-geometry reactor. Key words: Drug, pollution, photo catalysis, tubular reactor, paracetamol.

Keywords: Environment, drug residues, photo catalytic degradation, spiral-geometry reactor.

P20S3. Improving Stability for Organic Solar cells using a new encapsulated Architecture.

A.bengrine and D. Chalal

Université Ferhat Abbas Sétif-1, Sétif, Algérie.

bengrine088@gmail.com

Abstract. In this work, new inverted organic solar cells based on photoactive blends composed by the conjugated regioregular poly-(3-hexylthiophene) (P3HT) and [6,6]-phenyl-C61-butyric acid methyl ester (PC61BM) with large area of 2 cm², are fabricated with a novel top electrode design in which the silver electrode is deposited over the whole substrate to completely cover the photoactive layer, allowing an effective protection of the entire device. Consequently, initial power conversion efficiencies of 3.2% are maintained at 90% after 15 h under standard illumination conditions in ambient atmosphere for encapsulated devices. Light beam induced photo-voltage (LBIV) maps revealed the effectiveness of the new design to prevent lateral moisture and oxygen diffusion. Light soaking test combined with LBIV data, indicates that the degradation of performance arises from dark spots [4] which reduce the active layer area for the non- encapsulated devices.

Keywords: Inverted Organic solar cells, Degradation Process, Stability, Lifetime, LBIC.

P21S3. Isolation and characterization of cellulose microcrystalline from date palms

M. Beroual, O. Mehelli, L. Boumaza, D.Trache and K. Khimeche

UER Procédés Energétiques, Ecole Militaire Polytechnique, Bordj-El-Bahri, Algies, Algeria.
moufidaberoual@gmail.com

Abstract. In this study, microcrystalline cellulose (MCC) particles have been isolated from date Palms cellulose using HCl acid hydrolysis method. The obtained MCC has been fully characterized through infrared spectroscopy (FTIR), scanning electron microscopy (SEM), X-ray diffraction (XRD), and differential scanning calorimeter (DSC). The obtained results showed that the extracted cellulose microcrystalline exhibited similar properties with respect to the commercial one. FTIR demonstrated that most hemicellulose and lignin of the raw fibers were removed during the extraction process. XRD spectra of cellulose revealed that the isolated date palm-MCC was identified as cellulose type I with high crystallinity index than cellulose (*CrI* date palm MCC: 75% > *CrI* α-cellulose: 69 %), due to degradation of the amorphous components. According to DSC analyses, the MCC sample prepared

presented higher thermal stability properties ($> 330\text{ }^{\circ}\text{C}$), thus making it promising candidate for use in many fields such as reinforced-polymer composites, pharmaceuticals and food industry.

Keywords: microcrystalline cellulose, cellulose, Date Palm.

P22S3. Investigation into the application of the electroremediation process to the removal of Pb^{2+} from an artificial soil

K. Kada, A. Abdi and D.E. Akretche

Ecole Militaire Polytechnique, BP17 - 16046 Bordj El-Bahri, Algiers, Algeria.
karima_kada@yahoo.fr

Abstract. Electroremediation is an in situ technique used to remove organic or inorganic contaminants such as heavy metals or aromatic molecules in soils under the application of an electric field. In this study, an artificial soil polluted by lead was studied. Two current intensities (0.1 and 0.2 A) were applied. The experimental study was carried out in a Plexiglas cell (volume $\sim 2\text{L}$) consisting of three compartments Anode, cathodic and that of medium separated by a tissue, sulfuric acid H_2SO_4 (0.1 N) was carried out as a study medium for a duration of 240 hours (10 days). All of the results showed the transport of Lead ions from the anode to the cathode.

Keywords: Electroremediation, decontamination, soil artificial, lead.

P23S3. Phytochemical analysis and assesment of antioxidant activity of *Tetraclinis articulata* (Vahl) Masters leaves

B. Bensebia, G. Belloumi, O. Bensebia and S. Kouadri Mostefai

Laboratoire "Chimie Verte-Eau", Faculté de Technologie, Université Hassiba Benbouali-Chlef, Chlef, Algeria.

Abstract. In Algeria, many plants are used traditionally to treat various diseases. Among these plants, *Tetraclinis articulata* (Vahl) Masters belongs to the Cupressaceous family. *Tetraclinis* is endemic of south western Mediterranean and is an unexplored genus recognized for its great bioactive potential [1-2] that could be explored as a medicinal herb. In this work dried leaves of *T. articulata* have been analysed for their polyphenol and flavonoid composition, and antioxidant activity. The influence of extraction time (30-240 min), concentration of ethanol (40, 60 and 80 %) on the extraction yield of phenolic and flavonoid compounds of extracts were investigated. The contents in total phenolics (TPC) and flavonoids (FLV) were evaluated by the Folin–Ciocalteu and the aluminum chloride methods, respectively. In addition, the antioxidant activity was determined and measured by 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay. The Maximum extraction yield regarding TPC (95.28 mg EAG/g) and FLV (46.70 mgEQ/g) was achieved with 60 % ethanol for an extraction time of 210 min and 120 min respectively. In addition, the best anti-radical activity, with values of IC_{50} of 0.14 mg/ml was obtained from the *T. articulata* leaves extracted with 80 % ethanol.

Keywords: Phytochemical, Polyphenol, flavonoid, *Tetraclinis articulata*

P24S3. Hydrochemical characteristics of the ground Waters of Ain Defla

H. Haddad, F. Benrejda and H. Goualem

Laboratory of Electrochemistry-Corrosion, Metallurgy and Inorganic Chemistry. Faculty of Chemistry. USTHB. Algiers. Algeria.
habou16@hotmail.com

Abstract. As part of our work, special attention is given to water and especially to its quality. The present work proposes to contribute to the estimation of the physicochemical quality of the sources of the region of Ain Defla. The physicochemical parameters taken into account during the characterization of its waters are: Conductivity, temperature, pH, Ca^{2+} , Mg^{2+} , Na^{+} , K^{+} cations, and NO_3^{-} , NO_2^{-} , Cl^{-} , HCO_3^{-} anions, SO_4^{2-} , PO_4^{3-} . The use of the Piper and Stabler and Schöeller-Berkaloff diagrams made it possible to make a hydrochemical study of these spring waters and thus to know their chemical facies, their quality and their potability. The use of these diagrams has been facilitated by its

automation thanks to the software (Rolond SIMILER Laboratory of Hydrogeology of Avignon) that we have developed on PC.

Keywords: Groundwater, Physicochemical Parameters, Hydrochemistry.

P25S3. Application of response surface methodology to optimize elimination of organic pollutants in water using photocatalytic oxidation process

K. Akhrib, A. Bensmaili, Y. Kadmi and M. Berkani

Faculté de Génie des Procédés et Génie Mécanique El Allia, Bab ezzouar, Algérie.
a_kenze@yahoo.fr

Abstract. Textile industries discharge large amounts of colored wastewaters due to the unfixed dyes on fibers during the coloring and washing steps. The presence of these pollutants in water streams causes problems related to their carcinogenicity, toxicity to aquatic life and the easily detected and undesirable aesthetic aspect. Dyeing effluents are very difficult to treat, due to their resistance to biodegradability, stability to light, heat and oxidizing agents. A rapid development of industry and other activities and the increment of population in last year's is originating a serious problem of water pollution. Advanced oxidation techniques are proving to be important contributions to the treatment of wastewater to remove harmful and toxic pollutants. In addition, these methods are very important because can degrade emerging organic pollutants to non-toxic substances, such as carbon dioxide and water, under moderate conditions. The aim of the study is developing at the present time to laboratory scale, in the first phase of the investigation. Many operational parameters can influence the degradation of BR46 elimination, like the initial concentration of dye, volume of the solution, the catalysis concentration and pH of the solution. In order to optimize the dye removal efficiency, different experimental variables involving pH, catalysis concentration, and initial BR46 concentration were optimized. Moreover, these parameters were analyzed by the response surface methodology. The good recovery of the dye elimination with developed method was 99%.

Keywords: Photocatalysis process, Pollutants, Water pollution, Dye, Wastewater.

P26S3. Comparaison of the Semi-Conducting Properties of Tin Sulfide Prepared by Chemical and Electrochemical Methods

S. Kabouche, Y. Louafi and M. Trari

Laboratory of Electrochemistry-Corrosion, Metallurgy and Inorganic Chemistry, Faculty of Chemistry,
U.S.T.H.B, Algiers, Algeria.
saidchimieac@gmail.com

Abstract. The semiconducting properties of tin sulfide prepared by chemical and electrochemical methods have been characterized by electrochemical impedance spectroscopy (EIS) and cyclic potentiodynamic polarization. The observation of the morphologie wae done by scanning electron microscopy. Capacitance measurements have been employed to study the electronic properties of passive films. The first exhibit n-type semiconductor behavior and second p-type semiconductor for SnS. Electrochemical results show that the passive film that formed in the hydroxide solution is more homogeneous than that formed in the sulfide solution. It was seen the differences is found concerning Efb and the second in the concentration of donors.

Keywords: SnS, Passivation, Electrochemical impedance spectroscopy, Semiconductor properties.

P27S3. DFT investigation: Molecular and electronic properties of homogeneous trinuclear complexes of formulas $M_3(\text{Ant})_2$, $M_3(\text{CO})_2(\text{Ant})_2$ ($M = \text{Ti, Cr, Fe and Ni}$)

N. Bensalem and B. Zouchoune

Laboratoire de chimie Appliquée et Technologie des Matériaux, Université Larbi Ben M'hidi, Oum El Bouaghi, Algérie.

bzouchoune@gmail.com

Abstract. The theoretical calculations applied in this study were carried out on homogeneous trimetallic complexes of $M_3(\text{Ant})_2$ ($M = \text{Ti, Cr, Fe, Ni}$), ($\text{C}_{14}\text{H}_{10} = \text{Ant} = \text{l'anthracene}$) via the functional GGA BP86 using density functional theory (DFT) to elucidate the mode of coordination that governs this type of complexes as well as the metal-metal bonding order, this depending on the nature of the metal. Also the substituted complexes of the $M_3(\text{CO})_2(\text{Ant})_2$ type will be analyzed after the introduction of carbonyl ligands, in order to see the effect of this substitution on the formation where the breaking of existing metal bonds in the trimetallic compound, and on the stabilization of this type of substituted complexes.

Keywords: Anthracene ligand, electronic configuration, NBO analysis.

P28S3. Electrodeposition of Cu_2O thin film on titanium substrat and its application in the oxidation of ascorbic acid

T. Bezghiche-Imlouf and H. Hammache-Makhloufi

Laboratoire d'Electrochimie, de Corrosion et de Valorisation Energétique, Faculté de Technologie, Université de Bejaia, Bejaia, Algérie.

imloutayakout@yahoo.fr

Abstract. Cuprous oxide (Cu_2O) thin film is fabricated by means of electrochemical deposition on titanium substrat from an acetate solution and is introduced for the efficient oxidation of ascorbic acid (AA). Surface morphology and composition of the resulted electrode ($\text{Cu}_2\text{O}/\text{Ti}$) were studied by means of SEM, EDX and DRX. The Electrochemical study was realised by cyclic voltammetry and chronoamperometry and shows that $\text{Cu}_2\text{O}/\text{Ti}$ electrode exhibited a high catalytic activity towards AA oxidation with good sensitivity and selectivity. The proposed electrode has wider linear range, low detection limit, good reproducibility and stability. When compared with bare titanium electrode, a large decrease in AA oxidation overpotential is observed at the $\text{Cu}_2\text{O}/\text{Ti}$ modified electrode surface. The catalytic oxidation peak current showed a linear dependence on the ascorbic acid concentration and a linear calibration curve was obtained in the range 0.01 - 5 mM of ascorbic acid with a correlation coefficient of 0.9953 and good sensitivity. The detection limit (2σ) was determined and found to be equal to ($5.48 \cdot 10^{-5} \text{ M}$).

Keywords: Electrodeposition; Cu_2O ; Titanium; Ascorbic acid; oxidation; Electrocatalysis

P29S3. Isothermal decomposition kinetics of two single base gunpowders used in 7.62×39mm and 9×18mm calibers

D. S. Karahacane, A. Dahmani, K. Khimeche and A. Mezroua

Laboratory of Thermodynamics and Molecular Modeling, Faculty of Chemistry, USTHB, Bab-Ezzouar, Algiers, Algeria.

Abstract. Isothermal and non-isothermal decomposition kinetics are mainly used to study the thermal stability of energetic materials. In this work, thermal properties and kinetic study of the decomposition process of two single base propellants used in some local calibers manufacturing ($7.62 \times 39 \text{ mm}$ and $9 \times 18 \text{ mm}$) were investigated using vacuum stability test (VST). The $7.62 \times 39 \text{ mm}$ propellant have a cylindrical geometry with a single perforation while the other type of propellant used in $9 \times 18 \text{ mm}$ ammunition is multi perforated grain. The mechanism reaction model and Arrhenius parameters of the thermal decomposition process of the investigated powders were obtained using model fitting and model free (isoconversional) methods. According to VST results, it is found the two propellants

samples are relatively stable and safe during the usage and storage, and the mechanism of thermal decomposition of the powders is controlled by the second order reaction model.

Keywords: gunpowders, vacuum stability, kinetics

P30S3. Evaluation of theoretical performances of composite solid propellants

F. Chalghoum, D. Trache and M. Benziane

Ecole Supérieure du Matériel, El-Harrach, Algiers, Algeria.
chalghoumfateh@gmail.com

Abstract. Composite solid propellants (CSPs) are an important class of solid propellants widely used in military and civilian applications. The search for a longer range requires the development of new materials to improve the energy performance of solid propellants. The almost universally formulation used in CSPs contains PA / PBHT / Al. However, some disadvantages are often encountered, in this case, the phenomena of agglomeration of aluminum during combustion, the release of HCl which causes problems of discretion in addition to environmental problems, and the generation of a high concentration of alumina in the combustion products thus causing mechanical erosion at the nozzle. metal hydrides, widely used for a wide range of applications, have received a lot of attention from the scientific community as promising metal fuels for CSPs. In this study, theoretical performances of some composite solid propellants have been evaluated by NASA-CAE thermochemical computer program. Aluminum and numerous complex metal hydrides are the combustible additives for the investigated CSPs. gravimetric specific impulse (I_{sp}) is the main energetic parameter used to optimize propellant formulations. Another criteria applied to evaluate performance of CSPs is "high performance halide scavenger" (HPHS) parameter. The highest performance propellants have been obtained by the use of $LiAlH_4$, Mg_2FeH_6 and $LiMgH_6$ in CSPs formulations as energetic additives.

Keywords: composite solid propellant, complex metal hydride, NASA-CAE thermochemical computer program

P31S3. Study of the Migration of Combustion Moderator for Nitrocellulose Based Propellant

K. M. Boulkadid, M.H. Lefebvre, L. Jeunieu and A. Dejeaifve

UER. Procédés Energétiques, Ecole Militaire Polytechnique EMP, BP 17 Bordj El-Bahri, 16046
Algiers, Algeria.
karim.boulkadid@gmail.com

Abstract. In this investigation, we expose an improved experimental procedure to study the migration of combustion moderator for nitrocellulose-based propellant. It is based on well-known experimental technique namely High Pressure Liquid Chromatography (HPLC) and composed of the following steps: First the preparation of propellant grains that have cylindrical shape and double base chemical composition (around 11% nitroglycerin) using extrusion process, then a known quantities of deterrent (dibutylphthalate; DBP) are deposited on the surfaces perpendicular to the axis of the grains before conditioning them at constant temperature (85°C) for 24 hours. After that, each grain is cut by a microtome into small slices (thickness 20 μ m). The last step comprises the determination of the concentration in DBP of each slice by HPLC. The results permit the determination of the concentration distribution and the diffusion coefficient of DBP in grain matrix.

Keywords: Deterrent concentration profile, diffusion coefficient, DBP, ball propellant, HPLC.
