Sciences and Engineering of Polymeric Materials

SEPM 2016

Organized by the

Tunisian Chemical Society

Société Chimique de Tunisie

24-27 March 2016

Royal Thalassa Monastir Hotel, Skanes - Tunisia

Lectures and Communications Abstracts
List of Participants

Tunisian Chemical Society - Short Program of SEPM 2016

Thirsday, March 24th 2016		
13.30 - 16.00	***Welcoming participants, distribution of documents and check in***	
16.00 - 16.30	**Opening Ceremony + Coffee Break**	
16.30 - 17.10	Lecture 1 **Mohamed Naceur BELGACEM** *Université Grenoble Alpes - Pagora, France*	
17.10 - 17.50	Lecture 2 **Richard HOOGENBOOM** *Ghent University, Supramolecular Chemistry Group - Belgium*	
18.00 - 19.00	**Poster Session 1**	
19.00	***Dinner***	
Friday, March 25th 2016		
09.00 - 09.40	Lecture 3 **Etienne FLEURY** *INSA Lyon - University Claude Bernard - Lyon I - IMP - France*	
09.40 - 10.20	Lecture 4 **Yusuf YAGCI** *Istanbul Technical University, Department of Chemistry, Istanbul - Turkey*	
10.20 - 10.50	**Coffee break**	
11.00 - 12.15	**Oral Communications – Session 1 : OC1 - OC5**	
13.00	***Lunch***	
15.00 - 15.40	Lecture 5 **Bernard SILLION** *Institut des sciences analytiques*, *Université Lyon1* - France	
15.45 - 16.45	**Oral Communications – Session 2 : OC6 - OC9**	
16.45 - 17.45	**Coffee break**	**Poster Session 2**
17.50 - 18.50	**Oral Communications – Session 3 : OC10 - OC13**	
19.00	***Dinner***	
Saturday, March 26th 2016		
09.00 - 09.40	Lecture 6 **Zijie Qiu** (On behalf Pr Ben Zhong Tang) *Hong Kong Univ. of Science and Technology Clear Water Bay - Hong Kong*	
09.40 - 10.20	Lecture 7 **Susanta BANARJEE** *Materials Science Centre, Indian Institute of Technology - India*	
10.20 - 11.20	**Coffee break**	**Poster Session 3**
11.30 - 12.30	**Oral Communications – Session 4 : OC14 - OC17**	
12.30	***Lunch***	
	Afternoon off	
20.30	***Gala Dinner***	
Sunday, March 27th 2016		
09.00 - 09.40	Lecture 8 **Ridha BEN CHEIKH** *Université de Tunis El Manar, Ecole Nationale d'Ingénieurs de Tunis - Tunisia*	
09.45 - 10.45	**Oral Communications – Session 5 : CO18 - CO21**	
10.45 - 11.15	**Coffee break**	
11.15 - 12.15	**Oral Communications – Session 6 : CO22 - CO25**	
12.20 - 13.00	Lecture 9 **Eric DROCKENMULLER** *University Claude Bernard - Lyon I - IMP - France*	
13.00 - 13.15	***Awards distribution for the 2 top poster commun. and closing ceremony***	
13.15	***Check Out, Lunch and leaving the hotel***	

FOREWORD

On behalf of the Chemical Society of Tunisia (Société Chimique de Tunisie - SCT), it is our great pleasure to welcome you to the international conference on Science and Engineering of Polymeric Materials (SEPM 2016).

The first edition of SEPM was held in Hammamet and turned out to be successful so that many delegates and members of the SCT and other colleagues encouraged us to organize the second edition without any delay. Again, SEPM is fully devoted to polymeric materials, their challenging design strategies and established or emerging applications.

SEPM covers many aspects of polymer science and engineering going from pure synthetic aspects to innovative (bio)polymer-based materials and devices.

We anticipate that SEPM 2016 will be an exciting forum to discuss the recent progress in polymer science and engineering as well as an ideal opportunity for cooperation and networking.

We warmly thank the invited speakers, contributing authors, chair persons and our close colleagues who spent time and effort organizing this exciting event.

Thank you for sharing with us polymer science and for supporting our country in this difficult geopolitical period.

As a Chairman and on behalf of the SCT members and all academics in Tunisia, I would like to dedicate SEPM 2016 to the numerous foreign and Tunisian people who were victims of terrorism since SEPM 2014.

Pr Hatem Ben Romdhane
Chairman
On behalf of the SCT

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Being on time is the main factor for conference's success

Thursday, March 24th 2016	
13.30 - 16.00	***Welcoming participants, distribution of documents and check in***
16.00 - 16.30	**Opening Ceremony + Coffee Break**
16.30 - 17.10	Invited Lecture 1 **M[ed] Naceur BELGACEM -** *Introduced by:* ***Sami Boufi*** *Université Grenoble Alpes, LGP2, F-38000 Grenoble - France* **Recent advances on surface modification of polysaccharides: From basic considerations to concrete applications**
17.10 - 17.50	Invited Lecture 2 **Richard HOOGENBOOM** - *Introduced by:* ***Hatem Ben Romdhane*** *Ghent University, Supramolecular Chemistry Group, Department of Organic and Macromolecular Chemistry - Belgium* **Multiresponsive polymers for drug delivery and sensors**
18.00 - 19.00	**Poster Session 1**
19.00	***Dinner***

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<table>
<tr><td colspan="5">Friday, March 25th 2016 (Morning)</td></tr>
<tr><td>09.00 - 09.40</td><td colspan="4">Invited Lecture 3 Etienne FLEURY - Introduced by: Majdi Abid
INSA Lyon - University Claude Bernard - Lyon I - IMP - France
Step-growth polymerization: a convenient tool to build poly(dimethylsiloxane)-containing copolymers</td></tr>
<tr><td>09.40 - 10.20</td><td colspan="4">Invited Lecture 4 Yusuf YAGCI - Introduced by: Mohamed M. Chehimi
Istanbul Technical University, Department of Chemistry, Maslak, Istanbul - Turkey
Photoinduced click reactions</td></tr>
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<tr><td colspan="5">Oral Communications – Session 1</td></tr>
<tr><td></td><td colspan="2">Room A - Chairperson:
Memia Benna Zayani</td><td colspan="2">Room B - Chairperson:
Taïcir Ben Ayed</td></tr>
<tr><td></td><td>Com.</td><td>communicating</td><td>Com.</td><td>Communicating</td></tr>
<tr><td>11.00 - 11.15</td><td>OC-1A</td><td>Fatma WALHA</td><td>OC-1B</td><td>Mona Marie OBADIA</td></tr>
<tr><td>11.15 - 11.30</td><td>OC-2A</td><td>Nour Elhouda BEN AMMAR</td><td>OC-2B</td><td>Sirine MHIRI</td></tr>
<tr><td>11.30 - 11.45</td><td>OC-3A</td><td>Marwa LAHOUIOUI</td><td>OC-3B</td><td>Ahmad IBRAHIM</td></tr>
<tr><td>11.45 - 12.00</td><td>OC-4A</td><td>Marwa KHEMAKHEM</td><td>OC-4B</td><td>Haythem BENNOUR</td></tr>
<tr><td>12.00 - 12.15</td><td>OC-5A</td><td>Fekri LAATAR</td><td>OC-5B</td><td>Nadia MANSOUR</td></tr>
<tr><td>13.00</td><td colspan="4">Lunch</td></tr>
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Friday, March 25th 2016 (Afternoon)				
15.00 - 15.40	Invited Lecture 5 **Bernard SILLION** - *Introduced by:* ***Naceur Belgacem*** *Institut des sciences analytiques, Université Lyon1* - France **Polymeric materials and Sustainable development**			
Oral Communications – Session 2				
	Room A - *Chairperson : Mustapha Majdoub*		**Room B -** *Chairperson: Etienne Fleury*	
	Com.	*communicating*	*Com.*	*Communicating*
15.45 - 16.00	**OC-6A**	Khouloud BAATOUT	**OC-6B**	Khouloud JLASSI
16.00 - 16.15	**OC-7A**	Yosra HADJ KACEM	**OC-7B**	Eya BEN KHALIFA
16.15 - 16.30	**OC-8A**	Besma MELLAH	**OC-8B**	Maroua BEN ABDELKADER
16.30 - 16.45	**OC-9A**	Balkiss BEN SALEM	**OC-9B**	Achraf GHORBAL
16.45 - 17.45	**Coffee break**		**Poster Session 2**	
Oral Communications – Session 3				
	Room A - *Chairperson : Mehrez Romdhane*		**Room B -** *Chairperson : Aderrahmane Sanhoury*	
	Com.	*communicating*	*Com.*	*Communicating*
17.50 - 18.05	**OC-10A**	Roukaya MEJDOUB	**OC-10B**	Sayed MANSOUR AHMED
18.05 - 18.20	**OC-11A**	Najeh MAALOUL	**OC-11B**	Nihed RAHMOUNI
18.20 - 18.35	**OC-12A**	Rabiaa HAJJI	**OC-12B**	Rania MEJRI
18.35 - 18.50	**OC-13A**	Imen DRIDI	**OC-13B**	Amal BELAIDI
19.00	***Dinner***			

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Department of Chemistry, The Hong Kong University of Science and Technology Clear Water Bay, Kowloon - Hong Kong
AIE-Active Macromolecules</td></tr>
<tr><td>09.40 - 10.20</td><td colspan="4">Invited Lecture 7 Susanta BANARJEE - Introduced by: Eric Drockenmuller
Materials Science Centre, Indian Institute of Technology - India
Designing polymers and membranes thereof for efficient gas separation</td></tr>
<tr><td>10.20 - 11.20</td><td colspan="2">Coffee break</td><td colspan="2">Poster Session 3</td></tr>
<tr><td colspan="5">Oral Communications – Session 4</td></tr>
<tr><td></td><td colspan="2">Room A – Chairperson: Ridha Ben Cheikh</td><td colspan="2">Room B - Chairperson: Ezzeddine Srasra</td></tr>
<tr><td></td><td>Com.</td><td>communicating</td><td>Com.</td><td>Communicating</td></tr>
<tr><td>11.30 - 11.45</td><td>OC-14A</td><td>Dorsaf CHEICKH</td><td>OC-14B</td><td>Mohamed Mehdi CHEHIMI</td></tr>
<tr><td>11.45 - 12.00</td><td>OC-15A</td><td>Salma BEN CHEIKH</td><td>OC-15B</td><td>Asma SAADAOUI</td></tr>
<tr><td>12.00 - 12.15</td><td>OC-16A</td><td>Amira EROKH</td><td>OC-16B</td><td>Leila HASSAINI</td></tr>
<tr><td>12.15 - 12.30</td><td>OC-17A</td><td>Zaineb AOUISSI</td><td>OC-17B</td><td>Ons ZOGHLAMI</td></tr>
<tr><td>12.30</td><td colspan="4">Lunch</td></tr>
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<tr><td>20.30</td><td colspan="4">Gala Dinner</td></tr>
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Sunday, March 27th 2016				
09.00 - 09.40	Invited Lecture 8 **Ridha BEN CHEIKH** - *Introduced by:* ***Hatem Majdoub*** *Université de Tunis El Manar, Ecole Nationale d'Ingénieurs de Tunis - Tunisia* **The use of different shapes of alfa fibers in the reinforcement of polymers**			
Oral Communications – Session 5				
	Room A– *Chairperson: Mohamed Khitouni*		**Room B -** *Chairperson : Sami Boufi*	
	Com.	*communicating*	*Com.*	*Communicating*
09.45 - 10.00	**OC-18A**	Aida BENCHAABANE	**OC-18B**	Nasr LITIM
10.00 - 10.15	**OC-19A**	Rabii ZIDI	**OC-19B**	Norhene MAHFOUDHI
10.15 - 10.30	**OC-20A**	M^{ed} Abderrahmane K. SANHOURY	**OC-20B**	Asma KEDIM
10.30 - 10.45	**OC-21A**	Rim BEN ARFI	**OC-21B**	Amira BOUAZIZ
10.45 - 11.15	**Coffee break**			
Oral Communications – Session 6				
	Room A – *Chairperson: Nizar Bellakhal*		**Room B -***Chairperson: Ridha Ben Salem*	
	Com.	*communicating*	*Com.*	*Communicating*
11.15 - 11.30	**OC-22A**	Habiba ZRIDA	**OC-22B**	Moez GUETTARI
11.30 - 11.45	**OC-23A**	Malek MSAHEL	**OC-23B**	Hasna MAHJOUB
11.45 - 12.00	**OC-24A**	Fedia MHALLA	**OC-24B**	Marouen ZAMMALI
12.00 - 12.15	**OC-25A**	Said Lotfi HAFSAOUI	**OC-25B**	Sabrina HALLADJA
12.20 - 13.00	Invited Lecture 9 **Eric DROCKENMULLER** - *Introduced by:* ***Farhat Rezgui*** *University Claude Bernard - Lyon I - IMP - France* **1,2,3-triazolium-based poly(ionic liquid)s: A new class of functional ion conducting materials**			
13.00 - 13.15	***Awards distribution for the 2 top poster communications and closing ceremony***			
13.15	***Check Out, Lunch and leaving the hotel***			

Speakers' Abstracts

RECENT ADVANCES ON SURFACE MODIFICATION OF POLYSACCHARIDES: FROM BASIC CONSIDERATIONS TO CONCRETE APPLICATIONS

Mohamed Naceur BELGACEM

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CNRS, LGP2, F-38000 Grenoble, France
Agefpi, F-38000 Grenoble, France

The present conference is focused on the recent advances on surface chemical modification of polysaccharides. It will be divided into three parts:

1. The first part will be devoted to the basic consideration on surface phenomena with a special care about the difficulties associated with surface contamination, the surface energy characterization, the surface properties determinations, etc.

2. The second part will be focused on the relevant characterization techniques, including classical low-resolution ones and more efficient tools such as: X-ray photoelectron (XPS) and more recently Time of Flight Secondary Ion Mass Spectrometry (ToF SIMS). This presentation assesses the merits and the drawbacks of these techniques [1, 2].

3. The last part points out the interest in using polysaccharides (cellulose mainly starch) in several functional materials. These two raw materials could be subjected to several surface modification strategies, namely (i) physical treatments (ii) chemical grafting by direct condensation, "grafting from" and "grafting onto" approaches [1, 2]. In this context, recent works investigating green solvent-based or solvent-less systems will be reported [3, 4]. All these treatments aim at providing these substrates specific functions, such as hydrophobic character, anti-microbial properties, etc. [5, 6].

Finally, some relevant concluding remarks and perspectives will be given.

Key words: Surface characterization, Surface modification, Surface chemical grafting, Polysaccharides.

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Multiresponsive polymers for drug delivery and sensors

Richard Hoogenboom

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In the last decades, responsive polymeric materials are gaining significant interest for the development of smart materials.[1] Within this context, thermoresponsive polymers that undergo a solution phase transition in aqueous solution are especially interesting. Polymers that phase-separate upon heating, so-called lower critical solution temperature (LCST) behaviour, are widespread based on entropy-driven dehydration of polymers with intermediate hydrophilicity, such as poly(*N*-isopropylacrylamide),[2] poly(oligoethyleneglycol (meth)acrylate)s[3] and poly(2-oxazoline)s.[3,4] In recent years, the focus is moving more and more towards the development of multi-responsive polymers.[5,6]

Recent progress from our group in the area of multi-responsive polymers in aqueous solution will be addressed in this contribution. First of all, we have developed pH-degradable thermoresponsive polymers for biomedical applications based on a comonomer having a cyclic acetal side chain.[7-9] These polymers are soluble at low temperatures and aggregate or form micelles upon heating to 37 ^{o}C. Importantly, at pH 7.4 the polymers are stable but they readily degrade at lower pH enabling selective release of coupled or encapsulated drug molecules after endocytosis or in the direct, slightly, acidic, environment of tumors. A second topic that will be discussed are multi-responsive solution polymer sensors, that simultaneously respond to temperature and pH[10] or temperature and salt.[11] These latter systems are based on polymer coated gold nanoparticles and also act as logic gates.[12] The final part of this contribution will discuss more advanced applications, such as the development of polymeric temperature sensors with a memory function[13] as well as the use of thermoresponsive polymer micelles for reversible binding of calcium(II) for decalcifying of water with mild low temperature regeneration.[14]

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STEP-GROWTH POLYMERIZATION: A CONVENIENT TOOL TO BUILD POLY(DIMETHYLSILOXANE)-CONTAINING COPOLYMERS

LEYMARIE L.[b], GENEST A.[a], GANACHAUD F.[a], PORTINHA D.[a], POUGET E.[c], DUPUY J.[a], SINTHES N.[b], CHAUMONT P.[b], FLEURY E.[a]

[a)] Université de Lyon, CNRS, UMR 5223, INSA-Lyon, IMP@INSA, F-69621, Villeurbanne, France
[b)] Université de Lyon, CNRS, UMR 5223, Université Claude Bernard Lyon 1, F-69622, Villeurbanne, France
[c)] Bluestar Silicones France, 55 rue des Frères Perret, BP 22, F-69191 Saint-Fons Cedex, France

Polydimethylsiloxane (PDMS) polymers are well known for their numerous properties: flexibility, low surface tension, high thermal stability, high gas permeability, resistance toward hydrolysis and oxidation, biocompatibility… due to the inorganic backbone Si-O in which methyl groups are attached. Thus introducing a PDMS block into another polymer backbone gives the possibility of accessing to a combination of a new properties.
In this frame, we will describe three synthesis approaches giving us the possibility to develop new silicone copolymers such as:

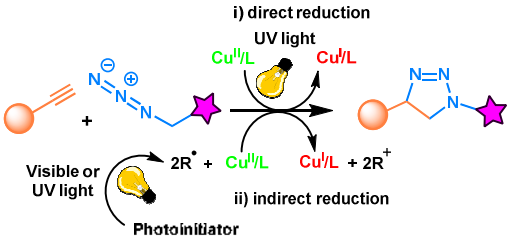
- Copoly(ethylene terephthalate) sodiosulfonate ionomers by copolycondensation with methyl benzoate functionalized polydimethylsiloxane giving an hydrodispersable material,
- Poly(hydroxyaminoethers) by Step growth polymerization between α, ω glycidyl ether polydimethylsiloxane and primary alkylamine leading to $(A_2B_2)_n$ type copolymers, a new family of potential thermoplastic elastomers,
- Supramolecular materials based on ionic interactions by combining commercially available amino-functional polysiloxanes with multifunctional acids.

PHOTOINDUCED CLICK REACTIONS

Yusuf Yagci

Istanbul Technical University, Department of Chemistry, Maslak, Istanbul 34469, Turkey

The click chemistry strategy involving modular reactions with high yield and atom economy was extensively used so efficiently in the synthetic chemistry including macromolecular synthesis [1]. Most commonly used click reactions include Huisgen type and Diels-Alder cycloadditions and thiol-ene reactions. In recent years, the interest has been directed to achieve these reactions under photochemical conditions providing spatial and temporal control which would otherwise not be possible by thermal processes [2]. In this presentation, various modes of photoinduced copper catalyzed azide cyloaddition (CuAAC) click reactions presented below will be described [3-5].



Such photoinduced electron transfer processes [6] can also be combined with controlled radical polymerizations in an *in situ* or sequential manner [7, 8]. The other click-like processes such as photoinduced acylation reactions will be presented [9].

Key words: Photochemistry, Click Chemistry, CuAAC, Polymer, Synthesis, Block Copolymers, Graft Copolymers, Telechelics

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Polymeric materials and Sustainable development

B. Sillion, H. Casabianca, S. Chatti

Institut des sciences analytiques, Université Lyon1 - France

The concept of sustainable development was introduced in 1987 by the Brundtland Commission which recommended that development must meet present needs without compromising the ability that should-have future generations to meet needs their own. However, the global warming is a strong incentive to speed up the measures implemented so that human activity becomes respectful of human health and the environment.

This presentation discusses the role that the polymers can play in ensuring sustainable development.

World production of polymers is about 300 Mtonne per year so it is very low and therefore it takes very little to global warming by the emission of carbon dioxide. However, the recommendations on the development of green chemistry (Anastas and Warner 1998). However, recommendations on the development of green chemistry (Anastas and Warner 1998) shall apply to the polymer industry which involves examining the monomers and processes.

In the application areas of polymer the processing water is probably the most important because more than 800 million people lack drinking water. The polymers provide the solutions for the purification of waste water and the desalination of seawater.

The second important point is energy management. The recovery of fossil fuels is only about 30% the use of viscous solutions of polymers increases the yield.

On the other hand the use of plastics and composite save energy by lightening of automobiles and aircraft. For the future alternative energy sources like solar could be improved by replacing silicium semiconductor with semiconducting polymers. The reduction in CO_2 emissions will take place by the replacement of engines fuel with batteries or fuel cells using polymers as membrane.

The societal demand in medicine is increasingly important and more and more new polymeric systems are used in surgery, ophthalmology ... but also for the treatments with stimuli-responsive polymers permit a controlled delivery to a target

All these items will be discussed with examples.

AIE-Active Macromolecules

Ben Zhong Tang
(Talk given by Dr QIU Zijie)

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Polymers with aggregation-induced emission (AIE) are widely studied recently because of their good solubility, processability, and high emission efficiency in the aggregated states. A large variety of AIE-active macromolecules have been developed. In this talk, the research efforts directed to AIE-active macromolecules including the designs and syntheses, structures and topologies, as well as functionalities and applications will be introduced with an emphasis on the most up to date progress. The synthetic approaches for the construction of AIE macromolecules include chain polymerizations such as free-radical polymerization and metathesis polymerizations, step polymerizations such as transition-metal catalyzed carbon-carbon coupling reactions and polycycloadditions, as well as post-modification of polymers. Through such versatile polymerization approaches, a vast array of AIE macromolecules with various chemical and topological structures can be easily accessed such as linear or zigzag shaped oligomers and polymers, star-shaped oligomers, dendrimers and hyperbranched polymers, conjugated microporous polymers, as well as crystalline supramolecular polymers. Combining the AIE characteristics with the desired traits of the polymeric materials will endow the resulting macromolecules with fascinating functionalities and they have found applications in fluorescent sensors, stimuli-responsive materials, biological probes, cell imaging, electroluminescence devices, optical nonlinearities, circular polarized luminescence, photopatterning, light refractive materials, liquid crystalline, gas adsorption, etc. AIE-active macromolecule is still a young research area with numerous possibilities and it is a fast-growing promising field.[1],[2]

Key Words: aggregation-induced emission, macromolecules

Reference:

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DESIGNING POLYMERS AND MEMBRANES THEREOF FOR EFFICIENT GAS SEPARATION

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Polymers occupy a central role in the development of modern society. One of the important application of polymers is in the field of membrane based technologies. Particularly, the separation of different gas mixture using polymeric membranes is gaining strong impetus due to their high demands in industrial applications. Membrane based separation technologies offer many advantages over conventional separation technologies. Membrane based separation technology is a very efficient unit operation technique over conventional separation procedures like cryogenic distillation and adsorption. However, the main problem with the polymeric membranes is their natural trade-off between the gas permeability and selectivity. It has been observed that the structural changes that lead to increase in permeability generally decrease the selectivity and vice versa. Thus, designing of new polymers that have both high permeability and high gas selectivity is a great challenge. The talk will provide the different design strategies that have been adopted in the authors' group to circumvent this so called “trade-off” issue.

THE USE OF DIFFERENT SHAPES OF ALFA FIBERS IN THE REINFORCMENT OF POLYMERS

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New composite materials reinforced by long, short, micro and nano alfa fibers are manufactured and characterized. The long and short fibers are extracted from the alfa stems by an aqueous NaOH treatment followed by a NaClO bleaching. The micro fibers are obtained by a sulfuric acid hydrolysis of the short fibers, and the nano ones are realized using a centrifugation and sonication treatment of the micro fibers.

The matrixes used are famous and commercial biodegradable polymers such as SEVA-C, SCA, PLA and PHBV.

Experiments on the extracted alfa fibers show that they can substitute in many applications synthetic fibers.

The long and short fibers were used for the manufacture of composite plates. The micro and nano fibers served for the preparation of composite wires and films.

Mechanical and thermal properties of the new composites have been investigated. The influence of fibers orientation, fibers amount and weathering time on the properties of the composites have been evaluated.

It has been proved that the obtained new fully biodegradable composites are useful for many applications.

POLY(1,2,3-TRIAZOLIUM IONIC LIQUID)S: NEW GENERATION OF TAILORED ION CONDUCTING MATERIALS

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Polymerized ionic liquids (PILs) are unique polyelectrolytes with cationic and anionic groups included in the repeating unit. They are extremely attractive in the field of materials science as they combine the properties of ionic liquids (high ionic conductivity, thermal and chemical stabilities) with those of polymers (mechanical stability, processing and tunable macromolecular design). Many examples have demonstrated their potential in applications such as dye sensitized solar cells, fuel cells, batteries, permselective membranes for CO_2 recovery or catalysis. In all these applications, imidazolium-based PILs are by far the most widespread and investigated materials. Since the striking development of the copper-catalyzed azide-alkyne cycloaddition (CuAAC) modular ligation, a large variety of materials containing 1,2,3 -triazole groups have been reported. However, applications of 1,2,3-triazolium derivatives as anion recognition structures, organocatalysts, metal ligands and precursors of *N*-heterocyclic carbenes has only been explored lately. We have recently pioneered the synthesis of 1,2,3-triazolium-based PILs (**TPILs**). The tuning of structural parameters has a tremendous effect on ionic conductivity, thermal stability and crucial properties in most applications of PILs. The first generation TPILs not only demonstrate ionic conduction similar to that of imidazolium-based PILs with analogous structure, pendant substituent and anion, but their synthesis also benefits from the versatile, robust and orthogonal nature of CuAAC. This oral communication demonstrates the potential of 1,2,3-triazolium chemistry to tackle new synthetic challenges using unexplored approaches competent to broaden the current structural variety and functionality of PILs (**Figure 1**).

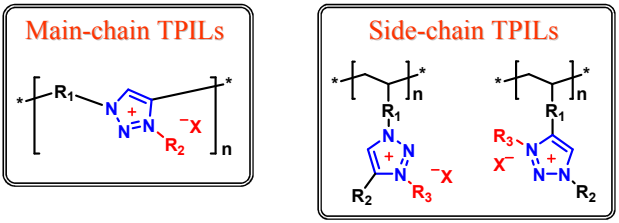

Figure 1. Structural variety of 1,2,3-triazolium-based polymerized ionic liquids.

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Oral Communications' List

(alphabetically authors' name)

Nr.		**Ref.**
1	**Z. Aouissi**, H. Mahjoub, T. Othman *FST - Tunis* Temperature-concentration effect on Ficoll 400 behaviour	**OC17A**
2	**K. Baatout**, N. Jaballah, M. Chemli, Mu. Majdoub *FSM - Monastir* New PPV-type π-conjugated polymer containing fluorescein dye moiety for optoelectronic application	**OC6A**
3	**A. Belaidi**, M. Guettari, T. Tajouri *FSB - Bizerte* Electrical conductivity of a post gamma radiation polymer	**OC13B**
4	**M. Ben Abdelkader**, N. Azizia, Y. Chevalier, M. Majdoub *FSM - Monastir* Fragrantmicrocapsules based on β-cyclodextrinfor cosmetotextile applications	**OC8B**
5	**N. E.H. Ben Ammar**, T. Saied, A. M'nif, A.H. Hamzaoui *CNRSM - Borj Cédria* Study of the physical and rheological behaviour of gamma ray synthesised hydrogel	**OC2A**
6	**R. Ben Arfi**, A. Ghorbal, A. Ben Brahim *ENIG - Gabès* Nanotribological behavior of amorphous polystyrene: The macromolecular weight effect	**OC21A**
7	**S. Ben Cheikh**, R. Ben Cheikh *ENIT - Tunis* Preparation and caracterization of nanofibrillated cellulose polyvinyl alcohol (PVA) composite for potential biomedical application	**OC15A**
8	**E. Ben Khalifa**, F. Faidi, R. Chakroun, H. Nehdi, A. Mabrouk, J. Belgaied, H. Nouagui *Institut de santé et sécurité au travail* Synthesis of molecularly imprinted polymers for the selective extraction of alkoxyacetic acids from urine samples	**OC7B**

Nr.		Ref.
9	**B. Ben Salem**, K. Hriz, N. Jaballah, M. Majdoub *FSM - Monastir* New semi-conducting polymers biphenyl-based: Synthesis and photophysical properties	**OC9A**
10	**A. Benchaabane**, Z. Ben Hamed , M. Lejeune , M.A. Sanhoury , F. Kouki , A. Zeinert, H. Bouchriha *FST - Tunis* Bulk heterojunction solar cells based on P3OT polymer and CDSE nanoparticles	**OC18A**
11	**H. Bennour**, A. Fildier, S. Chatti, H. R. Kricheldorf, M. Said Zina, R. Medimagh *INRAP - Sidi Thabet* Biosourced cyclic and multi-cyclic polyesters based on 1,4:3,6 –dianhydrohexitols : Application as a sorbent for metal ions in aqueous solutions	**OC4B**
12	**A. Bouaziz**, M. Jaziri, Valérie Massardier *ENIS - Sfax* Reprocessing silica reinforced polypropylene/ ethylene-propylene-rubber nanocomposites: Structure-property relationships	**OC21B**
13	**M.M. Chehimi**, Z. Ait Touchente, M. Lo, E. Cabet, A. Lilienbaum, D. K. Aswal *ICMPE - CNRS - Thiais, France* Grafting reactive and functional polymer thin layers to flexible substrates: Methods and applications	**OC14B**
14	**D. Cheickh**, H. Majdoub, M. Benna Zayani *FSB - Bizerte* Preparation and characterization of novel bionanocomposites using pectin extracted from prickly pear nopals and Tunisian clay	**OC14A**
15	**I. Dridi**, C. Ellijmi, N. Srairi Abid, M. Benna Zayani *FSB - Bizerte* Synthesis and application of novel bionanocomposites	**OC13A**
16	**A. Erokh**, A. M. Ferraria, D. Conceição, L. F. Vieira Ferreira, A. M. Botelho Do Rego, M. Rei Vilar, S. Boufi *FSS - Sfax* Controlled growth of Cu_2O nanoparticles bound to cotton fibres	**OC16A**

Nr.		Ref.
17	**A. Ghorbal**, F. Grisotto, J. Charlier, S. Palacin *ISSAT - Gabès* Macro- and nano- electrografting of polymers: Atomic force microscopy characterization	**OC9B**
18	**M. Guettari**, S. Abel, T. Tajouri *IPEIT - Tunis* Sturctural transition of polyvinylpyrrolidone in water/ethanol solvents mixture	**OC22B**
19	**Y. Hadj Kacem**, A. Bougarech, M. Abid, S. Abid, E. Fleury *FSS - Sfax* Biobased aliphatic sulfonated polyesters: Synthesis, characterization and hydrolitic degradation	**OC7A**
20	**S.L. Hafsaoui**, L. Metref, Z. Safiedine, A. Tcharkhtchi *Military School Polytechnic - Bordj El-Bahri, Algeria* Study of shape memory polymer hybrids of SBS/PCL	**OC25A**
21	**R. Hajji**, R. Ben Arfi, A. Ghorbal, W. Essafi, A. Ben Brahim, T. Budtova *ENIG - Gabès* Biopolymer-based cryogels regenerated from EMIMAc solutions	**OC12A**
22	**S. Halladja** *University 20 août 1955 - Skikda, Algeria* Comparative study of the incorporation of metal ions into poly(acrylamide CO acid acrylic acid) on the adsorption of bovine serum albumin	**OC25B**
23	**L. Hassaini**, M. Kaci, S. Bruzaud *University of Bejaia - Bejaia, Algeria* The effects of silane treatment of filler on morphology and properties of poly(3-hydroxybutyrate-Co-3-hydroxyvalerate)/olive husk flour composites	**OC16B**
24	**A. Ibrahim**, M. Retailleau, C. Croutxé-Barghorn, X. Allonas *University of Haute-Alsace/LPIM - France* New design of highly homogeneous photopolymer network by three-stage polymerization system using double click Michael addition and photopolymerization	**OC3B**

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25	**K. Jlassi**, A. Mekki, M. Benna-Zayani, S. Thomas, M.M. Chehimi *LACReSNE / FSB - Bizerte* Conductive hairy nanofillers with unusual effects on interfacial properties through sequential diazonium chemistry and surface-confined polymerization	**OC6B**
26	**A. Kedim**, P. Cassagnau, A. Serghei, M. Jaziri *ENIS - Sfax* The influence of carbon nanotube ratio on the foam electrical conductivity of PMMA/MWCNT nanocomposite foams	**OC20B**
27	**M. Khemakhem**, K.Lamnawar, A. Maazouz, M. Jaziri *ENIS - Sfax* Biocomposites based on polylactic acid and olive solid waste: Improvement of thermal stability, physico-chemical and rheological properties	**OC4A**
28	**F. Laatar**, M.R. Ben Romdhane, E. Srasra, M. Lazzari, T. Praveen, J. Manuvel, P. Predeep *CNRSM - Borj Cédria* Unsaturated polyester-Tunisian clay nanocomposite coatings for cost effective corrosion protection of steel	**OC5A**
29	**M. Lahouioui**, A. Ghorbal, M. Fois, L. Ibos, R. Ben Arfi, A. Ben Brahim *ENIG - Gabès* Effect of bio-polymer concentrations on the thermal and mechanical properties of a new eco-composite	**OC3A**
30	**N. Litim**, A. Baffoun, S. Ben Abdessalem *ENIM - Monastir* Study of resin treatment effects on the mechanical, thermal and surface properties of cotton yarns by the Taguchi method	**OC18B**
31	**N. Maaloul**, A. Ghorbal, M. Rendueles, A. Ben Brahim, M. Diaz *ENIG - Gabès* Preparation and characterization of nanocellulose from Tunisian palm tree date pits: Application for copper (II) adsorption	**OC11A**

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32	**N. Mahfoudhi**, S. Boufi *FSS - Sfax* Enhanced mechanical properties of smart super absorbent hydrogels made of poly(acrylic acid-co-acrylamide)/nanofibrillated cellulose	**OC19B**
33	**H. Mahjoub**, F. Hkiri, M. Majdoub, T. Othman *INSAT - Tunis* Under shear viscosity study of Poly-N-isopropyl acrylamide in water and in the solvent mixture (water-ethanol)	**OC23B**
34	**N. Mansour**, K. Hriz, M. Chemli, N. Jaballah, D. Kreher, M. Majdoub *FSM - Monastir* New distyrylanthracene-based semi-conducting polymers: Spacer effect on photophisycal properties	**OC5B**
35	**S. Mansour Ahmed**, S. S. Darwish, N. A. Elmarzugi, M. A. Al-Dosari, N. A. Al-Mouallimi *Ministry of antiquities - Grand Egyptian museum, Egypt* Enhancing the durability of calcareous stone monuments of ancient Egypt using ZnO coated nanoparticles	**OC10B**
36	**R. Mejdoub**, H. Hammi, J. J. Suñol, A. M'Nif, S. Boufi *CNRSM - Borj Cédria* Nanofibrillated cellulose as nanoreinforcement in Portland cement : Thermal, mechanical and microstructural properties	**OC10A**
37	**R. Mejri**, J. Dias, S. Besbes Hentati, C. M. Costa, J.M.S.S. Esperança, S. Lanceros-Mendez *FSB - Bizerte* High performance electromechanical actuators based on ionic liquid/poly(vinylidene fluoride) composites	**OC12B**
38	**B. Mellah**, L. Baklouti, Y. Kim, E. Srasra *CNRSM - Borj Cédria* Hyperbranched macromolecules: Synthesis and binding properties towards metal cations	**OC8A**

Nr.		**Ref.**
39	**F. Mhalla**, M. Chemli, K. Hriz, N. Jaballah, M. Majdoub *FSM - Monastir* New semi-conducting poly(phenylenevinylene-alt-naphtalenevinylene)s: Synthesis, characterization and photophysical properties	**OC24A**
40	**S. Mhiri**, N. Mignard, M. Abid, S. Abid, M. Taha *FSS - Sfax* Synthesis of thermoreversible and biodegradable polyglycolic-acid-based networks	**OC2B**
41	**M. M'sahel**, A. El Mahdi, R. Medimagh, M. Said Zina *INRAP - Sidi Thabet* Synthesis and characterization of novel biosourced building blocks from isosorbide	**OC23A**
42	**M. Obadia**, D. Montarnal, E. Drockenmuller *University of Lyon 1 - France* Facile and accelerated methods for the preparation of ion conducting materials	**OC1B**
43	**N. Rahmouni**, Ja. Desbriéres, S. Besbes-Hentati *FSB - Bizerte* The elaboration of modified electrodes through the electropolymerization of chitin	**OC11B**
44	**A. Saadaoui**, C. Sanglar, R. Medimagh, A. Bonhomme, R. Baudot , S. Chatti, S. Marque, D. Prim, M. Said Zina, H. Casabianca *Université de Lyon 1 - France* New biosourced chiral molecularly imprinted polymer: Synthesis, characterization and evaluation of the recognition capacity of methyltestosterone	**OC15B**
45	**M.A.K. Sanhoury**, R. Mallek, A. Benchaabane, F. Kouki, M.T. Ben Dhia, H. Bouchriha, M.R. Khaddar *FST - Tunis* Phosphine oxide-capped CdTe nanoparticles as new acceptors for poly-3-hexylthiophene (P3HT)	**OC20A**
46	**F. Walha**, K. Lamnawar, A. Maazouz, M. Jaziri *ENIS - Sfax* The effect of a commercial melt strength enhancer additive on the physical and rheological properties of poly (lactic acid)	**OC1A**

Nr.		**Ref.**
47	**M. Zammali**, H. Mahjoub, T. Narita, T. Othman *FST - Tunis* Microrheology of transient networks based on associative polymers in aqueous media	**OC24B**
48	**R. Zidi**, I. Bekri-Abbes, N. Sdiri, A. Vimalanandan, M. Rohwerder, E. Srasra *CNRSM - Borj Cédria* Electrical and dielectric proprieties of intercalated polymer/clay nanocomposite prepared by spontaneous polymerization of pyrrole into Fe(III)-montmorillonite	**OC19A**
49	**O. Zoghlami**, M. Guettari, T. Tajouri *FST - Tunis* Experimental and theoretical studies of the temperature effect on the electrical conductivity of a polyelctrolyte aqueous solution	**OC17B**
50	**H. Zrida**, K. Hriz, N. Jaballah , M. Majdoub *FSM - Monastir* New π-conjugated polymers analogue of poly(*p*-phenylvinylene): Chromophore effect on the optoelectronic properties	**OC22A**

Oral Communications' Abstracts

Program of
Friday 25
March 2016

The effect of a commercial melt strength enhancer additive on the physical and rheological properties of poly (lactic acid)

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In order to find out the effect of a commercial melt strength enhancer additive on the thermal, rheological and morphological properties of polylactide (PLA), different blends of PLA/Paraloid BPMS-260 were melt-blended using a twin screw extruder. Thermal analysis results showed only one Tg for all blends suggesting the complete miscibility of the melt strength enhancer additive with PLA resin. The cold crystallization onset of the PLA blends shifts to higher temperatures and their crystallinity decreased with an increase of the BPMS additive compared to neat PLA. This behavior indicates that BPMS additive decreases the ability of PLA to crystallize and/or recrystallize during processing. The rheological tests showed that zero-shear viscosity and storage modulus of the PLA/BPMS-260 blends were significantly increased with the additive content. The analysis of SEM micrographs seems to confirm the miscibility of the acrylic additives with the PLA. These findings could be attributed to the entanglements between the PLA chains with those of the high molecular weight additive, creating a physical network which reduces the segmental mobility of PLA and leads to a high melt elasticity of the blend.

Key words: poly (lactic acid), BPMS additive, Twin screw extruder, Physical properties

STUDY OF THE PHYSICAL AND RHEOLOGICAL BEHAVIOUR OF GAMMA RAY SYNTHESISED HYDROGEL

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Polymerization process with Gamma irradiation technique is an important method for obtaining superabsorbent polymer.

In this study, we aimed to identify the effect of agar proportion on the synthesized superabsorbent properties based on polyvinylpyrrolidone (PVP), poly (ethylene glycol) (PEG) and agar. In the first stage, the study of swelling and deswelling behavior of synthesized hydrogel was done and the discussion proves that agar acts as a crosslinking inhibitor since it competes for free radicals. The pH and time dependent swelling was studied. The polymer was characterized by Fourier transform infrared spectra analysis and X-ray Diffraction. The effect of agar proportions on the rheological behaviour was then investigated and showed remarkable changes in the mechanical properties of the material depending on its composition [2].

Results showed that for a pH interval [1-12], pH=6 goes with the hydration maximum of all hydrogels and the swelling is strongly affected by pH. It can be seen that hydrogels reaches the equilibrium swelling after almost 7 hours of soaking. In fact, PVP and PEG compete with agar for the free radicals. The incorporation of a higher amount of agar can improve the swelling behavior of hydrogel until 1% because agar contains the polyhydroxy functional grouping which could increase hydrophilicity of the synthesized gel. This could be indicative of the presence of agar within the network either as an SIPN with permanent entanglement or as a grafted PVP and PEG.

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EFFECT OF BIO-POLYMER CONCENTRATIONS ON THE THERMAL AND MECHANICAL PROPERTIES OF A NEW ECO-COMPOSITE

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The exploitation of the agricultural wastes in construction materials has proved to be a very efficient way to create new ecological composite materials and mitigate the economic and environmental constraints on those materials. This paper presents a study of the feasibility of adding untreated and bleached date palm fibers, to cement and sand to produce a new eco-composite. Raw dates palm fibers underwent different surface modification methods such as the alkali and the bleaching treatments. Untreated fibers and extracted biopolymers were characterized by attenuated total reflection infrared spectroscopy (ATR-FTIR), and scanning electron microscopy (SEM). Moreover, the thermal conductivity, the compressive strength and the water absorption were experimentally quantified. The results showed that the incorporation of treated fibers with different weight concentrations in the new eco-composite reduces the mechanical and thermal properties of materials. Indeed, this work showed that the prepared eco-composite has a good thermal insulation propriety and an acceptable mechanical resistance.

Keywords: Eco-composite, biopolymers, thermal conductivity, mechanical properties.

Biocomposites based on polylactic acid and olive solid waste: Improvement of thermal stability, physico-chemical and rheological properties

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A new valorization strategy for Olive Solid Waste (OSW) has been carried out which consists in incorporating this biomass as a filler in a biopolymer matrix. The aim of the present work is to gain a fundamental understanding of the relationships between structure, processing conditions and final properties of the obtained materials. In this study, biocomposites based on poly(D,L-lactide) (PDLLA) and OSW fillers were prepared by a twin screw extrusion with various filler contents. It was highlighted that the inclusion of OSW under elevated temperatures resulted in the degradation of the matrix leading to a reduction of the viscoelastic properties and molar masses. Nevertheless, it was demonstrated that this degradation of the PDLLA matrix could be attenuated through two approaches. The first was chemical and consisted in using a chain extender agent containing glycidyl methacrylate (GMA) functions. The second route was physical and consisted in coating the OSW with the hydrophobic biopolymer poly(ε-caprolactone) followed by mixing with PDLLA. The effect of OSW with and without Joncryl on the thermal stability as well as the melt and the crystallization properties was assessed. Furthermore, the rheological properties in linear viscoelasticity of the controlled systems PDLLA/OSW/ Joncryl and/or PDLLA/ (OSW) coated with PCL were investigated in the molten state. The improvement of the shear viscoelastic properties corroborated the measured molar masses. The physicochemical matrix/filler interactions had to be taken into account to explain the improved rheological, morphological and mechanical properties.

Key words: Olive solid waste, poly (lactic acid), biocomposites, thermal stability, processing.

UNSATURATED POLYESTER-TUNISIAN CLAY NANOCOMPOSITE COATINGS FOR COST EFFECTIVE CORROSION PROTECTION OF STEEL

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Polymer and polymer composite coatings are often used to protect metal surfaces from corrosion. It has been shown that various types of polymer nanocopmsites provide comparatively better corrosion protection than the neat polymer resins. In this study protective properties of nanostructured Tunisian clay (Montmorillonite -MMT) modified Unsaturated Polyester (UP) (MMT/UP) is studied in 3.5% NaCl. The coatings are applied on metal surfaces by spin coating on Stainless steel panels. The samples are characterized with XRD, SEM and TEM. The corrosion performance was evaluated using electrochemical impedance spectroscopy (EIS), open circuit potential (OCP) and polarization measurement. The UP / MMT nano composites showed better performance in terms of corrosion protection properties.

Keywords: Corrosion, Montmorillonite, Nanocomposite, Polyester resin, polymer coatings

NEW PPV-TYPE Π-CONJUGATED POLYMER CONTAINING FLUORESCEIN DYE MOIETY FOR OPTOELECTRONIC APPLICATION

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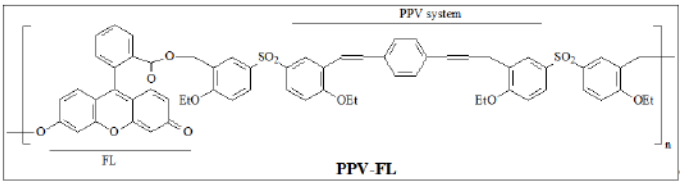
The discovery of electroluminescence in poly(*p*-phenylenevinylene) (PPV) [1], has produced a new area in polymer sciences: the semi-conducting polymers. Since then, a tremendous progress has been made in the molecular engineering of π-conjugated polymers and in their uses as active components in various optoelectronic devices [2,3]. Herein, we report the synthesis and the characterization of a new PPV derivative (**PPV-FL**) comprising the fluorescein dye (FL) group in the polymer backbone.



The Structure of the π-conjugated polymer **PPV-FL**

This π-conjugated polymer was soluble in volatile solvents and its macromolecular structure was confirmed by ^{1}H NMR, ^{13}C NMR and FT-IR spectroscopies. It exhibited an amorphous morphology with relatively high glass transition temperature. This organic material showed a good film quality and the surface properties thin **PPV-FL** layer were investigated by contact angle measurements.

The absorption and photoluminescence properties of **PPV-FL** were studied in solution and as thin film; the results showed an optical gap of 2.25 eV and an orange emission in solid state. The HOMO/LUMO energy levels were evaluated by cyclic voltammetry measurements and indicate a *p*-type semi-conducting material. Single-layer diode device of [indium-tin oxide/ **PPV-FL** /aluminium] configuration has been fabricated and showed relatively low turn-on voltages.

Keywords: Semi-conducting polymer; poly(*p*-phenylenevinylene); organic thin layer; fluorescein; photoluminescence; organic diode.

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BIOBASED ALIPHATIC SULFONATED POLYESTERS: SYNTHESIS, CHARACTERIZATION AND HYDROLITIC DEGRADATION

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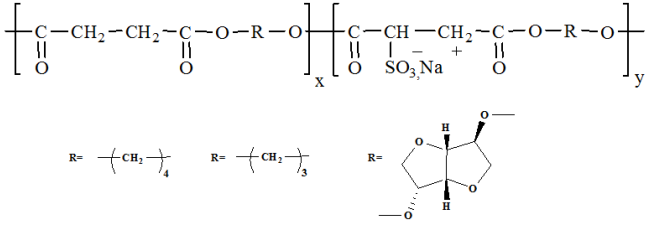
Recently, there has been considerable interest in the synthesis of aliphatic polyesters because of the growing importance of environmentally degradable polymers [1] but they often do not present optimal physical and thermomechanical properties for applications in the field of conventional thermoplastics. Sulfonated aliphatic or aromatic copolyesters were prepared as viable macromolecular materials exhibiting specific properties in terms of rigidity, biodegradability, hydrophilicity [2, 3]. The present study is devoted to the synthesis of novel aliphatic sulfonated polyesters from biobased monomers by the melt polycondensation from diols (1, 4-butanediol, 1,3-propanediol and isosorbide) and a mixture of dimethyl sodiosulfosuccinate and diethyl succinate. Structural characterization of copolyesters was investigated by ^{1}H and ^{13}C NMR. The NMR investigation indicates that the copolymerization takes place.The thermal properties (DSC, TGA) show that the level of Tg was correlated to the nature of the diols and the concentration on the sulfonated units. Therefore, the glass transition temperature increased with the content of sulfonated moieties. The hydrolytic degradation in acidic aqueous conditions (pH= 4,35) and alkaline conditions (PH=11,5) at 37°C over the period of four weeks show that the mechanism of the hydrolysis of copolyesters was elucidated in relation with the nature of the diols. This study allows tuning their properties as a function of the final applications.



Key words: polycondensation, hydrolytic degradation.

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HYPERBRANCHED MACROMOLECULES: SYNTHESIS AND BINDING PROPERTIES TOWARDS METAL CATIONS

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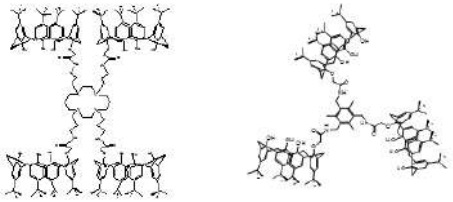
Dendrimers are nanosized, well-defined and tree-like polymers. They have symmetrical branching units built around a small molecule or a linear polymer core. Their name originated from “dendron” meaning tree and “meros” meaning unit. They have well-defined molecular weights and host–guest entrapment properties due to their empty internal cavities and their open conformations which make them possible to encapsulate hydrophobic drug molecules, cations, anions...

This presentation provides an insight into the structure, synthesis of novel dendrimers carrying calixarenes as branching units. Their binding properties towards transition metal cations have been performed by UV absorption spectrophotometry.



Scheme: Synthesized Dendrimers

Key words: Dendrimers, Calixarenes, spectroscopic characterization, complexation.

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NEW SEMI-CONDUCTING POLYMERS BIPHENYL-BASED: SYNTHESIS AND PHOTOPHYSICAL PROPERTIES.

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New conjugated PPV derivatives containing biphenyl (**P1-2**) have been synthesized via the Witting and Knoevenagel reaction (Figure 1).

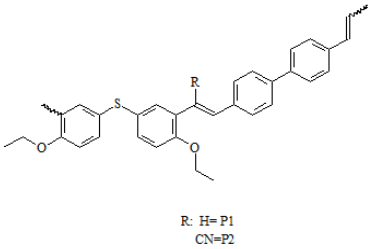

Figure 1: molecular structures of the polymers P1 and P2

The polymers are soluble in common organic solvents and show good film-forming abilities. High number-average molecular weights were determined by ^{1}H-NMR and size exclusion chromatography (SEC). The molecular structures of the polymers were confirmed by nuclear magnetic resonance (NMR) and Fourier transform infrared (FTIR) spectroscopies. Thermogravimetric analysis of the polymers showed good thermal stability up to 350°C for P1 and 320°C for P2. The optical properties of these π-conjugated materials were investigated by UV-vis absorption and photoluminescence (PL) spectroscopies. The polymers show a blue fluorescence in dilute solution for P1and yellow emission for polymer containing a cyano-group (P2). This behavior was attributed to the introduction of cyano-group in the backbone. In slide state both polymers exhibit an orange emission. The HOMO and LUMO levels were estimated using cyclic voltammetry analysis; the values show a significantly effect of the CN-group on the electronic affinity and ionization potential. Single-layer diodes based on these organic semiconductors have been fabricated and showed relatively low turn-on voltages.

Key words: semi-conducting polymers, Biphenyl, Wittig reaction, Knoevenagel reaction, photoluminescence.

NANOFIBRILLATED CELLULOSE AS NANOREINFORCEMENT IN PORTLAND CEMENT : THERMAL, MECHANICAL AND MICROSTRUCTURAL PROPERTIES

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Nanofibrillated cellulose (NFC) from eucalyptus pulp produced by high pressure homogenization was used as additive for cement matrix. The effect of the content of NFC on the thermal conductivity, thermal expansion, compressive strength and phase composition were investigated. Results shown a meaningful enhancement in the thermal conductivity by about 43% and an improvement in the compressive strength by more than 50% induced by the NFC addition. Analysis of the phase composition using X-ray diffraction (XRD) revealed that the presence of NFC promoted the hydration of cement by producing more $Ca(OH)_2$ and C–S–H gel and less ettringite crystals which is likely the main reason accounting for the strong enhancement in the compressive strength.

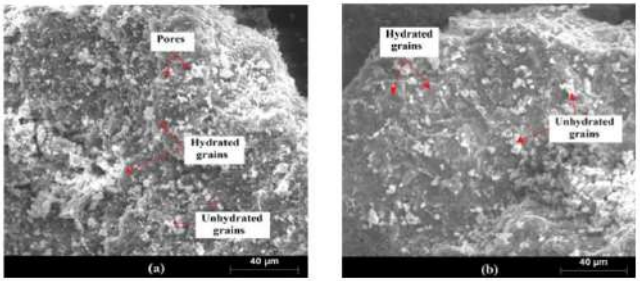

FIG1. SEM micrographs of (a) Control and (b) optimal specimens at 7 curing days.

Key words: Nanofibrillated cellulose (NFC), Portland cement nanocomposite, Thermal properties, Mechanical properties, Microstructural propertie

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PREPARATION AND CHARACTERIZATION OF NANO- CELLULOSE FROM TUNISIAN PALM TREE DATE PITS: APPLICATION FOR COPPER (II) ADSORPTION

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In the last decade, nano-fibrillated cellulose (CNF) or nano-cellulose (CNC) has been the subject of intense research [1], due to their light weight, high aspect ratios, high elastic moduli and low thermal expansion coefficients. Cellulose nano-fibrils (bio-polymers) have been isolated from various kinds of plant sources and it has been observed that their morphology plays a critical role in the efficiency of cellulose use. Transmission electron microscopy (TEM) and scanning electron microcopy (SEM) are powerful tools in visualizing the extracted cellulose nano-structure [2].

The goal of this work is to extract cellulose nano-crystal from Tunisian palm tree date pits "Bou Hattam". The first part of this work was dedicated to the structure characterization and the thermal stability of cellulose nano-fibers and cellulose nanocrystal. However, the second part was dedicated to the investigation of Copper (II) removal from aqueous solutions by the extracted bio- polymers.

The thermogravimetric measurements showed a high thermal stability of CNF and CNC. The TEM and SEM observations showed cellulose with a ribbon like structure formed by parallel nano-fibers. CNC have shown a spherical shape with an average diameter of about 5-6 nm. The CNC were successfully used for the biosorption of Copper (II) from aqueous solutions.

Key words: Bio-polymers, nano-fibrillated cellulose, date pits, heavy metal ions.

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BIOPOLYMER-BASED CRYOGELS REGENERATED FROM EMIMAC SOLUTIONS

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The development of natural biopolymer materials is becoming increasingly important due to the decrease of petroleum resource and their use as a substitute for non-biodegradable petroleum based plastics [1]. Flax (Linum usitatissimum L.) is one of the most widely used lignocellulosic materials. Flax fibers are very promising because they show high mechanical strength, chemical stability, biodegradability, non-toxicity and are composed mostly of cellulose (70%), hemicelluloses (15%), pectin (1-15%) and lignin (2-5%) [2]. In recent years, much attention has been focused on cellulose based cryogels. Transforming cellulose to cryogel-like materials enhances its properties and expands its use within the biomedical field and filtration and sorption processes. But yet, there is a lack of research efforts towards the direct use of raw lignocellulosic materials for cryogels preparation. Flax fibers cryogels have been successfully regenerated, for the first time, from 1-ethyl-3-methylimidazolium acetate (EMIMAc). The results show that the Flax fiber concentration in the EMIMAc solutions and the lyophilization process influence the cryogels properties (porosity, bulk density, crystallinity and Brunauer-Emmett-Teller surface area). A direct correlation between the crystallinity of cryogels and the concentration of flax fibers in the ionic liquid solutions, has been established by Attenuated Total Reflectance Fourier Transform Infrared Spectroscopy (ATR-FTIR) characterizations. Mechanisms of nanofibrils reorganization have been suggested so as to explain the variation of the porosity, the bulk density and mainly the crystallinity of the materials during the lyophilization process.

Key words: biopolymer, cryogel, crystallinity, Flax fibers, ATR-FTIR, ionic liquid.

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SYNTHESIS AND POTENTIAL MEDICAL APPLICATION OF NOVEL BIONANOCOMPOSITES

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The development of new nanocomposites is a discipline of growing interest which includes the preparation of nanomaterials by different experimental approaches including the synthesis using the bottom-up strategy.
Various types of nanoparticles (NP) can be involved including clay minerals as building blocks to produce various nanocomposites and bionanocomposites. In this context, the modification of the clay mineral surfaces allows the development of various types of nanocomposites in which clay nanoparticles are intercalated or exfoliated.
In the present work, new bionanocomposites based on the assembly of a snail slim with natural smectite clay and with an organophilic smectite. The synthesis was performed by intercalating the slim in the interlayer galleries of clay.
The obtained bionanocomposites were characterized by XRD and FTIR to confirm the intercalation of the slim.
The Natural clay and the synthesized bionanocomposites were tested on skin.cancer cell line The results show that the synthetic bionanocomposites have an anti-proliferative effect on this cell line.

Key words: Natural clay, organophilic clay, bionanocomposite, snail slim, skin cancer

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FACILE AND ACCELERATED METHODS FOR THE PREPARATION OF ION CONDUCTING MATERIALS

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Polymerized ionic liquids (PILs) are unique polyelectrolytes with cationic and anionic groups included in the repeating unit. They are extremely attractive in the field of materials science as they combine the properties of ionic liquids (high ionic conductivity, thermal and chemical stabilities) with those of polymers (mechanical stability, processing and tunable macromolecular design). PIL elastomers, networks and gels are envisioned as effective (quasi-)solid polyelectrolytes in applications such as dye sensitized solar cells, batteries or membranes for carbon dioxide recovery. In all these applications, imidazolium-based PILs are by far the most widespread and investigated materials. PIL elastomers or networks are generally obtained by the copolymerization of ionic liquid monomers and multifunctional crosslinkers or by the post-polymerization crosslinking of neutral or charged (co)polymers. Since the striking development of the copper-catalyzed azide-alkyne cycloaddition (CuAAC) modular ligation, a large variety of materials containing 1,2,3-triazole groups have been reported. We have recently pioneered the synthesis of 1,2,3-triazolium-based PILs, and their synthesis through CuAAC offers unprecedented structural design opportunities. This work describes a novel monotopic approach for the elaboration of PIL elastomers which is solvent- and catalyst-free, easy to process and applicable to a broad range of processing methods and applications.

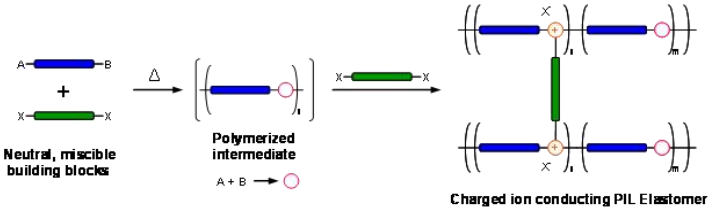

Figure: Principle of solvent- and catalyst-free synthesis of ion conducting elastomers.

Keywords: Poly(ionic liquids), solid electrolytes, elastomers, 1,2,3-triazoliums, click chemistry

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Synthesis of thermoreversible and biodegradable polyglycolic-acid-based networks

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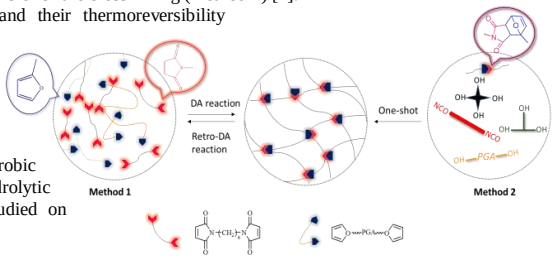
Polymers based on renewable resources such as plant and agro-industrial waste are of considerate interest as substituents for petroleum-based materials. Poly(glycolic acid) (PGA), obtained from bio-based monomer [1], is a promising biodegradable polymers owing to its good mechanical properties and its unique biological properties such as biocompatibility and biodegradability [2]. It has long been a popular polymer investigated for biomedical applications such as absorbable sutures, tissue scaffolds and drug release systems [3].

Furthermore, PGA has unusual properties compared to other related series of linear polyhydroxyalkanoates. Thus, on the one hand PGA possesses a melting temperature higher than 200 °C, second, it shows insolubility in most common organic solvents and third, it has a higher degradation rate. Successful efforts were made to provide poly(glycolic acid) specific mechanical and architectural features and facilitate its handling such as synthesis of glycolide copolymers [4], polymer blends [5] and chemical crosslinking [3]. Among these methods, cross-linking seems to be a good method to optimize the materials properties of PGA while maintaining its biodegradability.

The present works aims to develop thermoreversible polyglycolic-acid-based networks while maintaining the attractiveness biodegradability of PGA. First, PGA hydroxyl-telechelic oligomer with a well-controlled molecular weight was synthesized by ring opening polymerization of glycolide. Before approaching the synthesis of the networks, two precursors which are the Diels-Alder adduct and a coupling agent were synthesized separately for a better control of the conversion of the Diels Alder reaction. Thereafter, the networks were obtained by two methods: the first one in which the Diels-Alder adduct gives rise to the network (method 1) [6] and the one-shot process where the alcoholysis reaction of the coupling agent is responsible for the crosslinking (method 2) [7].

The formation of networks and their thermoreversibility through Diels Alder reactions have been identified over several cycles following the thermal behavior of materials by dynamic mechanical analyses.

The biodegradation by aerobic microorganisms and the hydrolytic degradation at 37°C were studied on networks of different densities.



Scheme1: Methods for the synthesis of thermoreversible PGA-based networks

Keywords: poly(glycolic acid), Diels-Alder reaction, Thermo-reversibility, Rheology, Biodegradability.

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New design of highly homogeneous photopolymer network by three-stage polymerization system using double click Michael addition and photopolymerization

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Click reaction is known as attractive concept for polymer tailoring basing to their advantages such as high yielding, simple performing, can be conducted in easily removable or benign solvents…. The Michael addition reaction was identified to fulfill criteria of a "click" reaction [1]. Benefiting of the spatial and temporal control of the photopolymerization process while being fast, a two-stage system including an off-stoichiometric thiol or aza Michael addition and a further photopolymerization of the residual acrylate functions has been designed to produce smart materials [2-4].
Kinetic profiles and thermomechanical properties of polymer film obtained via this three step approach were investigated and compared to the ones obtained by conventional free radical photopolymerization of acrylates. The second aza-Michael addition appears as a valuable post-consolidation step of the polymer network [5]. Finally, this kind of homogeneous 3D network with tunable properties is used in different examples to produce smart materials.

Key words: Click Chemistry, Aza-Michael, Photopolymerization, smart materials.

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Biosourced Cyclic and Multi-cyclic Polyesters based on 1,4:3,6 –dianhydrohexitols : Application as a sorbent for metal ions in aqueous solutions

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Recent investigations of the role of cyclization in kinetically controlled (irreversible) polycondensations confirmed the previous calculations of Gordon, Temple and Stepto.[1] In this field cyclic and multicyclic polymers represent fascinating macromolecular architectures. They were studied by scientists in the last years due to their unique properties that distinguish them from their linear counterparts,[2] such as a smaller hydrodynamic volume and lower melt viscosity at a given molecular weight (MW), as well as higher thermostability. These cyclic and multicyclic polymers were demonstrated to behave as potent ligands (cryptands) for heavy metals uptake in aqueous media. In fact, the use of these architectures, in this work, for the retention of heavy metal ions of different valencies was successful. In addition, Isosorbide and isomannide based polymers showed selectivity toward some type of metals due to the conformation difference between both monomers. Taking this into account, our work aimed to study the polycondensations of isosorbide and isomannide with trimesoyl chloride to obtain cyclic and multicyclic structures. This was done by varying both the feed ratio of diol:trimesoyl chloride and the concentration in order to optimize the fraction of cyclic and multicyclic species. The stereochemistry of the diol proved of great importance for the efficiency of cyclization, because isomannide enhanced the faction of multicyclic species at the expense of cyclic ones due to V-shape structure. The resulting products were characterized by solvent free MALDI TOF MS.

Key words: Isosorbide, Multicyclic, Metal uptake, MALDI ToF.

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New distyrylanthracene-based semi-conducting polymers: Spacer effect on photophisycal properties

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This work is a contribution to molecular engineering which aims to develop new semi-conducting polymers for organic thin-layer electronic application.
A series of distyrylanthracene polymer derivatives were synthesized via Wittig condensation using sodium hydride (NaH) as base (**Figure1**). The polymers are fully soluble in common organic solvents and show a good film quality. The polymer structures were confirmed by ^{1}H NMR, ^{13}C NMR and FTIR spectroscopic analysis. The optical properties of the polymers were investigated by UV-visible absorption and photoluminescence spectroscopies.
In dilute solution, the absorption spectra of all polymers exhibit the same feature with three maxima. Also, we noted the same optical gaps for all polymers indicating not effect of spacer-group on intrinsic properties of polymers.
A blue emission was observed in dilute solution and orange fluorescence was obtained in thin film. This behavior was ascribed to the π-π interaction of the excited distyrylanthracene segments and excimer formation in the solid state.[1] Indeed, we noted that the π-π interactions in the solid state are mainly associated to the size of the spacer-groups.
The HOMO/LUMO energy levels were estimated by cyclic voltammetry measurements Single-layer diode devices of an indium-tin oxide/polymer/aluminum configuration were elaborated and showed relatively low turn-on voltages (2.5- 4 V).

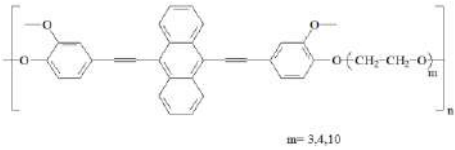

Figure1: chemical structures of **P1-3**

Keywords: Organic semiconductors, Anthracene, PPV, Optical properties, Thinfilms

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Conductive hairy nanofillers with unusual effects on interfacial properties through sequential diazonium chemistry and surface-confined polymerization

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The surface chemistry of diazonium salts is well documented [1] and concerns the modification of several materials. Herein we describe general methods of modification of CNTs and clay by aryl diazonium salts followed by in situ polymerization for making *hairy*fillers. The latter were characterized by XPS, SEM/TEM, IR and TGA while the reinforcing properties of epoxy matrices were investigated with clay-diazonium-polyaniline (clay@PANI) fillers. The effect of clay@PANI on the mechanical properties of the epoxy was studied by tensile and fracture toughness tests. The presence of 0.1 wt% clay@PANIhas improved the tensile strength by more than 40%. The fracture toughness of epoxy reinforced with an extent above 0.1 wt% of clay@PANIindicates resistance to breakdue to exfoliated clay.

This work highlights diazonium salts as efficient coupling agents for making *hairy* fillers that reinforce epoxy matrices.

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Synthesis of molecularly imprinted polymers for the selective extraction of alkoxyacetic acids from urine samples

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Glycol ethers (GE) are extensively used in industrial processes as solvents to produce lacquers, varnishes, resins, printing inks and textile dyes. Occupational exposure to these compounds causes reproductive effects. Recent epidemiologic studies suggest an association of major congenital malformations with exposure to GE during the period of pregnancy. Methoxyacetic acid (MAA) and ethoxyacetic acid (EAA) are the main biomarkers of exposure to glycol ethers. The aim of this study was to synthesize two molecularly imprinted polymers for specific extraction of the metabolites. Both polymers were synthesized using methacrylic acid as the functional monomer, ethylene glycol dimethacrylate as cross-linker, acetonitrile as porogen solvent, 2,2'-azobisisobutyronitrile as initiator and methoxyacetic acid and ethoxyacetic acid as templates. A Doehlert experimental design was applied to determine optimum synthesis conditions. Four factors were chosen: the monomer amount, the solvent volume, the cross-linker amount and the polymerization temperature. The imprinted polymers, non imprinted polymer NIP and the functional monomer were characterized by Fourier transform infrared spectrometry (FTIR).
Graphic analysis of contour plots obtained from NEMROD software showed that the highest retention for both AMA and AEA was obtained under the following conditions : 0,66 mmol of the monomer, 1 mL of acetonitrile, 4 mmol of cross-linker and 40°C polymerization temperature.

Key words: Molecularly imprinted polymers, Glycol ethers, Methoxyacetic acid, Ethoxyacetic acid, Doehlert experimental design.

FRAGRANTMICROCAPSULES BASED ON β-CYCLODEXTRINFOR COSMETOTEXTILE APPLICATIONS

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The synthesis of polymeric materials based on monomers from renewable feedstock is a steadily growing area of interest, stimulated by the rising concern for the environment and the fast exhaustion of petroleum reserves [1]. Thereby, several bio-based polymers are exploited in microencapsulation field as a shell surrounding a functional compound.
As a contribution in this area, we study the development of polyurethane bio-sourced microparticles based on β-cyclodextrin and its applications in textile especially cosmetotextile field. A novel kind of microparticles containing neroline as a perfume was successfully synthesized. The polyurethane shell was synthesized by interfacial polycondensation of β-cyclodextrin with hexamethylenediisocyanate [2]. The success of polymerization reaction leading to the formation of the polyurethane shell was checked by ATR-FTIR. Optical microscopy and scanning electron microscopy (SEM) were used to study the microparticles morphology and shape. Particle size distribution was studied by small-angle light scattering using a particle size analyzer. Thermal behavior studied by thermogravimetric analysis (TG) showed excellent properties of synthesized microcapsules. Their stability and isoelectric point (IEP) in aqueous solution were studied using small-angle light scattering in order to have an idea about their storage and their fixation onto textile substrate.
Neroline-loaded microcapsules have been investigated for their properties and their suitability for cosmetotextile applications. The microcapsules were deposited onto 100% cotton knitted fabrics by an impregnationprocess. In order to control the performed treatment, finished textile were tested by SEM and IRTF-ATR.

Key words:β-cyclodextrin;Polyurethane; interfacial polycondensation;neroline; microcapsule, impregnation.

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MACRO- AND NANO- ELECTROGRAFTING OF POLYMERS: ATOMIC FORCE MICROSCOPY CHARACTERIZATION

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Atomic force microscopy (AFM) is a technique with many different applications in fundamental and technical fields. This methodological platform offers several advantages over more traditional approaches and overcomes some of the barriers in the study and the realization of electrografting processes [1]. Indeed, AFM was proved to be not only a technique for imaging surfaces, but also the suitable tool for the chemical and physical patterning of surfaces [2, 3]. The present work relates to these phenomena. In the present work, we investigated the multilayer formation of polynitrophenylene [PNP] films by coupling, in situ, electrochemistry and AFM analysis, in the first instance, and then the potential AFM as an electrochemical lithographic tool has been explored. Moreover, in this study, we proved that AFM allows polymeric films nano-characterization and vinylic monomers to be electrografted onto a conducting substrate to form motifs with a few hundred nanometers wide.

Key words: AFM, Electrografting process, Polymers, Thin films, Nanotechnology.

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ENHANCING THE DURABILITY OF CALCAREOUS STONE MONUMENTS OF ANCIENT EGYPT USING ZnO COATED NANOPARTICLES

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Historical calcareous stone surfaces may undergo unwanted changes due to the exposure to many physical and chemical deterioration factors. The current work evaluates the use of zinc oxide nanoparticles, dispersed in acrylic copolymer [polyethylmethacrylate/methylacrylate (70:30) as a nanocomposite coating material with hydrophobic, properties. This applied on historic stone monuments of ancient Egypt, which is aiming to consolidate and protect properties against artificial aging by relative humidity/temperature, UV radiation and dirt accumulation.

The obtained Nanocomposites have been characterized by microscopically by TEM to ensure the homogenous dispersion of ZnO nanoparticles in the polymer matrix and the average crystal size.Expermental marble stone blocks gifted from Grand Egyptian Museum have been coated by the prepared nanocomposites. The efficacy of the treatments has been evaluated after coating and artificial Thermal aging, through capillary water absorption, Ultraviolet-light exposure to evaluate photo-induced and the hydrophobic effects of the coated surface, while the surface morphology before and after treatment was examined by scanning electron microscopy (SEM). Colorimetric measurements have been performed to evaluate the optical appearance.

The coated ZnO nanoparticles enhanced the durability of stone surfaces toward UV aging, and improved their resistance to relative humidity and temperature compared to the samples coated with the Acrylic polymer without ZnO nanoparticles. Self-cleaning properties were confirmed without any colour change on the surface.

Keywords: ZnO nanoparticles, Acrylic polymeric, Nanocomposite, Colorimetric measurements, historic stone monuments of ancient Egypt.

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The elaboration of modified electrodes through the electropolymerization of chitin

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Several studies have been concerned with the chemical modification of chitin in the objective of the enhancement of its solubility [1]. However, on the basis of our knowledge; there was never a question of an electrochemical deposition.
By means of cyclic voltammetry study and macroscale electrolysis at platinum, it is shown that the addition of chitin to a mixed solvent system acetonitrile/ dimethylacetamide with the presence of LiCl, leads to its electropolymerisation and consecutive electrodeposition. An appearance of a quasireversible oxidation step and a subsequent generation of coated surfaces indicate a direct electron ejection from this biopolymer. In the potentiostatic experiment, new oxidation product that presents a more important solubility than the initial substrate has been collected as precipitates in the electrochemical cell and on the working electrode. Their spectroscopic characterizations reveal a coupled chemical reaction to the electron transfer. The electrogenerated films are oxidized with a biggest difficulty than chitin.

Key words: Chitin, Electroactive deposit, Cyclic Voltammetry, Anodic oxidation.

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High performance electromechanical actuators based on ionic liquid/poly(vinylidene fluoride) composites

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Poly(vinylidene fluoride), PVDF, has been blended with different ionic liquids (IL) in order to evaluate the effect of the different IL anions and cations on the electroative phase, thermal, mechanical and electrical properties [1], [2] of the polymer blend. C_2MIMCl, C_6MIMCl, C_{10}MIMCl, C_2MIMNTF$_2$, C_6MIMNTF$_2$, C_{10}MIMNTF$_2$ have been selected and were introduced in the polymer at 40 wt%. It was found that the incorporation of ILs into the PVDF matrix leads to an increase of the β-phase content due to the strong electrostatic interactions between the dipolar moments of PVDF and the ILs [3]. Further, the incorporation of ILs into PVDF strongly decreases the elastic modulus and increases the electrical conductivity of the blend with respect the pure polymer matrix, all these effects being accompanied by a modification of the crystallization kinetics, as indicated by the modified spherulitic microstructure. Therefore, novel PVDF/ IL blends films with high transparency, excellent antistatic properties, and highly polar crystal form fraction were successfully achieved.
The bending movement of the IL/PVDF composites is correlated to the degree of crystallinity and ionic conductivity value [2] and the best value of bending response is found for IL/ PVDF composite with 40 wt% of [C_6mim][Cl] at 20V.

Key words: PVDF, Ionic Liquid, Electroactive polymers, EAP.

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ELECTRICAL CONDUCTIVITY OF A POST GAMMA RADIATION POLYMER

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The polyvinnylpyrrolidone (M_w = 1.3 10^6 g mol^{-1}) was irradiated in air by different doses, D, of gamma radiation ranged between 0,8 kGy and 5kGy. The obtained samples were dissolved in deionized water, and different post gamma radiation polymer concentrations were prepared. The conductivity of the samples shows a kinetic dependence where two regimes were appeared: a transitional regime and a permanent regime. The rapidity to establish the permanent regime, τ, was deduced and discussed for all the used doses and concentrations.

Keywords: Polymer, conductivity, Gamma radiation

Program of Saturday 26 March 2016

Preparation and characterization of novel bionanocomposites using pectin extracted from prickly pear nopals and Tunisian clay

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Polymer-clay nanocomposites are highly sought-after materials, mainly due to their applicabilityin a variety of avenues. However, organic compatibility with clay and adherence to "green chemistry" concepts and principles can be limiting factors from the standpoint of the preparation of these nanocomposites.

As such, the objective was to prepare a biopolymer-modified clay nanocomposite using a simple and environmentally friendly method of preparation.

Novel nanocomposites were prepared using high and low methyl pectins extracted from prickly pear nopalsand purified MMT, functionalized MMT through the grafting ofan organosilane and organophilic MMT through the intercalation of an alkyl ammonium.

Theresultsshow the formation of intercalated structure of all nanocomposites and an important synergy between low methyl pectin and silanated clay besides an excellent affinity between the purified clay and low methyl pectin.

On the basis of the data of the present investigation, the as-prepared nanocomposites will be tested for gastricpharmaceuticalapplication.

Keywords: Bionanocomposites,Pectin, Montmorillonite.

PREPARATION AND CARACTERIZATION OF NANOFIBRILLATED CELLULOSE POLYVINYL ALCOHOL (PVA) COMPOSITE FOR POTENTIAL BIOMEDICAL APPLICATION

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Nanofibrillar cellulose (NFC) (also referred to as cellulose nanofibers, nanocellulose, microfibrillated, or nanofibrillated cellulose) has gotten recent and wide attention in various research areas. Here, we report the application of nanofibrillar cellulose as a matrix-former material for long-lasting sustained drug delivery.

This work reports the preparation of NFC−PVA−Caffeine composite films, and the thermal and mechanical properties of these films.

Nanofibrillated cellulose (NFC), which was separated from Posidonia Oceanica by alkali treatment, bleaching and subsequent hydrolysis with 40 % sulfuric acid, was used as the reinforcement in polyvinyl alcohol (PVA) matrix. NFC−PVA−Caffeine composite films were created by casting from a water suspension to produce a homogeneous dispersion of MFC in the polymer matrix. Infrared spectroscopy (FT-IR) suggested sufficient removal of lignin and hemicellulose from the marine plant. FT-IR, XRD, SEM, thermogravimetric analysis (TG, and DSC) and mechanical analyses were used to characterize the NFC and the composites. The tensile strength and modulus of the PVA film were significantly improved by the addition of cellulose nanofibers.

As a result of this research, it has been shown that NFC is an excellent reinforcement comparable to cellulose nanowhiskers. Furthermore, by combining NFC with PVA in addition to good mechanical properties, this composite has good chemical resistance and biodegradability, and the films should be able to control drug release over long periods of time.

Key words: Posidonia Oceanica, Cellulose nanofibers, Poly (vinyl alcohol), Nanocomposites, Mechanical properties, Caffeine, Drug Delivery System.

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CONTROLLED GROWTH OF Cu_2O NANOPARTICLES BOUND TO COTTON FIBRES

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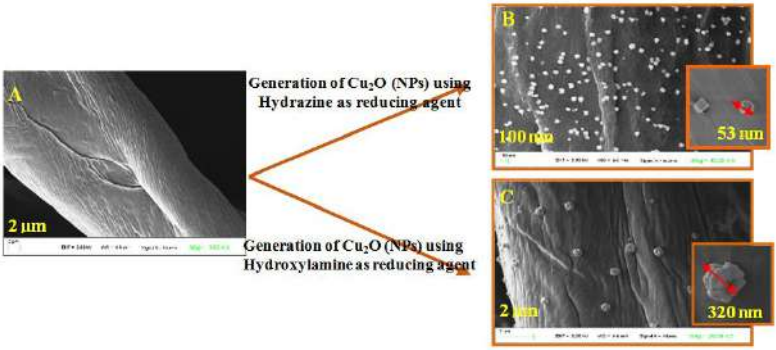
A green, safe and fast procedure is presented for in situ generation of nanoparticles (NPs) of cuprous oxide (Cu_2O) onto cotton fibres at room temperature using water as a solvent. The method is based on a mild surface oxidation of cellulose fibres to generate in a controlled way carboxylic groups acting as a binding site for the adsorption of Cu^{2+} via electrostatic coordination. Then, the adsorbed Cu^{2+} ions were readily converted into Cu_2O by dipping the treated cotton fibres into an aqueous solution of a reducing agent. Field-emission scanning electron microscopy (FE-SEM), X-ray photoelectron spectroscopy (XPS) and X-ray diffraction (XRD), as well as UV-Vis absorption and emission spectroscopic methods were used to analyse the size, morphology, chemical composition and the crystalline structure of the generated nanoparticles on the fabrics. The morphology of the ensuing Cu_2O nanoparticles was shown to be dependent on the reducing agent used. Antibacterial properties of the modified fibres were also investigated.

Key words: Cotton, Cellulose, Nanoparticles, Cu_2O, Antibacterial properties.



FE-SEM: Cotton fabric before and after generation of Cu_2O (NPs) using differents reducing agents. (A) Neat cotton, (B) Cot-Hydrazine and (C) Cot-hydroxylamine.

TEMPERATURE-CONCENTRATION EFFECT ON FICOLL 400 BEHAVIOUR

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Polysucrose (witch trade name is Ficoll) is a highly, cross linked polysaccharide, formed by copolymerization of sucrose with epichlorohydrin. It has a high molecular weight, Mw = 400KDa used in biologic and biopyisics applications [1-5]. Ficoll is readily soluble in the aqueous media, its molecules appear to behave like rigid spherical globules which are nonflexible.

In the present work, we have applied dynamic light scattering (DLS) and rheological measurements in order to assess the most important characteristics of Ficoll in water. Indeed, we evaluated the effect of the temperature and the concentration on rheological properties and on the size and shape of Ficoll 400. Dynamic Light Scattering experiments indicated the coexistence of tow closely-spaced diffusive modes in solution by analyzing the spectra with double exponential fits. The apparent diffusion coefficient D at fixed concentration of Ficoll 400 showed the existence of three regimes of concentration separated by critical concentrations. The real coefficient diffusion D0 obtained by eliminating the effect of Ficoll concentration was evaluated in order to investigate the comportment of the individual chain at different temperatures, then real hydrodynamic radii were deduced. We also determined the interaction parameter kD to evaluate the medium and also to estimate the type of interactions and to assess Ficoll behavior. Rheological results allowed us to calculate the intrinsic viscosity and the Huggins coefficient kH at different temperatures. Both rheological and dynamic light scattering results indicated the existence a critical temperature around 35°C separating two zones: for temperatures smaller then 35°C, Ficoll molecules are in good solvent, around 35°C, kD show negative values, and kH take high positive values an aggregation phenomenon; then, for higher temperatures, the size of formed aggregates grow indicating probably the existence of hydrophobic interactions.

Key words: Polysaccharide, Dynamic light scattering, hydrodynamic radius, dynamic viscosity, intrinsic viscosity, interaction parameter

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Grafting reactive and functional polymer thin layers to flexible substrates: Methods and applications

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In recent years, there has been growing interest in the design of functional flexible materials for the making of intelligent textiles, organic electronic devices, low cost sensors, solar cells, light-emitting diodes, and bioactive supports to name but a few.
One can impart high added value to such flexible materials by attaching reactive and functional thin polymer layers. The latter impart remarkable properties to surfaces such as sensing, catalytic properties, control of hydrophilic/hydrophobic properties and antibacterial activity. However, long term performance is a major concern and relies on durable adhesion. Nevertheless, good adhesion could be achieved via mechanical interlocking or chemical modification of the flexible support. Towards this end silane, thiol, diazonium and many other coupling agents are key chemical compounds for controlling the adhesive properties of substrates and ensure stable attachment of polymers top layers. Particularly, the last two decades witnessed a quantum jump in the use of aryldiazonium salts for the modification of a wide range of materials prior to the attachment of reactive and functional polymers.

In this paper, we will :

- *(i)* briefly summarize the growing role of flexible substrates in materials science;
- *(ii)* describe the preparation of flexible gas sensors based on polypyrrole-coated PET sheets;
- *(iii)* discuss the electrochemical modification of flexible ITO for the covalent attachment of electrochemically and photochemically synthesized conductive polypyrrole;
- *(iv)* demonstrate the role of diazonium modification of flexible PET in the vertical growth of ZnO nanorods and their wrapping by thin, conductive PANI layers
- *(v)* and finally summarize our main findings on the attachment of cells to fibronectin-activated PHEMA thin layers on PET and growth of muscle fibers.

From the above, it is clear that interface chemistry is challenging but promising for the design of high performance flexible materials.

NEW BIOSOURCED CHIRAL MOLECULARLY IMPRINTED POLYMER: SYNTHESIS, CHARACTERIZATION AND EVALUATION OF THE RECOGNITION CAPACITY OF METHYLTESTOSTERONE

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Molecular imprinting [1,2] is a method of inducing molecular recognition properties in synthetic polymers in response to the presence of a template species during formation of the three-dimensional structure of the polymer [3]. New biosourced chiral crosslinkers were reported for the first time in the synthesis of methyltestosterone (MT) chiral molecularly imprinted polymers **cMIPs**. Isosorbide and isomannide known as 1,4:3,6-dianhydrohexitols (DAH) were selected as starting diols. The cMIPs were synthesized following a noncovalent approach via thermal radical polymerization and monitored by Raman spectroscopy. These crosslinkers were fully characterized by ^{1}H and ^{13}C NMR spectroscopy and high resolution mass spectrometry (HRMS). The cross polarization magic angle spinning CP/MAS ^{13}C NMR, Infrared spectoscopy (FT-IR), Scan Electron Microscopy (SEM), and specific surface analysis by Brunauer–Emmett–Teller (BET) analysis were used to characterize the cMIPs. The effect of stereochemistry of crosslinkers on the reactivity of polymerization, morphology and adsorption-recognition properties of the MIP was evaluated. The results showed that the cMIP exhibited an obvious improvement in terms of rebinding capacity for MT as compared with non-imprinted (NIP).

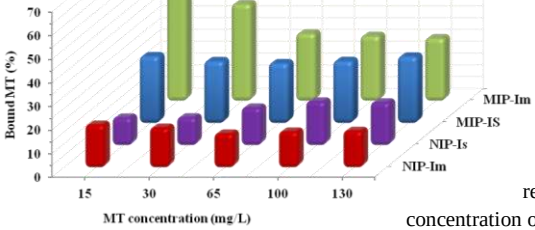

Fig. Binding of methyltestosterone with different types of imprinted polymer. The cMIPs showed an unreported stereodependant capacity regarding the diol type and the concentration of the template molecule.

Key words: Molecularly imprinted polymers, Crosslinkers, Isosorbide, Isomannide, Methyltestosterone

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The Effects of Silane Treatment of Filler on Morphology and Properties of Poly(3- Hydroxybutyrate-Co-3-Hydroxyvalerate)/Olive Husk Flour Composites

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The paper provides some experimental data on the effects of octadecyltrimethoxysilane (ODMS) used as coupling agent for poly(3-hydroxybutyrate-co-3- hydroxyvalerate) (PHBV)/olive husk flour (OHF) composite prepared by melt compounding. The content loading of the natural filler was added to PHBV at leading rate of 20 wt. %. Morphology, contact angle measurements, water absorption, mechanical, viscoelastic, and barrier properties of the various composites were investigated before and after ODMS treatment of OHF. The study showed through scanning electron microscopy (SEM) that the ODMS treatment of filler in the PHBV/OHF composite resulted in a better and finer dispersion of the filler in the matrix, indicating improved affinity between the components. This is in agreement with the decrease in both surface energy and water absorption. Further, tensile and dynamic mechanical measurements indicated a reinforcing effect of OHF in PHBV composite, being more pronounced after silane treatment of the filler. The barrier properties against oxygen and water vapor were also improved for the silane-treated composite.

Keywords: PHBV, olive husk flour, silane treatment, composites and compatibility.

EXPERIMENTAL AND THEORETICAL STUDIES OF THE TEMPERATURE EFFECT ON THE ELECTRICAL CONDUCTIVITY OF A POLYELCTROLYTE AQUEOUS SOLUTION

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The aim of the present work is to study the effect of temperature on the electrical conductivity of a polyelectrolyte model in water and to examine the validity of the Manning's condensation theory [1-2]. First, the electrical conductivity of poly(sodium4-styrenesulfonate) (M_w=70000 $gmol^{-1}$) aqueous solution was measured versus polyelectrolyte concentration, in the dilute regime, over a temperature range between 298.15 K and 323.15 K. The dependence of the conductivity on temperature was analyzed and discussed on the basis of an Arrhenius equation type and the activation energy was deduced for all the polyelectrolyte concentrations. The equivalent conductivity was deduced and compared with those calculated according to the Manning theory, where a large deviation was detected.

Keywords: Polyelectrolyte, conductivity, equivalent conductivity, Manning's condensation theory

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March 2016

BULK HETEROJUNCTION SOLAR CELLS BASED ON P3OT POLYMER AND CDSE NANOPARTICLES

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Photophysics of hybrid nanostructures of π-conjugated polymers and inorganic nanoparticles remains a frontier area of research due to the potentials of such structures in the development of optoelectronic, solar and light harvesting devices [1,2]. In this work, optoelectronic properties of P3OT:wt%CdSe composite films are investigated as a function of CdSe nanoparticles (NPs) concentration (wt%) incorporated in the films. The incorporation of CdSe NPs produces a quenching of the photoluminescence and improves the performance of solar cells based on the composites. These effects are explained in terms of exciton dissociation and charge separation occurring at P3OT/CdSe interfaces within the Förster formalism [3]. An exciton quenching rate constant of 1.4.10-10 cm3.s-1 was determined using the Stern-Volmer equation. In addition, scanning electron microscopy (SEM) images revealed that the whole surface morphology was changed following CdSe NPs incorporation, in agreement with FTIR spectra. The J-V characteristics of ITO/P3OT:%CdSe/Al photovoltaic cells (see Figure 1) are also reported and indicate a significant improvement of the photovoltaic parameters cells, in particularly the conversion efficiency become 20 times greater than the cell based on pure polymer.

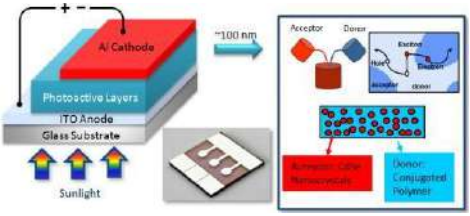

Figure 1: π-conjugated:wt% CdSe solar cell device

Key words: polymer, nanoparticles, photovoltaic cells

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Electrical and dielectric proprieties of intercalated polymer/clay nanocomposite prepared by spontaneous polymerization of pyrrole into Fe(III)-montmorillonite

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Polypyrrole–montmorillonite nanocomposites were prepared at room temperature using Fe-exchanged montmorillonite both as oxidant for the polymerization and reinforcement for the nanocomposite. Pyrrole (Py) was introduced into Fe(III)-exchanged montmorillonite to spontaneously polymerize within the interlayer resulting in the formation of intercalated polypyrrole-montmorillonite nanocomposite (Fe-MMT/PPy). The molar proportion of Py to interlayer Fe^{3+} (R) has been varied from 0.5 to 5. The properties of the nanocomposite have been characterized by X-ray diffraction, Scanning Electronic Microscope (SEM), FTIR spectroscopy and impedance spectroscopy. The results showed that the dc conductivity and dielectric properties of (Fe-MMT/PPy) depend on R. On the other hand, the alternating current (ac) conductivity of the polymer obeys the power law, i.e., $\sigma_{ac}(\omega)=A\omega^{s}$. The alternating conductivity of nanocomposite was controlled by the correlated barrier hopping model. Furthermore the activation energy for alternating current mechanism decreases with increasing frequency which confirms the hopping conduction to the dominant mechanism as compared with the dc activation energy. The imaginary modulus plot at different temperatures showed a dielectric mechanism with non-Debye relaxation.

Keywords: Polypyrrole, Montmorillonite, Dielectric properties, Conduction mechanism.

PHOSPHINE OXIDE-CAPPED CdTe NANOPARTICLES AS NEW ACCEPTORS FOR POLY-3-HEXYLTHIOPHENE (P3HT)

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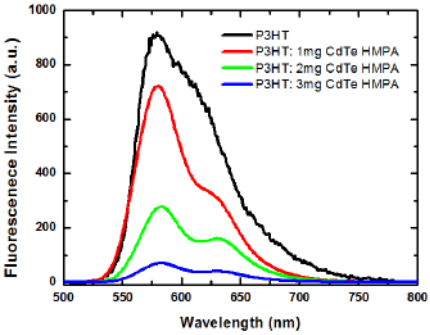
Hybrid materials produced by incorporating nanoparticles into organic conjugated molecules often display interesting properties. For example many hybrid structures for solar cell applications are made with poly-3-hexylthiophene (P3HT) and inorganic nanoparticles [1-3]. Incorporation of gold nanoparticles into polypyrrole, [4] polyaniline [5], and polythiophene [6] films have displayed an increase of two orders of magnitude in the conductivity when compared to the pure polymer films. In this communication, we describe the spectroscopic study of the interactions between CdTe nanoparticles capped with different phosphine oxide ligands and P3HT. Emission spectra were recorded for the addition of these nanoparticles to a 0.004 wt% solution of P3HT in toluene to investigate the charge transport of the system. The quenching of the polymers' emission follows first-order like decay for each nanoparticle. The results show that the hexamethylphosphoramide-capped CdTe nanoparticles are more efficient at quenching the emission of the polymer than those capped with tributylphosphine or tris(diethylamino)phosphine oxides. The charge transfer from the polymer donor to the capped nanoparticle acceptor is clearly observed in solution via photoluminescence quenching of P3HT.



Keywords: CdTe nanoparticles, P3HT, phosphine oxide, fluorescence.

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NANOTRIBOLOGICAL BEHAVIOR OF AMORPHOUS POLYSTYRENE: THE MACROMOLECULAR WEIGHT EFFECT

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Recent progress in polymer behavior tests [1] has been due in large part to experimental instruments giving access to molecular scales. The earliest studies using Atomic Force Microscopy (referred to as AFM) to probe frictional forces between materials led to the development of the friction force microscopy (FFM), also called lateral force microscopy (LFM). As the tip slides across the surface under a given load, frictional forces acting between the tip and sample surface can be detected by measuring the torsional bending of the cantilever, during FFM experiments. The adhesion between the tip and the surface can also be probed through force-distance measurements. Here, the tip is brought into contact and pressed against the surface to a fixed load and then retracted from the surface. A significant advantage of AFM as a nanotribological tool is its ability to investigate most types of materials (e.g. metals, ceramics, polymers) under a range of environments from the ambient gas surroundings to vacuum or liquids [2]. In this study, the adhesion force and the friction force of four molecular weights of amorphous atactic polystyrenes (PS-26, PS-118, PS-245 and PS-385) were measured and the average contact pressure was calculated by using the JKR contact theory. The nanotribological behavior of polystyrene showed a dependence on the macromolecular weight with varying applied normal force and sliding velocity. The study indicates that the length of the polymer chains noticeably influences the tribological behavior of amorphous polystyrenes. Mechanisms governing such behavior differences were ascribed to energy dissipating modes [3].

Key words: Atomic force microscopy; Nano-adhesion; Nanotribology; Polymeric materials; Macromolecular weight; Surface.

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New π-conjugated polymers analogue of poly(*p*-phenylvinylene): Chromophore effect on the optoelectronic properties

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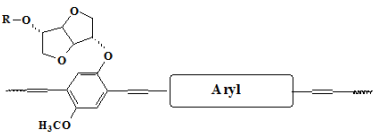
Since the discovery that poly(phenylvinylene) (PPV) exhibited a strong electroluminescence, there have been many studies involving structural variation of the PPV polymer backbone[1]. In our contribution, we report the synthesis and optical characterization of π-conjugated polymerswith different chromophore (**PPVIs-Naph**, **PPVIs-Car** and **PPVIs-An**).We aim to make structural substitutions in a systematic manner in order to understand their effects on the optoelectronic properties of the systems.
New Poly(arylenevinylene)s containing naphthalene, anthracene and carbazole in the backbone have been synthesized via the Wittig reaction. The polymers are soluble in common organic solvents and show good film-forming abilities. The molecular structures of the polymers were established by NMR and FT-IR spectroscopies. They have number-average molecular weights of 12000, 6750 and 10300 $g.mol^{-1}$for **PPVIs-Naph**, **PPVIs-Car** and **PPVIs-An**,respectively. Thermogravimetric analysis of the polymers showed good thermal stability up to about 300°C.
The optical properties of these materials were investigated by UV-vis absorption and photoluminescence (PL) spectroscopies. **PPVIs-Naph** and **PPVIs-Car** show a blue emission whereas **PPVIs-An** present a green fluorescence in dilute solution. However,a green fluorescencewas observed for all polymers in thin films. The PL intensity show a significantly effect of the chromophore's nature and quantum yields between 70% and 90% were obtained.The HOMO-LUMO energy levels were estimated by cyclic voltammetry, and electrochemical gaps were 1.84, 2.27, 2.53 eV for **PPVIs-Naph**, **PPVIs-Car** and **PPVIs-An**,respectively. Single-layer diode devices of the [indium tin oxide /polymer/aluminium] configuration were fabricated and show relatively low turn-on voltages between 2.3 and 4 V.



Polymer	Aryl	R
PPVIs-Naph	Naphtyl	C_2H_5
PPVIs-Car	Carbazyl	C_6H_{13}
PPVIs-An	Anthryl	C_6H_{13}

Figure 1: polymer structures

Keywords: isosorbide; poly(p-phenylenevinylene); thin film, naphthalene, carbazole, anthracene, chromophore effect

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Synthesis and characterization of novel biosourced building blocks from isosorbide

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New biosourced unprotected diols were prepared by acylation reaction of aminoalcohol[1] based on 1,4:3,6-dianhydrosorbitol (Isosorbide **Is**) with several aliphatic and aromatic diacyl chlorides[2] (sebacoyl, adipoyl and terephthaloyl). Optimization of reaction conditions (solvent, base addition and so on...) has been investigated on the protected alcohols.The convenient selection of the base type revealed essential to ensure the selectivity of the addition reaction in order to obtain unprotected bis-amides diols**Bam-Is**. HRMS spectroscopy and 2D NMR techniques were investigated to ascertain the structures of the unprecedented monomers. Then, a solvent-free polyesterification of **Bam-Is**were carried on with succinic acid and terephthalic chloride in the presence of $Sn(oct)_2$ as a metal catalyst. The afforded poly(ester)amides were characterized by NMR and DSC to study the effect of stereochemistry on its thermal properties[3].

Key words: biosourced, 1,4:3,6-dianhydrohexitols, NMR, Isosorbide, diols.

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New semi-conducting poly(phenylenevinylene-alt-naphtalenevinylene)s: Synthesis, characterization and photophysical properties

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The π-conjugated semi-conducting polymers have attracted immense interest from both scientific community and industrialists,and their applications to diverse devices, such as light-emitting diodes and thin-film transistors are currently expanding. The main advantages
Ofusing such materials lie in their low cost and easy processibility.
A series of naphtalene-based polymers (**P1–2**) have been synthesized via the Wittig polycondensation. These organic materials were soluble in common organic solvents and show good film-forming abilities. Their macromolecular structures were characterized by NMR, FT-IR spectroscopies and steric exclusion chromatography. Their HOMO-LUMO energy levels were estimated by cyclic voltammetry. The optical properties of these π-conjugated systems were investigated by UV-visible absorption. The effect of the spacer-group structure on the photo-physical behavior, π-π stacking ability and charge carrier transport properties of the polymer has been studied.

Keywords: semi conducting polymer,naphthalene

STUDY OF SHAPE MEMORY POLYMER HYBRIDS OF SBS/PCL

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The hybrids of styrene-butadiene-styrene tri-block copolymer (SBS) and poly(ε-caprolactone) (PCL) are found to exhibit shape memory effects, which gives an example of a dual-domain shape memory system consisting of an elastic and a thermo-switch domain.

The dual-domain manner in this hybrid is studied by means of Differential Scanning Calorimetry (DSC) and Fourier Transform Infrared Spectroscopy (FTIR) Analysis. Subsequently, the tensile test clarifies the interactions of the two domains on shape memory effects.

In the hybrid, the two immiscible components separately contribute to shape memory performances, in which the SBS elastomer provides the stretching and recovery performances, the semicrystalline PCL provide the fixing and unfixing performances and the phase morphology greatly affects the shape recovery and shape fixing performance of this hybrid.

The mechanism of shape memory with different morphology indicates that the best shape memory effect can be attained when the elastomer and the switch polymer constitutes respectively a major and minor continuous phase.

This study indicated an ideal SMP system with both good stability and performances can be achieved.

Key words: hybrids, SBS/PCL, shape memory polymer (SMP), dual-domain.

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Study of resin treatment effects on the mechanical, thermal and surface properties of cotton yarns by the Taguchi method

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This paper presents a study of resin treatment effect on the mechanical and surface properties of diverse cotton yarns, by the experience plan method. Three untreated types of yarn were used ; a 100% cotton yarn TY, a sized 100% cotton yarn TF, and a cotton yarn containing 5% of Elasthanne YE treated with cross linking agents which are Glyoxalic and Acrylic resin and mixed resin. Furthermore, the effect of the chemical properties of resins and the treatment conditions based on analysis surface morphology of treated yarns SEM, Thermal analyze of treated cotton yarns by DSC and thermal analyze of resins by TGA, it has led to better understanding and explaining the effect of resins and changes in factors of finishing treatment (concentration, curing temperature, curing time, dry time and dry temperature) by experience plan Taguchi method allowed us to optimize better finishing conditions to reflect and preserve the mechanical properties during processing. It seems that the sized yarn is more stable under curing conditions, unlike the stretch yarn which is more sensitive to a high curing temperature or a curing time.

Key words: cotton yarn, finishing resin, thermal analyze, surface Morphology, mechanical properties

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Enhanced Mechanical Properties of Smart Super Absorbent Hydrogels made of poly(Acrylic Acid-co-Acrylamide)/Nanofibrillated Cellulose

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The swelling and mechanical compressive behavior of composite hydrogels made of poly (Acrylic Acid-co-Acrylamide)/Nanofibrillated Cellulose (NFC) were investigated. Water swelling properties depending on different compositions of NFC within the 3D crosslinking structure of the synthesized hydrogel ranging from 0% to 10% were highlighted. The swelling kinetics were influenced by pH variations along the range of 3 to 11, bringing about a maximum water retention of 220 grams of water per grams of NFC at pH=7. Once the equilibrium was reached, static compression tests were introduced showing interesting mechanical properties manifested by an increase in elastic modulus compared to neat hydrogel of about 2 to 12 fold, reaching 2.5 MPa at 50% strain of the hydrogel with the highest NFC percent at neutral pH. The effect of salt was noticeable on the swelling kinetic resulting in a decrease of the hydrogel volumes when increasing the ionic strength. The nanocomposite hydrogels exhibited an interesting behavior of desorption–reabsorption without losing the amount of water uptake which is helpful in their storage before reuse. This study showed that NFC inclusion contributed to strongly enhance the mechanical strength of the hydrogel and its physical integrity with aging.

Key words: hydrogel, nanocomposite, NFC, mechanical property, swelling, 3D network, ionic strength, super-absorption.

THE INFLUENCE OF CARBON NANOTUBE RATIO ON THE FOAM ELECTRICAL CONDUCTIVITY OF PMMA/MWCNT NANOCOMPOSITE FOAMS

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Polymer nanocomposites foams, have received increasing attention in both the scientific and industrial communities. Because of their mechanical, electrical and thermal properties, PMMA/MWCNT (Multi-Walled Carbon NanoTube) nanocomposites emerge to be the ideal candidates for the multifunctional material systems.

The aim of the present work is to investigate the influence of different ratio of MWCNT filler on the electrical properties. The latest is studied before and after foaming.

In this work, different PMMA/MWCNT blends (0.2; 0.4; 0.6; 0.8; 1; 2; 3; 4; 5 vl.% of MWCNT) were prepared from PMMA pellets mixed with MWCNT by extrusion at 210°C. After processing, samples were compression molded at 180°C, under an appropriate pressure program, into 1mm thick sheet. Finally, samples were investigated with batch CO2 foaming process by two distinct stages: saturation and nucleation.

A nucleating agent was used to improve the nucleation of PMMA. It consists on MAM (methl methacrylate-b-butyl acrylate-b-methyl methacrylate). The obtained PMMA blends are characterized by the increase of cell density and decrease the cell size.

The electrical conductivity of the PMMA pure and respective foamed nanocomposites was measured between 10^{-2} and 10^{7} Hz using Broadband Dielectric Spectroscopy at room temperature. Results indicate an increase of the electrical conductivity values with the increase of the MWCNT ratio. It can be seen also that for a critical concentration of MWCNT a significant increase of electrical conductivity is detected (percolation threshold).

Key words: MWCNT; CO2 foaming process; electrical conductivity; multifunctional; percolation threshold; Broadband Dielectric Spectroscopy.

REPROCESSING SILICA REINFORCED POLYPROPYLENE/ ETHYLENE-PROPYLENE-RUBBER NANOCOMPOSITES: STRUCTURE-PROPERTY RELATIONSHIPS.

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This work focuses on the effect of repeated processing cycles on the structure and properties of nanosilica-thermoplastic olefin elastomer (TPO) nanocomposite through a series of three extrusion cycles using a high shear twin screw extruder by varying the speed screw rotation (300; 800 and 1200 rpm). The content of silica nanoparticles was set to 3wt% and the nanocomposites were compatibilized with polyethylene modified with maleic anhydride MAPE. Rheological, morphological, mechanical Analyses were carried out on as-produced and reproduced samples in order to explore different parameters such as number of extrusions, shear rate level, SME (specific mechanical energy) and residence time, on properties of the recycled systems.

The analysis of the different results illustrate that the mechanical and the rheological properties were affected by the multiple extrusion. In particular, this process provokes a decrease of the molecular weight and the melt flow index. The first recycling procedure induced an increase of the Young's modulus and tensile yield stress, while for higher recycling numbers, these two parameters dropped. The MAPE copolymer stabilized the tensile elongation at break at 3 recycling procedures due to a decrease of the size of EPR nodules and a homogenization of their shape, while that of neat (PP/EPR) continuously decreased with recycling numbers.

Key words: high shear process, recycling nanocomposites, rheological properties.

STURCTURAL TRANSITION OF POLYVINYLPYRROLIDONE IN WATER/ETHANOL SOLVENTS MIXTURE

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The present work was aimed at studying the behaviour of polyvinylpyrrolidone in its mixed solvents. Dynamic light scattering was used to measure the hydrodynamic radius of polyvinylpyrrolidone (PVP) (Mw=360,000 g/mol), in water/methanol solvents mixture, versus the ethanol molar fraction, at 25 °C. The polymer conformation adopts a coil–globule–coil conformation when the ethanol molar fraction was varied. The ternary system PVP/water/ethanol was described by the effective solvent interacting with polymer model (E.S.I.P. model). According to this model, the calculated PVP/ethanol interaction parameter shows that ethanol was a good solvent for PVP at 25◦C, as reported in the literature. The E.S.I.P model was used to calculate the polymer–mixed-solvents interaction parameter and the second virial coefficient of the PVP in mixed solvents. The obtained results were in agreement with our experimental results.

Key words: Dynamic light scattering, polymer, mixed solvents, model.

Under shear viscosity study of Poly-N-isopropyl acrylamide in water and in the solvent mixture (water-ethanol)

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We present an under shear viscosity study of a thermo-sensitive polymer, (poly N-isopropyl acrylamide) PNIPA, with weight averaged mass M_w = 17774 Daltons whose LCST is 32 °C. The concentration regimes in water are identified. As solvent, we first used ultra pure water then we added an organic co-solvent (ethanol) up to 20% by mass. Under shear, the dynamic viscosity of a PNIPA solution with water as solvent, versus temperature first shows a common slight decrease because of the thermal motion (zone I); then it increases from a critical temperature T_{min} very close to the LCST until reaching a maximum at T_{max} (zone II), then the viscosity decreases up to be confused with that of water (zone III). T_{min} and T_{max} show the same value in the dilute and not entangled semi-dilute regimes, and increased by 3 °C in the entangled semi-dilute one. Kinematic viscosity measurements do not show this increase in viscosity. We believe that by deforming the chains of the polymer and bringing the hydrophobic end groups (isopropyl) each other, the shearing causes the formation of aggregates through an inter-chain association at the time of activation of the hydrophobicity of isopropyl groups at ~ 32 °C. The entanglement between the chains in the entangled semi-dilute regime appears to delay this association. After reaching its maximum, the viscosity decreases, aggregates expel water and make turbid solutions. We find that the gradual addition of ethanol decreases the quality of the solvent, the intrinsic viscosity shows a decrease in the volume occupied by the chain in the solvent mixture because of the decrease of the H bridge density established with the solvent on the one hand and congestion caused by the complex water-ethanol on the other. The Huggins coefficient k_H confirms this trend by largely positive values in zone I in the presence of ethanol. At the jump of viscosity in zone II, the average aggregate size decreases as the alcohol proportion increases, k_H then assumes values around 0,5.

Key words: PNIPA, Rheology, Dynamic viscosity, Aggregation.

Microrheology of transient networks based on associative polymers in aqueous media

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The hydrophobic associative polymers in aqueous solution form a network beyond certain concentration by hydrophobic interaction between the alkyl groups. The hydrophobic interaction is regarded as physical crosslinking, having a lifetime that depends on the length of the alkyl chains. Therefore, the network is transient and it flows at low frequencies. What are the rheological behavior of the high frequency transient network? We use a new technique of micro-rheology based on Diffusing Wave Spectroscopy (DWS) that provides access to the properties at high frequencies (~ 105 rad / s). We will focus here on the synthesis of acrylic acid polymers modified by hydrophobic alkyl chains (HMPAA) and rheological characterization of these associative polymers in aqueous media. The reliability of the DWS is evaluated by classical rheological measurements

Key words: HMPAA, DWS, rheology, hydrogel.

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COMPARATIVE STUDY OF THE INCORPORATION OF METAL IONS INTO POLY(ACRYLAMIDE CO ACID ACRYLIC ACID) ON THE ADSORPTION OF BOVINE SERUM ALBUMIN

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These last years, research are focused on the development of biomaterials which may be in contact with the biological medium. This development is moving toward the biocompatibility, this one paid intention to interactions involved between the synthetic biomaterials and cells or proteins of the system.
Recent studies have shown that the synthesized functionalized polymers are prone to developing an anticoagulant activity or specifically retain any particular protein at the interface. These materials are therefore capable of reacting or separating proteins.
In this purpose two resins were prepared the first resin was acrylamide co acrylic acid on which an immobilized chelating metal ions (copper or nickel) was fixed.
The IR analysis spectrophotometry has shown a difference between the data recorded spectrum of the initial resin, poly (AAm-co-AA), and those of chelated resin, [poly(AAm-co-AA)-metal]$^{2+}$, wherein a slight shifting of the C = O band (1640 cm^{-1}) was observed. This is because of the interactions of the metal ion with the sites of resin.
We also optimized the pH of the analysis and we have found that it is equal to 7.4 for both resins. Then, we verified the removal capacity of protein using bovine serum albumin for those synthetic resins.
The adsorption test of bovine serum albumin on synthetic resins were carried out in aqueous solution, we noted an increase of the adsorption capacity of the protein by the resin. This result also showed that the immobilization of a metal ion on the surface of polymer improves significantly its retention capacity. This effect differs from metal ion to another and is best when the polymer is chelating with nickel ion.

Key words: polymer, fictionalization, biomaterials, protein, adsorption, chelating.

Poster Communications' List

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14	**T. Belaid**, M. Benamor *University A/MIRA - Bejaia, Algeria* Amberlite XAD-4 fonctionalized with Pyrocatechol violet and its application to the extraction of zinc (II)	**S3-PC73**
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34	**F. Boussema**, F. Boussema, R. Haddad, Y. Gandour, M.S. Belkhiria, M. Holzinger, A. Maaref, S. Cosnier *FSM - Monastir* Polyoxometalate $[PMo_{11}O_{39}]^{7-}$ / carbon nanocomposites for sensitive amperometric detection of nitrite	**S3-PC80**
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42	**A. Dhahri**, E. Beyou, M.H.^{V} Baouab *University of Lyon - France / FSM - Monastir* Chitosan-dithiooxamide-grafted RGO sheets decorated with Au nanoparticles : Synthesis, characterization and properties	**S3-PC83**
43	**A. Dhahri**, E. Beyou, M.H.^{V} Baouab *University of Lyon - France / FSM - Monastir* Synthesis and characterization of Au-immobilazed onto polysaccharides reduced graphite oxide sheets	**S3-PC84**
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Nr.		Ref.
68	**N. Maaloul**, A. Ghorbal, M. Rendueles, A. Ben Brahim, Mario Diaz *ENIG - Gabès* Extraction and characterization of cellulose nanocrystals originated from tunisian almond shells: Bio-sorbent for heavy metal ions	**S3-PC92**
69	**A. Mabrouki**, A. Kriaa, A. Hedhli *FST - Tunis* Synthesis and characterization of some 1,3,4-oxadiazole derivatives	**S2-PC58**
70	**N. Mansour**, K. Hriz, N. Jaballah, D. Kreher, M. Majdoub *FSM - Monastir* New anthracene-based semi-conducting materials for opto-electronic applications	**S1-PC21**
71	**M. Mathlouthi**, M. Rzaigui, W. Smirani *FSB - Bizerte* Synthesis, crystal structure, thermal analysis, spectroscopic and magnetic properties of a noval organic cation tetrachlorocobaltate (II)	**S2-PC59**
72	**M. Mbarek**, J-L. Duvail, K. Alimi *FSM - Monastir* Architecture of PPV and PVK based nanowires and coaxial nanowires for tunable photoluminescence properties	**S1-PC22**
73	**F. Mbarki**, F. Meganem *FSB - Bizerte* characterization and ion adsorption properties of functionalized polyvinylchloride cross-linked with dichlorodiethyl ether	**S1-PC23**
74	**R. Mejri**, J. Dias, S. Besbes Hentati, C. M. Costa, J.M.S.S. Esperança, S. Lanceros-Mendez *FSB - Bizerte* Effect of anion type in the electromechanical performance of ionic liquid/poly(vinylidene fluoride) composites	**S3-PC93**

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75	**R. Melien Mehdaoui**, M.H.[V] Baouab, E. Beyou *FSM - Monastir* Magnetic hierarchized structures: Self-assembly and characterization of magnetic cellulose composite	**S1-PC24**
76	**F. Mhalla**, M. Chemli, N. Jaballah, M. Majdoub *FSM - Monastir* New sensitive polymer fluorescent indicator for the detection of Zn^{2+} and Cr^{2+}	**S1-PC25**
77	**R. Milad**, Khaled Essalah , Manef Abderrabba *FSB - Bizerte* Estimation of optical bandgap and charge transport properties of poly–phenylene–vinylene derivatives: A DFT study	**S2-PC60**
78	**R. Milad**, S. Junqing, B. Milián-Medina, M. Abderrabba, J. Gierschner *FSB - Bizerte* Backbone twisting in fluorinated MEH–PPV polymers: Experiment and Theory	**S3-PC94**
79	**K. Mkadmini Hammi**, M. Hammami, C. Rihouey, D. Le Cerf, R. Ksouri, H. Majdoub *Centre de Biotechnologie - Borj Cédria* Extraction optimization of polysaccharide from *Zizyphus lotus* by response surface methodology : Characterization and antioxidant activity	**S1-PC26**
80	**M. Moussa**, Ouederni Abdelmottaleb *ENIG - Gabès* Preparation of New material from Olives Stone for CO_2 Storage	**S3-PC95**
81	**R. Msaadi**, S. Ammar, M.M. Chehimi *FSG - Gabès* Diazonium salt as a route for new MMT/IIPs nanocomposites for selective removal lead (II) ions	**S3-PC96**
82	**M. Nadour**, F. Boukraa, A. Benaboura *USTHB EL AALIA, BAB EZZOUAR - ALGIERS, ALGERIA* Effect of methylcellulose as an additive on the structure and performances of polysulfone membranes	**S3-PC97**

Nr.		Ref.
83	**O. Naouali**, B. Malleh, L. Baklouti *FSB - Bizerte* Cation binding properties of thiazole derivatives towards some metal cations	**S1-PC27**
84	**A. Nasri**, A. Boubaker, W. Khaldi, A. Kalboussi *FSM - Monastir* Modeling of single molecule transistor	**S2-PC62**
85	**H. Nefzi**, F. Sediri *IPEIT - Tunis* Hydrothermal synthesis and electrochemical properties of vanadium oxide nanotubes	**S2-PC63**
86	**N. Rahmouni**, J. Desbriéres, S. Besbes-Hentati *FSB - Bizerte* An electrochemical behavior of chitosan in relation with the spectroscopic characterization of the degree of deacetylation	**S1-PC28**
87	**A. Rebei**, R. Ben Arfi, A. Ghorbal *ENIG - Gabès* Evaluation of the feasibility of metal passivation by low-cost bio-polymers	**S1-PC29**
88	**I. Saadaoui**, B. Ben Salah, M. Kossentini *FSS - Sfax* Synthesis of New Bis-Triazoles Derivatives from bis-amidrazones	**S3-PC98**
89	**A. Saaidia**, M. E. Saidani, S. Romdhane *FST - Tunis* Effect of film thickness and side chains on optical properties for photovoltaic applications	**S3-PC99**
90	**H. Sadki**, M.N. Bennani, M. Bouachrine *Université Moulay Ismail - Meknès, Maroc* Structure-properties correlation of new copolymer poly(ethylcarbazol - terphenyl)(PECbz-Ter) for optoelectronic devices	**S1-PC30**

Nr.		Ref.
91	**K. Said**, L. Mhamdi, R. Ben Salem *FSS - Sfax* Ultrasonic activation of Suzuki cross-coupling reaction catalyzed by NICKEL	**S2-PC64**
92	**S. Slimi**, H. Barhoumi, M. Braiek, S. Bourigua, A. Maaref *FSM - Monastir* Electrochemically determination of heavy metals simultaneously using Polypyrrole modified glassy carbon electrodes	**S1-PC31**
93	**K. Taleb**, S. Saidi-Besbes *university Ahmed Ben bella - Oran 1 , Algeria* Synthesis and characterization of PLA based biocomposites	**S3-PC100**
94	**F.Z. Talhi**, N. Belhaneche-Bensemra, M. T. Benaniba, V. Massardier *University Ferhat Abbas - Setif, Algeria* Study of properties of aged butt-welded polyethylene pipes used in gas distribution systems	**S3-PC101**
95	**I. Wechrine**, M. Rzaigui, W. Smirani Sta *FSB - Bizerte* Synthesis, crystal structure, physico-chemical characterization and dielectric properties of a new organic material, 1-benzhydrylpiperazinium tartrate	**S2-PC65**
96	**I. Wechrine**, M. Rzaigui, W. Smirani Sta *FSB - Bizerte* Structure, spectroscopic, electrical properties and antioxidant activity of a new organic material, 2-methylpiperazinum maleate	**S2-PC66**
97	**K. Zinoubi**, S. Bourigua, Sami Boufi, H. Barhoumi, H. Majdoub, A. Maaref *FSM - Monastir* Detection of trace heavy metal by anodic stripping voltammetry using nanofibrillated cellulose	**S1-PC33**

Posters Communications' Abstracts

Session 1 Thirsday 24 March

A poly (vinyl chloride) functionalization by L-alanine and 1-(2-aminoethyl) piperazine. Inductively coupled plasma study of the extraction of La(III) and Bi(III) by modified PVC polymers.

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The aim of this study was to evaluate the efficiency of two new polymers obtained by functionalization of a commercial poly (vinyl chloride) (Mw = 48000) by grafting L-alanine and 1-(2-aminoethyl) piperazine groups to extract some metal cations from aqueous solutions. The structural properties of the polymers were investigated by different analytical methods; namely elemental analysis (EA), infrared spectroscopy (FT-IR) and differential scanning calorimetry (DSC). The percentage of extraction was determined by inductively coupled plasma-atomic emission spectrometry (ICP-AES). One of the obtained polymers gave an extraction ratio of Bi^{3+} = 98.77 % which highlight the importance of the substitution of chlorine atoms by amino groups.

Keywords : Poly (vinyl chloride), functionalization, metal cations, extraction, inductively coupled plasma-atomic emission spectrometry

Molecularly Imprinted Solid Phase Extraction for a selective separation of melamine from milk samples

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Traditional SPE sorbents are short of selectivity for target molecules wich makes the subsequent analysis of some molecules very difficult. Recently, Molecular imprinting is known as a technique for generating tailor-made recognition sites with memory of the shape, size and functional groups of the template molecules. The utilization of molecular imprinting technique in solid-phase extraction (SPE), so-called molecularly imprinted SPE (MISPE), has become one of the most popular strategies for dealing with samples with complex components before the final quantification of target analytes by typical chromatographic technique. Due to many merits like good chemical stability and excellent reusability, the majority of the research works for MISPE were focused on organic polymers. In recent years, there has been a growing concern worldwide about the occurrence of melamine in human biological samples, which is essential for environmental exposure and human health assessments. Due to the complexity of biological samples, it is imperative to develop sample pre-treatment techniques with excellent clean-up efficiency for selective extraction of MEL. And MISPE can offer the opportunity to fulfill this purpose. To date, the research on developing MIPs for selective SPE of MEL has been extensively studied. However, very few works were focused on the analogs of MEL, and the used preparation technique was still traditional bulk polymerization. In this work, we prepared organic Molecular Imprinted Polymer to be used as SPE for melamine extraction, using melamine as template, Methacrylic Acid as functional monomer and Divinylbenzene as cross-linker and AIBN as an initiator for the radical polymerization. As comparing, a non imprinted polymer (NIPs) was prepared in the same conditions but in the absence of template. Prepared materials were characterized by Frourier Transform Infrared (FT-IR) and elementary analysis at different preparation steps. Adsoption characteritics of sorbents was studied with HPLC-DAD. The MIPs exhibited high recognition against the target molecule comparing with NIPs.

Keywords : Molecularly Imprinted Polymer, Melamine, Milk sample, Solid Phase Extraction

EXTRACTION OF CORK MICROFIBERS VIA MICROWAVE ASSISTED-CHEMICAL TREATMENTS

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The use of *microwaves* as an energy source for chemical reactions and processes has been extensively investigated during recent years[1]. This technique was used in the extraction of fibers from corncob and hemp stems [2]. Our work focus on the extraction and characterization of cork microfibers via *microwave assisted-chemical treatments* followed by sonication. Changes in the components like cellulose, hemicellulose and lignin during microwave treatment were studied by FTIR as well as microfibers morphology and sizes were studied by SEM and microsizer respectively.

Key words: Microwaves, cork, microfibers.

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ANTHRACENE-MODIFIED β-CYCLODEXTIN FOR OPTOELECTRONIC APPLICATION

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Recently, β-cyclodextrin (β-CD) based semi-conducting materials have opened new perspectives in conception of macromolecular sensible membranes [1]. Indeed the semi-conducting organic materials have aroused considerable interest due to their particular photo-luminescent properties and their fast carrier mobility [2]. They are a novel class of π-conjugated materials that combine the electronic and optical properties of semiconductors with the processability of conventional molecular materials [3]. In this light, a new modified β-CD consisting of an anthracene-based semi-conducting material (β-CDAn, Figure1) has been synthesized via the Williamson reaction.

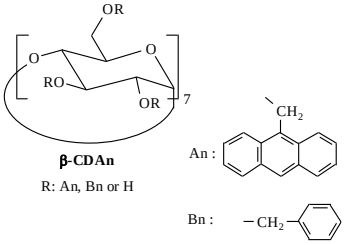

Figure1. Molecular structure of the β-CDAn

The obtained material was soluble in common organic volatile solvents and their macromolecular structure was investigated by NMR and FT-IR spectroscopies. The TGA and DSC analysis showed a good thermal stability and an amorphous morphology in solid state. The optical properties of this organic material were investigated by UV–visible absorption and photoluminescence spectroscopy. An optical gap of 2.7 eV was estimated from the absorption edge of the β-CDAn thin film. The β-CDAn exhibits a blue photoluminescence in dilute solution; whereas, a green emission was observed in the solid state, due to the π–π interaction in the anthracene moieties. The HOMO and LUMO levels were estimated using cyclic voltammetry analysis. A single-layer device with the configuration [ITO/ β-CDAn /Aluminum] has been elaborated and showed low turn-on voltage (Figure2).

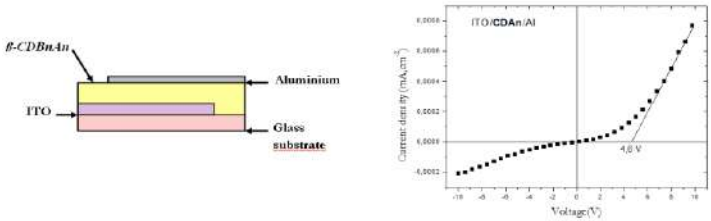

Figure2. Current–voltage curves for [ITO/ β-CDAn /Al] devices.

Key words: β-cyclodextrin; Semi-conducting material; anthracene; optical properties; thin solid films.

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Biocomposites based on Alfa fibers and starch-based biopolymer

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Biocomposite materials based on Alfa cellulose fibers as reinforcing element and starch-based biopolymer matrix were prepared and characterized in terms of mechanical performance, thermal properties, and water absorbance behavior. The fibers and the matrix were first mixed in the melted state under mechanical shearing using a plastograph and the obtained composites were molded by injection process. The tensile mechanical analysis showed a linear increase of the composite flexural and tensile modulus upon increasing the fiber content, together with a sharp decrease of the elongation at break. The fibers (incorporation into the biopolymer matrix brings about an enhancement in the mechanical strength and the impact strength of the composite. Dynamic mechanical thermal analysis (DMTA) investigation showed two relaxations occurring at about S30 and 35-C. The addition of Alfa fibers enhanced the storage modulus E (before and after T*a*, which is consistent with the reinforcing effect of Alfa cellulose fibers.

SYNTHESIS AND CHARACTERIZATION OF A NEW CATIONIC SURFACTANT BASED ON ISOSORBIDE

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A facile and effective method for the preparation of a new cationic surfactant derived from isosorbide is introduced. The synthesis consists in condensation of isosorbide and epichlorhydrin yielding a low molar mass prepolymer (DGEDAS) and subsequent condensation to a fatty amine[1,2] (figure 1). The derived Dodecylamino Diglycidyl Ether of Isosorbide (DoDGEDAS) surfactant was characterized for its chemical structure using ^{1}H NMR and size exclusion chromatography, and for its surfactant properties by CMC measurements and stabilization ability of o/w emulsions. A very low critical micelle concentration was determined by electrical conductivity. Stable o/w emulsions were prepared using low concentrations of DoDGEDAS as emulsifier. The thermal stability of DoDGEDAS up to 300°C makes it suitable for applications at high temperatures, and its cationic character is a good starting point regarding applications requiring strong adsorption to negatively charged surfaces.

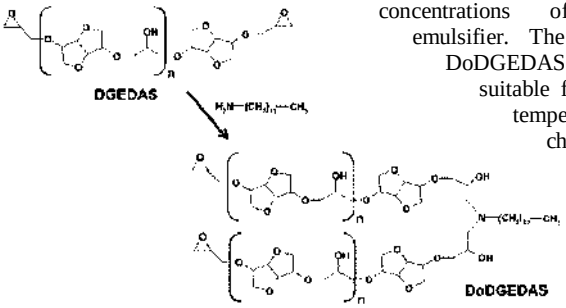

Fig. 1. Chemical reaction yielding the dodecyl derivatives of DGEDAS.

Key words: Surfactant; isosorbide; emulsion; textile; stability.

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Elaboration of new biopolymers complexes with antibacterial and antioxidant properties through adsorption process

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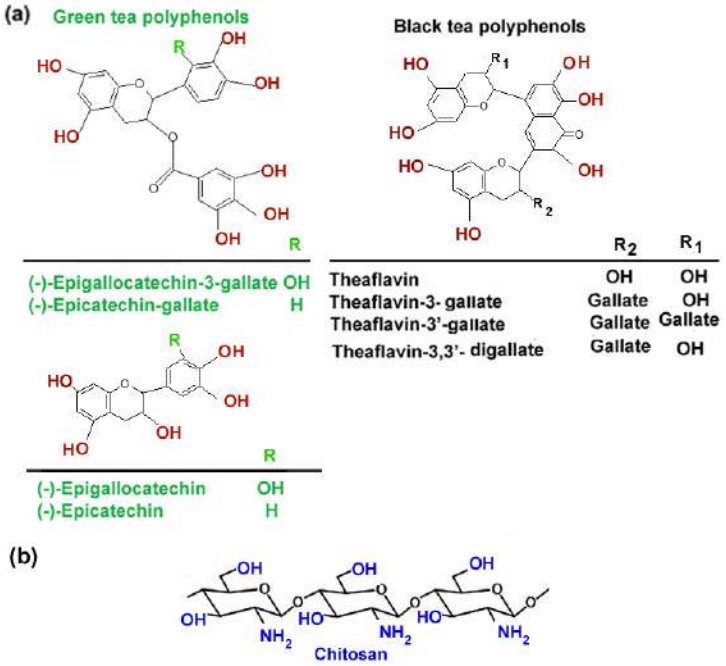
Antibacterial and antioxidant polyphenolschitosan agents have been elaborated through the adsorption of green tea and black tea extracts into chitosan. Their incorporation leads to an enhancement of the inhibitory effect of the biopolymer against the gram-negative and gram-positive bacteria. Voltammetry at a rotating disk electrode reveals a difficulty of the reduction of oxygen in the presence these complexes.



Structures of GT and BT tea polyphenols (a) and chitosan (b).

Keywords: Adsorption; Chitosan-polyphenols complexes; Antibacterial activity; Antioxidant.

NEW SEMI-CONDUCTING CYANO-POLYMERS BIPHENYL BASED: EFFECT OF CN-GROUP POSITION IN OPTICAL PROPERTIES

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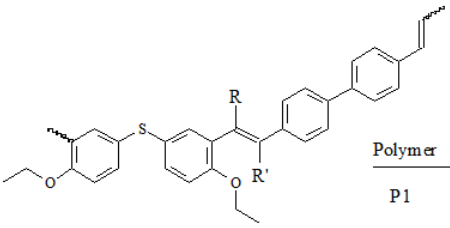
Biphenyl based semi-conducting polymers P1 and P2 (Fig 1) were synthesized via Knoevenagel polycondensation.
The polymers were soluble in common organic solvents. The thermal stability of both polymers was determined by DSC and TGA. DSC analyzes show a good thermal stability and an amorphous morphology in solid state for these organic materials. TGA analysis showed a good thermal stability up to 320°C for polymer containing a CN-group in α-position (P1) and 350°C for polymer containing a CN-group in β-position (P2).



Polymer	R	R'
P1	H	CN
P2	CN	H

Figure 1: polymer structures

The optical properties of the polymers were investigated by UV–visible absorption and fluorescence spectroscopies. The HOMO and LUMO levels were estimated using cyclic voltammetry analysis. The effect of the position of cyano group on the photophysical properties of polymers was investigated. Single-layer diodes based on these organic semiconductors have been fabricated and showed relatively low turn-on voltages.

Key Words: semi-conducting polymers, biphenyl, Knoevenagel reaction, photoluminescence.

Cellulose-Silver-TiO_2 (sol) thin films: Characterization and photocatalytic activity under visible light irradiation

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In recent years, many attentions have been focused on organic/inorganic composite materials composed of polymer matrix and inorganic nanoparticles, which can be widely applied in many fields including photocatalysis, adsorption and bulk-heterojunction solar cells. Several studies have shown that cellulose exhibited a multi-functional performance with TiO_2 in heterogeneous photocatalysis technologies by enhancing the adsorption–photocatalytic processes.

Cellulose is abundant, low-cost, non-toxic, biocompatible, biodegradable and antibacterial in nature. Moreover, cellulose is an excellent adsorbent in wastewater treatment for the adsorption of various pollutants, including heavy metals, organic compounds and dyes, due to its high content of amino and hydroxyl groups. For this cellulose has been combined with photocatalysts for the removal of organic pollutants.

Among several semi-conductor Titanium dioxide (TiO_2) is the most preferable material due to its non-toxic, insoluble, stability, high photoactivity and inexpensive nature. However, because of its large forbidden band, only radiation with energy larger than 3.2 eV (in ultraviolet range) can stimulate its photocatalytic action. So the first step of this study has been to coat TiO_2 with silver because of the strong absorbance of silver in the visible range. Cellulose was used as a substrate for the modified TiO_2

In the present work, Cellulose-Silver-TiO_2 hybrid thin films were successfully prepared at low temperature. Different quantities of Ag and temperatures of hydrothermal treatment were used. The samples were characterized using raman spectroscopy, time resolved luminescence, ground state diffuse reflectance spectra. Catalysts surface morphology was studied by Field-emission scanning electron microscopy (FE-SEM). The photocatalytic activity of the prepared Cellulose- Silver -TiO_2 thin films, under visible light irradiation, was investigated using dyes (Methyl blue, Methyl red and Acid orange) as pollutant models. A great enhancement of the photocatalytic efficiency was evidenced.

SYNTHESIS AND CHARACTERISATION OF BIOBASED PLASTICIZERS COMBINATION WITH POLY (VINYLCHLORIDE) PVC

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In this study, two bio based co plasticizers was synthesized and mixed with di-esters isosorbide (ISB) and acetyl tri butyl citrate (ATBC) as primary bio plasticizers. Epoxidized sunflower oil (ESO) was synthesized by epoxidation reaction of sunflower oil (SO) and the epoxidized sunflower oil methyl ester (ESOME) was obtained by esterfication of ESO [1].
The plasticized PVC sheets were prepared using ISB, ATBC, ESO and ESOME as plasticizing system. Samples prepared were characterized by discoloration sheets, thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC).
The discoloration degree of PVC samples before and after degradation was determined by using the Synmero scale. The changes in discoloration degrees for the PVC films were minimal in the films plasticized with system contain ESO or ESOME, when Epoxy groups of ESO and ESOME react with HCl evolved by dehydrochlorination of PVC [2]. The TGA results obtained in this study show that the PVC mixed with ATBC begins to lose its weight at a lower temperature than that of the ISB. However, formulations with ESO or with ESOME present the minimal weight loss in the first step. The second stage of the degradation begins more than 400°C. Thermal degradation of the polyene sequences occurring during this stage yields volatile aromatic and aliphatic compounds by the intermolecular cyclization of the conjugated sequences of PVC blends than ISB or/and ATBC. However, the second-stage degradation occurs as before without any marked variation in the temperature range. Hence, ESO and ESOME could improve the thermal stability of PVC blends with ISB or with ATBC [3].
Glass transition temperature (Tg) values obtained by DSC decrease slightly with incorporation with incorporation of ESO and ESOME than those of ATBC and ISB which is in accord with the study of Stuart [4].

Key words: PVC, Epoxidation, Esterifcation, Biobased plasticizers.

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HYDROLYTIC AND OXIDATIVE DEGRADATION STUDY OF NEW BIOBASED (FURANO-PYRIDINIC) COPOLYESTERS

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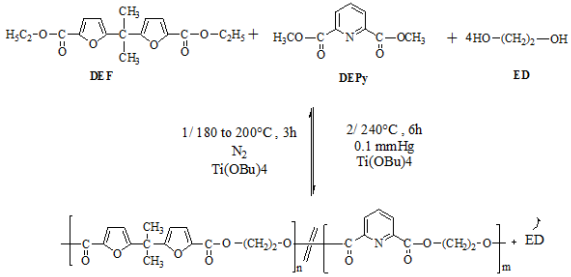
Polymers containing pyridinic moieties can be applied as sensor, in metal absorption or in biomedical application: antimicrobial activity, gene delivery[1]. As a part of our research conducted in the frame of the biobased furanic copolymers, we report herein the synthesis of a new family of furano-pyridinic copolyesters performed by melt polycondensation between 5,5'-isopropylidene-bis(ethyl 2-furoate) (DEF), dimethyl 2,6-pyridinedicarboxylate (DEPy) and ethanediol (ED)[2].The microstructure of the resulting copolyesters was investigated and the statistic repartition of monomer units was evidenced by NMR analysis. As introduction of pyridine moiety into furanic copolyesters backbone modify the polymer properties, a study on the relationship between the copolyesters structure and their physicochemical properties was achieved. Thus, thermal properties, solubility properties and degradation were investigated. Globally, the pyridinic moieties render the copolyesters backbone more flexible and consequently the copolyesters are amorphous and have a low Tg ranging from 62 to 67°C**.** For the same reason, both hydrolytic and oxidative (as in-vivo degradation model) degradations are enhanced when the pyridinic unit content increases. All these results suggest that these novel copolyesters should be suitable for biological applications.



Key words: Polycondensation, Bio-based, pyridine, oxidative degradation

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Chemical modification of a Polysulfone membrane (PS) by grafting vinyl monomer on its surface

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This study was aimed for the chemical modification of a Polysulfone membrane (PS) by grafting vinyl acetate on its surface. This grafting is carried out in order to improve the preferential selectivity of the modified membrane.
To study the binding of vinyl acetate monomers on the surface of the PS membrane and the evolution of the polymerization reaction, we have characterized these modified membranes by Fourier Transformed. InfraRed spectroscopy (FTIR), scanning electron microscopy (SEM), atomic force microscopy (AFM). An application with a frontal filtration module has been studied in order to confirm the improvement of selectivity and retention rates for two metals Cu^{2+} and Cd^{2+}.The results obtained shows that the surface modification of the polysulfone membrane improves the properties and performance of the ungrafted membrane.

Key words: Polysulfonemembrane (PS),Chemical modification,vinyl acetate monomers,frontal filtration application,scanning electron microscopy (SEM), atomic force microscopy (AFM).

Effect of the enzymatic pretreatment on the effective fibrillation of cellulose fibres by high pressure homogenization

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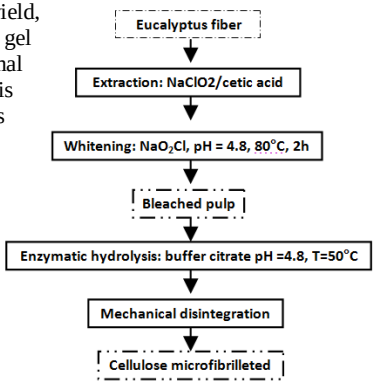
The aim of the present work was to investigate the effect of the enzymatic pretreatment on the effectiveness nanofibrillation of the chemical pulp from Eucalyptus using a high pressure homogenization. The bleached pulp from eucalyptus was submitted to a controlled hydrolysis by cellulose enzyme. Exo-and endo-type cellulose were used as enzyme to carry on the partial hydrolysis of the cellulose by controlling the sugar content. The enzyme treated fibers were then disintegrated by high pressure homogenization to break-down the cell wall and convert the cellulose fibers into NFC. The effect of the hydrolysis extent, enzyme type and the homogenization pressure on the fibrillation yield, viscosity and optical properties of the NFC gel was investigated. From this study, the optimal pretreatment conditions in terms of hydrolysis extent, enzyme type and number of passes through the homogenizer was determined. The ensuing NFC was used as reinforcement for a polymer matrix to prepar a nanocomposite films by solvent casting. The effect of the NFC content on the stiffness and the strength of the nanocomposite film was studied, and the data were compared to NFC prepared via a chemical pretreatment and high pressure homogenization



Schematic illustration of the different treatments performed to eucalyptus fibers for the sample preparation by high pressure homogenization of NFC

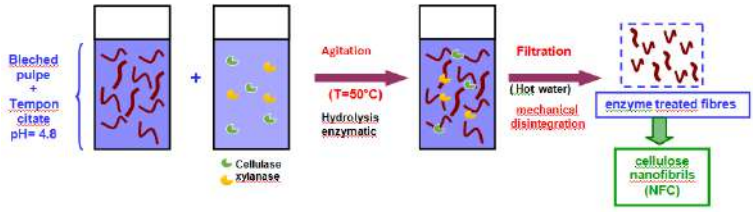


Fig: Cellulose nanofibrils obtained after the enzymatic hydrolysis

Key words: eucalyptus, enzymatic treatment, microfibrillated cellulose

ELABORATION OF PLASTICIZED POLYMER MEMBRANES BASED ON MODIFIED β – CYCLODEXTRIN AND APPLICATION DIALYSIS ORGANIC MOLECULES

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The aim of this study is to demonstrate a process facilitated transport molecules of a different nature through said neutral membrane plasticized polymer membrane or also to inclusion membrane incorporating an extracting agent, the modified beta cyclodextrin (β -CD). We prepared cellulose triacetate based MPP (TCA) that provides the elasticity of the membrane on the one hand and on the other hand acts as a plasticizer, in which the extractant molecule can diffuse easily where the double TCA functionality.The incidence of various parameters on the efficiency of transport as the thickness of the membrane and the concentration of cyclodextrin was investigated. We developed the calculation of flux and the chemical species of permeability coefficients in aqueous solution.The measurement method requires that the solutions of samples must beings performed when the quasi-stationary diffusion regime is established.In addition to a better understanding of the transport properties, the membranes were characterized by (AFM, AC, DSC and FTIR) for information about the composition and interactions that exist between the components of the membrane.

Keywords: Molecular dialysis, β – Cyclodextrin, Polymer membrane inclusion, Permeability, Flow, Facilitated transport.

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FLAX FIBERS / IONIC LIQUID BASED POROUS BIOMATERIALS

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During recent years much valuable work has been performed on different aspects of natural biopolymer production from lignocellulosic materials, and great achievements have been attained [1]. Lignocellulosic fibers from annual crops have a higher aspect ratio than wood fibers and are therefore more effective as reinforcements for composites [2]. Natural fibers have a number of advantages as they are biodegradable, chemically stable, low cost and lightweight. Flax (Linum usitatissimum L.) is one of the most widely utilized lignocellulosic materials. Flax fibers are very promising because they show high mechanical strength, chemical stability, biodegradability, non-toxicity and are composed mostly of cellulose (70%), hemicelluloses (15%), pectin (1-15%) and lignin (2-5%) [3]. This works aims to develop new natural, highly porous biomaterials and ultra light based flax fibers. Lignocellulosic fibers were dissolved in an ionic liquid (1-Ethyl-3-methylimidazolium acetate referred to as EMIMAc). The obtained gel was coagulated with ethanol and finally freeze and air dried so as to obtain cryogels and xerogels, respectively.
Cryogels and xerogels were then characterized. Indeed, the bulk density and the internal surface area (BET) of cryogels respectively ranged from 17 to 61 g/l and from 86.032 to 17.6623 m^2/g as a function of the biopolymer concentration increase. However, the bulk density of xerogels ranged from 326.5 to 917.8 g/l. Xerogels showed very low surface areas of about ~ 1 m^2/g.

Key words: biopolymer, cryogel, xerogel, morphology, Flax fibers, ionic liquid.

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MOLECULAR ENGENEERING OF SEMI-CONDUCTING POLY(ARYLENE SULFIDE)S: THE EFFECT OF THE CYANO GROUPS ON THE OPTO-ELECTRONIC PROPERTIES

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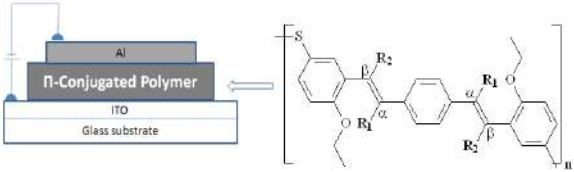
The discovery of electroluminescence in poly(*p*-phenylenevinylene) (PPV) [1], has generated a new area in polymer sciences: *the π-conjugated semi-conductingpolymers*. Since then, a tremendous progress has beenmade in the molecular engineering of conjugated polymersand in their uses as active components in various electronic devices [2,3].Herein, we report two new poly(arylene sulfide)s (**PPVS-CNα** and **PPVS-CNβ**)based on the *cyano*-substituted PPV-typeπ-conjugated systems as arylene moieties. The optical and the electrical properties of these polymers were compared to those of the cyano non-substituted analogue (**PPVS**) [4] in order to study the effect of the introduction of the CN groups as well as the influence of their positionon the vinylene unit (α or β).



	R_1	R_2
PPVS-CNα	CN	H
PPVS-CNβ	H	CN
PPVS	H	H

The molecular structures of the π-conjugated poly(arylene sulfide)s and the schematic configuration of the single-layer diodes

The *cyano*-substituted poly(arylene sulfide)s were synthetized via the Knoevenagelpolycondensation and their molecular structures were confirmed by ^{1}H NMR, ^{13}C NMR and FT-IR spectroscopies. These organic materials were soluble in volatile solvents commonly used in spin-coating process. They exhibited good film quality and the surface properties of their thin layerswere investigated by contact angle measurements which showed an improvement of the surface polarity as consequence of introduction of the CN groups.

The absorption and photoluminescence properties of the polymerswere studied in solution and as thin solid film. The optical gaps (*Eg*) were of 2,92eV, 2,82 eV and 3,71 eV for **PPVS**, **PPVS-CNα** and **PPVS-CNβ**,respectively. The narrowing of the gap in the case of **PPVS-CNα**is attributed to theelectronic effect of the *cyano*withdrawing groups on the PPV conjugated sequence. However, in **PPVS-CNβ**, theimportant structural distortion induced by the introduction of the CN implied a reduction of the effective conjugation length and consequently a significantly increase in *Eg* value. The results showed an enhancement of the interchain π-π interaction in the solid state by incorporation of the CN polar groups. The polymers films were fluorescent and exhibited a yellow-green emission.The HOMO/LUMO energy levels were evaluated by cyclic voltammetry measurements and indicate the improvement of the electronic affinity of the poly(arylene sulfide)s by introduction of the CN in the α position.

Single-layer diodes of [indium-tin oxide/polymer /aluminium] configuration have been fabricated and characterized. The electrical properties of the polymer active layers were investigated by the current-tension characteristic and modeled by the current space-charge-limited (SCLC) mechanism. The results showed higher charge carrier mobility in **PPVS-CNα**film, in comparison to **PPVS.** Conversely, the incorporation of the CN into the β position showed to significantly reduce the mobility in such poly(arylene sulfide)s.

Keywords: π-conjugated poly(arylene sulfide); semi-conducting polymers; *cyano*effect; thin solid film; photoluminescence; space-charge limited current (SCLC).

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NEW POLY(2-OXAZOLINE) FROM BIO-BASED LEVULINIC ACID PRECURSOR

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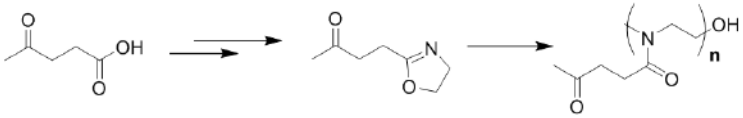
The living cationic ring opening polymerization (CROP) leading to poly(2-oxazoline) POx has been discovered more than 50 years ago. Since then, this special class of polymers has been widely studied and led to versatile polymeric materials.[1] However; it is only since the last decade, with the discovery of their amazing properties into biomedical applications and their thermo-responsive properties, the POx really started to a growing interest of the scientific community. For instance POx are considered as smart bioinspired polymers,[2] with an ability to form functional materials and nanostructures with tunable properties, leading to numerous applications.[3] They are claimed to be used in adhesives, coatings, ink formulations as well as in drug delivery applications.[4]
The aim of this work is to prepare via CROP a new POx from levulinic acid which is one of the most bio-based precursors (Scheme).



Scheme : POx synthesis from Levulinic acid

Key words: Levulinic acid, 2-oxazoline, Cationic ring-opening polymerization

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MOLECULARLY IMPRINTED POLYMER BASED ON SILICA SUPPORTS FOR EFFICIENT ADSORPTION OF MITOTAN

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The analysis of such pollutants is conducted by chromatography. In general, these pollutants exist in low concentrations in complicated matrices, so their determination requires extraction and concentration steps prior to instrumental analysis. Solid phase extraction (SPE) are now coming mostly used for the extraction of analytes and are substituting liquid-liquid extraction (LLE) protocols. Molecularly Imprinted Polymers (MIPs) have been used as SPE sorbents and seem to become the promising development to circumvent the draw backs of traditional SPE sorbents owing to the recognition ability of MIPs for given molecules.

The aim of the present work was to develop an acrylic polymers-based MIP for Mitotane (Mit), a derivative of the insecticide dichlorodiphenyltrichloroethane and an anticancer drug normally administered by oral route, at the surface of silica particles. Thin layers of MIP at the surface of silica particles provide easily accessible sites related to fast association/dissociation kinetics.

In this work, surface modified silica particles were used as support for the development of molecular imprinted polymer matrix for separation of Mit. The polymer matrix was developed from methacrylic groups anchored at the surface of silica support using laurylmethacrylic acid (LMAA) as functional monomer. The resulting imprinted materials SiO_2LMAA@MIP was characterized by means of FT- IR, ^{13}C NMR and elemental analysis. The uptake capacity of Mit by the synthesized adsorbent materials (MIP and NIP) was assessed under the same conditions. SiO_2LMAA@MIP has exhibited the best adsorption capacity of Mit 82.64 $\mu g.g^{-1}$ which was 1.36 times higher than that obtained with SiO_2LMAA@NIP.

EXTRACTION AND CHARACTERIZATION OF CELLULOSE FROM COMMON REED STEMS *(Phragmiteaustralis)*

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Common reed (*Phragmitesaustralis*) is a wetland plant genus that has been utilized by man since ancient times. It is a tall, thin, highly productive grassused for centuries as a fodder plant in summer, and as a raw material for crafts winter. Stems of common reed can be a potential source oflignocellulosic material. It has been popular as source of cellulose, pulp and paper in the middle of the twentieth century.

Microcrystalline cellulose was successfully isolated from common reed (*Phragmiteaustralis*) with a global extraction yield of 40%.The suitability of the raw material as cellulose source was studied with optical microscopy using Miranda carmine-green to distinguish lignified and cellulosic structures. The Van Soest global method, based on determination of neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid digestible lignin (ADL), was used to estimate fiber content. Extraction of cellulose was carried out by alkali and bleaching treatments with sodium chlorite. The structural characterization of the isolated cellulose was effected by colorimetric study, Fourier transform infrared spectroscopy (FTIR), the X-ray diffraction (XRD) and elemental analysis. Results showed that extracted cellulose was free of lignin, hemicelluloses and has a monoclinic crystal structure Iβ with a crystallinity index of 64.7%.

Keywords: Common reed, bleaching, cellulose, structural characterization, crystallinity index.

POLY(VINYL 1,2,3-TRIAZOLIUM) OBTAINED FROM BIO-BASED LEVULINIC ACID PRECURSOR: A NEW CANDIDATE TO THE POLY(IONIC LIQUID)S FAMILY

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The conversion of biomass to higher added value bio-based chemicals is receiving a lot of attention worldwide [1]. A well-known example is the conversion of glucose into levulinic acid (LA) by acid treatment. LA is potentially a promising building-block for the synthesis of various (bulk) chemicals for applications such as fuel additives, plasticizers, polymers and resin precursors [2].

On the other hand the 1,2,3-triazole group has become a significant component in a large variety of small molecule and polymer materials [3]in applications are ranging from therapeutics, self-assembling systems, responsive polymers[4] and proton exchange membranes [5] to ionic liquids and poly(ionic liquid)s [6,7].For instance, 1,2,3-triazolium-based poly(ionic liquid)s constitute a broad in scope addition to the PIL family. Their synthesis benefits from the versatile, robust and orthogonal nature of CuAAC in combination with efficient quaternization and anion metathesis reactions.

In this work, we present the synthesis of a series of bio-sourced PILs via radical addition-fragmentation transfer polymerization using LA as versatile building block.

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New anthracene-based semi-conducting materials for opto-electronic applications

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Anthracene was one of the first aromatic materials employed in OLED elaboration. The first experiments were carried out by Pope in the early 1960s [1]. Soon after, several reports on single-crystal anthracene-based OLEDs were published, and good quantum yields were obtained (up to 5%) [2]. Nevertheless, such devices are thick and hence require very high operating voltage (over 100 V). The improvement in the operating voltage was achieved by vacuum evaporating thin layers of anthracene; in this case the operating voltage was lowered up to 30 V [3]. However, the anthracene tends to recrystallize with diode operating time, which led to a degradation of device performance.
In this contribution, we describe the synthesis and characterization of new soluble anthracene-based semi-conducting materials (PVC_{12}-An and MVC_{12}-An) for organic thin layer electronic applications.

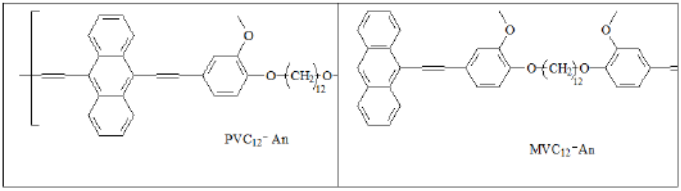

Figure1: Chemical structures of **PVC_{12}-An and MVC_{12}-An**

Two soluble anthracene-based organic materials (PVC_{12}-An and MVC_{12}-An) have been synthesized and characterized. Their chemical structures were confirmed by NMR and FT-IR spectroscopic analysis. DSC analyzes of PVC12-An show a good thermal stability and an melting peak in 180°C. MVC12-An indicates amorphous morphology with a glass transition temperature (Tg) about 35°C in solid state. The optical properties of this π - conjugated systems were investigated by UV–Visible absorption and photoluminescence (PL) spectroscopies. The optical gaps were estimated from the absorption onsets of the thin materials film; their values were 2.83 eV and 2.70 eV for PVC_{12}-An and MVC_{12}-An, respectively. The PL spectra of both materials exhibit a blue emission in dilute solution and a green emission in thin film. The HOMO and LUMO levels were estimated using cyclic voltammetry analysis.

Key words: Anthracene derivatives, Optical properties,

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Architecture of PPV and PVK based nanowires and coaxial nanowires for tunable photoluminescence properties

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In this present work we display a protocol of synthesis at the nanoscale of the simple and coaxial nanowires based to PPV and PVK polymers. Optical proprieties of these nanostructures were investigated. PL excitation and time-resolved experiments also confirm that a significant charge and energy. The evidence of reabsorption phenomenon (trivial energy transfer) and charge transfer has been reported in the coaxial nanostructures. The color of the synthetis nanowires was examined using epi-fluorescence microscope. An enhancement of PPV emission by adding PVK luminophore basing on the energy transfer process. Transfers are involved due to the self-absorption phenomenon due to overlapping of the absorption and emission spectra. Thus, it is possible to control the color of the photoluminescence (PL) of synthesis nanowires.

CHARACTERIZATION AND ION ADSORPTION PROPERTIES OF FUNCTIONALIZED POLYVINYLCHLORIDE CROSS-LINKED WITH DICHLORODIETHYL ETHER

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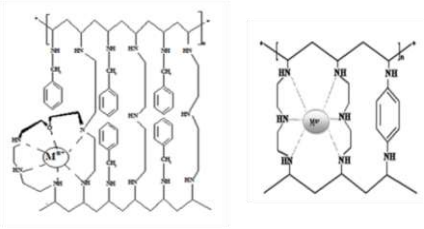
The chemical modification of materials with long polymer chains produces new materials for new applications. The development of these new modified materials in order to have new or improved properties is an essential line of research in the polymer field.

Polyvinyl chloride (PVC) is one of the most important polymers due to their high versatility and excellent physico-chemical properties [1]. PVC is employed in a wide range of fields [2, 3].

In the present work, polyvinyl chloride (PVC) was modified in solution by amino groups (benzylamine, p-phenylenediamine and diethylenetriamine) through nucleophilic substitution reactions. Then, the synthesized polymer chains were cross-linked with dichlorodiethyl ether in tetrahydrofuran (THF). The obtained polymers (P_1, P_2, P_3, P_4 and P_5) were characterized by elemental analysis (CHN), infrared spectroscopy (FTIR), differential scanning calorimetry (DSC) and X-ray diffraction (XRD). Subsequently, the obtained polymers were tested for their ability to remove some metal ions from aqueous media (Pb^{2+}, Cd^{2+} and Co^{2+}) using the solid-phase extraction (SPE) method and the inductively coupled plasma atomic emission spectrometry (ICP-AES) technique.



Possible interactions of modified polymers with M^{n+}

Keywords: benzylamine, p-phenylenediamine. Diethylenetriamine. dichlorodiethyl ether. Metal extraction.

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MAGNETIC HIERARCHIZED STRUCTURES: SELF-ASSEMBLY AND CHARACTERIZATION OF MAGNETIC CELLULOSE COMPOSITE

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A new synthesis method for producing cellulose magnetite nanocomposite was developed and new materials properties were studied. The preparation and characterization of a new schiff's base functionalized cellulose and their self-assembly was described.[1] Microcrystalline cellulose (MCC) was selectively oxidized using sodium periodate followed by grafting of dithiooxamide (DTX) and orthophenylendiamine (PDA) to obtain their imine derivatives in 80-85% yield.[2] The morphology, structure and thermal properties of functionalized cellulose [Diamino-Cellulose] by NMR, IR, SEM, ATG and DSC were studied and the functionnalization-organisation relationship was elucidated.[3] Magnetite amino-cellulose composite were prepared in a mixture of Fe^{2+}/Fe^{3+} to produce surface bonded nanoparticles of magnetite (Fe_3O_4). Optimal conditions of coating were determined. [4] The peaks of Fe_3O_4 in XRD patterns of [Diamino-cellulose/Fe_3O_4] composite confirm existence of the nanoparticles in the diamino cellulose matrix structure. The SEM micrograph results demonstrated that particular materials covered with magnetite agglomerate during the modification "spin coating" process.

Key words: functionnalization, magnetite, nanocomposite, schiff's base, sel-assembly, MCC.

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New sensitive polymer fluorescent indicator for the detection of Zn^{2+} and Cr^{2+}

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Chemistry complex has been the subject of several studies. Among them, the complexation of metal ions by organic molecules. These ligands may be in the form of different types with sites ligands of varied nature. They are widely used in medicine for the treatment of several diseases and industry in the fight against corrosion. They can also have a broad application in the field of water treatment because of their high capacity complexation of transition metals in particular in the recovery of heavy metals in industrial effluents or harmful radioactive elements in waste Nuclear.

An optical sensor based on a new semi-conducting polymer (OPD/ DV6) has been described for detection of various metallic cations. Its sensing behavior toward metals ions has been investigated by absorption and fluorescence spectroscopy. Indicator (OPD/DV6) showed high selectivity to $Zn^{2+}$and Cr^{2+} whereas other metal ions failed to induce response. The response of polymer towards Cr^{2+} and Zn^{2+}cations was studied and the results showed a good sensitivity to these ionic species.

Keywords: optical sensor, semi-conducting polymer, fluorescence

EXTRACTION OPTIMIZATION OF POLYSACCHARIDE FROM *ZIZYPHUS LOTUS* BY RESPONSE SURFACE METHODOLOGY : CHARACTERIZATION AND ANTIOXIDANT ACTIVITY

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The optimization of polysaccharide extraction conditions from *Zizyphus lotus* pulp was achieved through a response surface methodology using the Box-Behnken design. The optimum operating conditions for polysaccharide extraction were as follows: an extraction time of 3.25h, extraction temperature of 91.25°C and a water to solid ratio of 39 mL/g. Under these optimal conditions of extraction, the experimental value of the extraction yield was 20.4% which is in agreement with the predicted value (20.11%). Chemical analysis revealed that the obtained extract was composed mainly of carbohydrate (97.92%w/w) and uronic acid (41.89 %w/w). In addition, the results of Fourier transform-infrared spectroscopy confirmed the characteristic polysaccharide structures. Gas chromatography coupled to mass spectrometer analysis suggested that the extracted polysaccharides are composed of arabinose, rhamnose, glucose, galactose, fructose and xylose, with a molar percentage of 34%, 19.14%, 23.26%, 12.19%, 9.58%, 1.83%, respectively. Size exclusion chromatography analyses showed that the average molecular weight of ploysaccahrides was 2720 KDa. In vitro antioxidant assays showed that the Z. lotus polysaccharides possessed a potential 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity. It also exhibited significant reducing power and anti-lipid peroxidation activities. These results suggested that *Z. lotus* polysaccharides could be exploited in medicine or food as novel potential antioxidants.

Key words: *Zizyphus lotus* polysaccharide; Response surface methodology; Characterization and antioxidant activity.

CATION BINDING PROPERTIES OF THIAZOLE DERIVATIVES TOWARDS SOME METAL CATIONS

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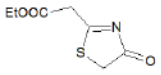
Pyranopyrido thiazole derivatives found a wide uses in the industry compounds and the chemistry of dyes and pigments such as laser technologies[1], colour and non-colour photographic processes [2], optical disk as recording media and inks[3].

The binding properties of a oxothiazole (**1**), phényliminothiazole (**2**), phénylaminothiazole (**3**) and aminothiazole (**4**) derivatives toward the alkali, alkaline earth and some transition metal cations, have been investigated in acetonitrile, followed by UV Spectrophotometry Absorption and conductivity. Thus, the stoichiometries of complexes formed and their stability constancts were determined by digital processing of data.



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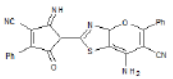

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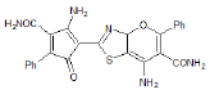

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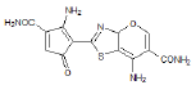

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Key words:. Thiazole, Stoichiometries, Stability, constants, Binding properties

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An electrochemical behavior of chitosan in relation with the spectroscopic characterization of the degree of deacetylation

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Several studies have been concerned with the study of the effect of the degree of deacetylation on the properties of Chitosan. In this work, cyclic voltammetry study was carried out in acetonitrile solution, in order to describe the electrochemical behavior of the shrimp shell chitosan at different degree of deacetylation.

Key words: Chitosan, Degree of deacetylation, Cyclic Voltammetry, Anodic oxidation.

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EVALUATION OF THE FEASIBILITY OF METAL PASSIVATION BY LOW-COST BIO-POLYMERS

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Metals are nowadays widely used in the daily life, from the building industry to many other applications: food industry, appliances or implants in orthopedic surgery. In order to fulfill the requirements of real industrial utilizations, metals have to be treated properly for better corrosion resistance without losing their physical and mechanical integrity [1]. Organic coatings [2] have already shown efficiency for protection against metal corrosion in different media, but novel strategies using green or low-cost polymeric films such as peptides, hydroxyethylcellulose, Chitosan, poly (4-vinylaniline), polymethacrylate, polyacrylic acid are urgently needed to fit the market requirements.

This works aims to evaluate the feasibility of metal passivation by low-cost bio-polymers films or powders in order to prevent the base metal attack during chemical processes.

Key words: Bio-polymers, Corrosion, Electrochemistry, Passivation.

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STRUCTURE-PROPERTIES CORRELATION OF NEW COPOLYMER POLY(ETHYLCARBAZOL - TERPHENYL)(PECbz-Ter) FOR OPTOELECTRONIC DEVICES

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Geometrical parameters, electronic structures, optoelectronic and photovoltaic properties of new copolymers Ethylcarbazole-Terphenyl (PECbz-Ter) containing carbazole as a donor group and terphenyl rings as electron acceptors, have been investigated through Density Functional Theory (DFT) with the hybrid B3LYP exchange correlation function and the split valence 6-31G/(d, p) basis set. The theoretical results including the geometries optimization of (PECbz-Ter)n was carried out, showing a reduction in the band gap when going from n=1 to the n=5 monomer. Structural parameters, optoelectronic and photovoltaic properties have been analyzed and discussed in terms of conjugative pathway between the electron-donating and electron-accepting moieties.

Optical properties of the studied oligomers of PECbz-Ter (n=1-5) characterized by the bathochromic effect and the decreases value of the wavelength λ_{abs} with increasing the chain length from n=1 to n=5 monomer.

From these results, the correlation structure-properties are better understood. Furthermore, the copolymers PECbz-Ter, which is blended with fullerene derivative [6,6]-phenyl-C61-butyric acid methyl ester (PCBM) and derivatives, seems to be a good active layer in bulk hetero-junction solar cells in the case of the studied oligomers of (PECbz-Ter) blended with C_{60} or C_{70}.

Key words: New copolymers, Ethylcarbazole-Terphenyl (PECz-Ter), correlation structure-properties, hetero-junction solar cells.

Electrochemically determination of heavy metals simultaneously using Polypyrrole modified glassy carbon electrodes

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Contamination of the environment by toxic metals is currently a major problem, the latter present at levels of trace and ultra trace; some trace elements are not metals (arsenic, selenium). Many of them are used in biological processes.
They are therefore essential to life, but in very small quantities (copper, arsenic…) while others do not seem (cadmium, mercury, lead, zinc...). At high doses they can become toxic. This results in an increasing demand for analysis of metal pollutants means. Polypyrrole modified glassy carbon electrodes have been developed for the analysis of metals of zinc, cadmium, lead, arsenic and copper in formulated samples of waters and industrial wastewater samples by differential pulse stripping voltammetry and Square wave stripping voltammetry.
The determination of heavy metals electrochemically revolves around three steps; (the first step is the preparation of the polymer film electrodes based on polypyrrole, while the second step involves preconcentration of the metal to be analyzed to the polymeric film surface; and finally redissolving and quantification of the potential sweep by metal and measure intensity to the appropriate potential the determination of heavy metals and get remarkable sensitivity.

Keywords: Heavy metals. Stripping voltammetry. Glassy carbon electrode. Polypyrrole modified electrode.

Detection of Trace Heavy Metal by Anodic Stripping Voltammetry using Nanofibrillated cellulose

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Pollution water by toxic metals remains a serious environmental problem and can be detrimental to plants, animals, and human being alike. Different governments have set up environmental laws to determine amount of heavy metal ion in drainage, considered to be non-detrimental to the environment.[1] In this work, nanofibrillated cellulose (NFC) was used to develop electrochemical sensors for the detection of trace mercury $Hg^{2+,}$ copper Cu^{2+}, lead Pb^{2+} and cadmium Cd^{2+} via differential pulse anodic stripping voltammetry (DPASV). Cellulose fibers from Eucalyptus were fibrillated into nano-sized fibrils using the homogenization process. To facilitate the fibrillation process, fibers were previously oxidized under neutral conditions to bring the carboxyl content up to 500 mol/g.[2] The method was optimized with respect to accumulation time, reduction time and reduction potential. The prepared sensor was further applied to detecting the Hg(II), Cu(II), Pb(II), Cd(II) concentrations in the real natural water samples. As a result, the modified electrode with nanofibrillated cellulose exhibited good reproducibility and high sensitivity for detection of Hg(II), Cu(II), Pb(II), Cd(II).

Keywords: nanofibrillated cellulose, chemically modified electrodes, differential pulse voltammetry (DPV), Heavy metal detection.

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Posters Communications' Abstracts

Session 2 Friday 25 March

Joint theoretical and electrochemical study of the oligomerization of *p-tert*-butylphenol in acetonitrile solution

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Several studies have been concerned with the mechanistic aspects of the electropolymerization of the substituted phenolic compounds. Instead of the peroxide liked oligomer, which has been qualified as highly unstable, a greater proportion tends to be C-C and C-O-C bonds. The proper choice of the medium may provide selectivity regarding the coupled chemical steps [1].

The work presented here relates to the study of the oligomerization of p-tert-butylphenolat platinum electrodeby means of its anodic oxidation in acetonitrile solution, without and with the presence of lutidine. In the absence of the strong base, thepotentiodynamic and potentiostatic investigations lead to an electrogeneration of the first five oligomers of this phenolic compound, in soluble forms and as a coated electrode, which is only observed at high substrate concentration and low scan rate. In this experimental condition, a C-C couplingis suspected subsequently to one electron ejection. With Lutidine, only a peroxide dimerformed through an O-O couplingreaction, according to a disproportionation mechanism, has been identified in the electrodeposited film. The results are rationalized on the basis of electrochemical study and the quantum-chemical calculations, using the density functional method (B3LYP) and the 6-31G* basis set implemented in Gaussian 09 [2]. Calculations in aqueous solution were carried out using continuum model with the PCM approach [3,4]. The predominant forms of bonding through the progressive anodic oxidation of the monomer could be Oxygen-Oxygen, which present a high stability.

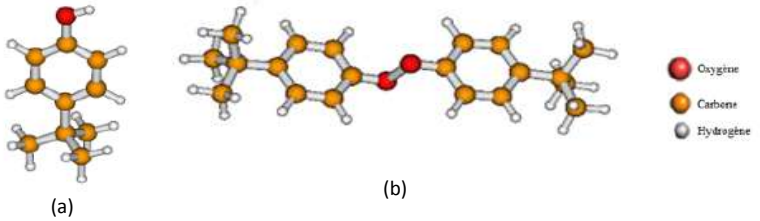

Figure.1: Optimized structures in acetonitrile of p-tert-butylphenol (a) and the peroxide dimer (b) using DFT/B3LYP/6-31G* method.

Key words: 4,4'-di-tert-butyl biphenyl peroxide, p-tert-butylphenol, oligomers, anodic oxidation, quantum chemical calculations.

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Cationic surfactants cibled to the synthesis of mesoporous silica nanoparticles

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Silica nanoparticles were synthesized by hydrolysis and condensation of tetraethoxysilane (TEOS) in water in the presence of cationic surfactant as structure agent in basic medium. In this work, we have interested to synthesis a new series of quaternary ammonium surfactants. The synthesis was based on a reaction between tertiary amines and the intermediaries which synthesized from reaction of thiols or alcohols with bromoacetyl bromide in dichloromethane [1]. Quaternary ammonium was obtained by the action of these intermediaries with tertiary amines in diethyl ether [2]. Some of these surfactants will be used in the synthesis of silica nanoparticles according to the sol-gel processing. The silica nanoparticles prepared were characterized with BET and TEM. The N_2 isotherms obtained were type IV, characteristic of mesoporous material. TEM image (Fig.1) confirmed the porosity of particles.

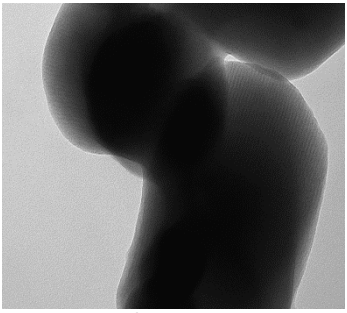

Fig.1. TEM image of silica nanoparticles prepared

Key words: Quaternary ammonium, sol gel, mesoporous silica nanoparticles

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EFECT OF POLYSTYRENE DISSOLUTION ON THE INTERACTION BETWEEN THE MOLECULES OF ITS MIXED SOLVENTS: BENZENE AND ETHYL ACETATE

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In this study, the ternary system polystyrene/ benzene/ethyl acetate was considered as a quasi-binary system and the presence of the polymer acts as a perturbation on the mixed solvents where the interaction between unlike molecules was quantified by the Grunberg-Nissan constant, d' . Thus, a pseudo Grunberg-Nissan constant, d'_P, was introduced to quantify the interaction between unlike molecules of the mixed solvents in the presence of the polymer. The effect of polystyrene addition on the interaction between benzene and ethyl acetate was quantified by introducing the deviation of the Grunberg-Nissan constant, $\delta d'_p = d'_p - d'$, concept which is connected to both the intrinsic polymer viscosity and the Huggins constant in pure and mixed solvents. An important perturbation was detected for weak proportions of benzene in the mixture and when the polymer concentration becomes higher.

Key words: Polymer, mixed solvents, Grunberg –Nissan constant, intermolecular interaction.

The use of cellulose nanofibers extracted from Alfa fibers as reinforcement to improve the mechanical and thermal properties of polyvinyl alcohol PVA

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This work is devoted to the study of the morphological, mechanical and thermal properties of nanocomposite films composed of PVA matrix reinforced with cellulose nanofibers extracted from the Alfa fibers by chemical treatement and ultrasonication.

The morphology of the films and the fibers was determined using the scanning electron microscopy (SEM), the thermal behavior and the mechanical properties of nanocomposites were determined using differential scanning calorimetry (DSC), thermogravimetric analysis (TGA) and tensile tests respectively.

Key words: nanocomposite, PVA, cellulose, Alfa.

APPLICATION OF CHITOSAN FOR REMOVAL OF ANIONIC DYES FROM AQUEOUS SOLUTIONS BY ULTRAFILTRATION PROCESSES

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A basic investigation on the removal of anionic dyes from aqueous solution by chitosan (CHI) was conducted in a batch ultrafiltration system. Anionic dyes removal from aqueous solutions by polyelectrolyte enhanced ultrafiltration (PEUF) process was investigated using chitosan with an average molecular weight of 117 kDa. The ultrafiltration studies were carried out using a frontal cell system equipped with 10 KDa MWCO regenerated cellulose. The influence of different experimental parameters such as chitosan and sodium chloride concentrations, transmenbrane pressure and pH of solution on retention rate and permate flux has been studied. The results indicate, the retention of dye without using chitosan is only 10 % and 32 % for methyl orange (MO) and bleu bromophenol (BBP) respectively. However, the retention rate increases up to 95 % and 99% for MO and BBP, respectively using chitosan. permeate flux depended slightly on CHI concentrations.The retention of anionic dyes decreases with salt concentration and pH of solution increases.

Keywords: Chitosan, anionic dyes, ultrafiltration, polyelectrolyte complex, Rejection coefficient.

REMOVAL OF METHYLENE BLUE FROM AQUEOUS SOLUTIONS BY POLY (ACRYLIC ACID) AND POLY (AMMONIUM ACRYLATE) ASSISTED ULTRAFILTRATION

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Despite the numerous works dealing with the application of Polyelectrolyte-enhanced ultrafiltration (PEUF) for the removal of micropollutants, its application for the treatment of dye effluent is very scarce. In the present study we investigated the recovery of methylene blue (MB), a phenothiazine cationic dye, by ultrafiltration with two anionic polyelectrolytes used as complexing agents. The ultrafiltration experiments were operated in batch mode with stirred cell equipped with 10,000 MWCO regenerated cellulose. Effects of operating conditions, e.g., transmembrane pressure, feed polyelectrolyte, feed dye solution, NaCl concentration, and pH on dye retention and permeate flux have been analyzed. High retention rate of dye in the order of 98% was obtained as a result of complexation between anionic polyelectrolyte and cationic dye. However the retention of the dye decreases as the salt concentration increases and pH decreases.

Key words: Poly (acrylic acid); Poly (ammonium acrylate); Methylene blue; Dye removal; Polyelectrolyte Enhanced-Ultrafiltration.

A NEW FLUORESCENT SENSOR FOR Cu^{2+} BASED ON NEW CONJUGATED OLIGOPHENYLENE

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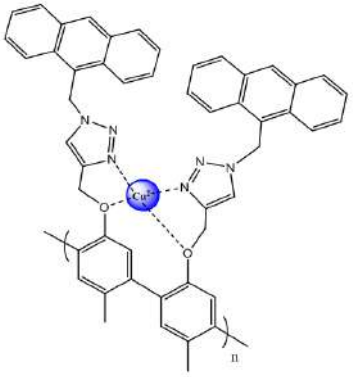
Recently, the development of fluorescent sensors of biologically active metal ions has been extensively investigated because of their potential applications in life sciences, medicine, chemistry, and biotechnology [1]. In this frame, we describe the synthesis and the characterization of a new organic material for Cu^{2+} detection. In fact, this metallic cation plays an important role in various biological processes and is highly toxic to some organisms [2-4].

The copper-sensing material (A) was prepared according a two-step method. Firstly, an oligophenylene derivative was synthesized from the electrochemical oxidation of a propargyl aryl ether monomer. Then, a chromophore was attached to the obtained oligomer by the Huisgen Cycloaddition. This new material was characterized by NMR, FT-IR and ATG. The detection of the Cu^{2+} cation was investigated by fluorescence and UV-visible spectroscopy.



Material (A)

Keywords: Π-Conjugated oligomers, semiconductors, sensor, fluorescence, copper.

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Preparation and characterization of polypyrrole-polyaniline/$Li_3Mn_{1/3}Ni_{1/}Co_{1/3}O_2$ nanocomposites as an Electrode for Li-ion Batteries

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In recent years, conducting polymers have attracted attention of many researchers and engineers of different fields of science [1]. Because of their conjugated double bond they possess electronic properties similar to metals [2]. One of those polymers was Polypyrrole (PPy) and polyaniline (Pani). Because of their excellent properties such as high biocompatibility [3], good adhesion to substrate [2], excellent electrical and mechanical and thermal properties (PPy) and (Pani) can be used as electrode material for energy storage devices [2]. The present study aims at investigating the preparation process and properties of materials made of $LiMn_{1/3}Ni_{1/3}Co_2$ particles dispersed in a Polypyrrole-Polyaniline matrix. Thus composite materials with favorable encapsulation of LMNCO by Pani and PPy are expected providing electrical contact to electrodes, high conductivity, and retaining the lithium ion exchange capacity of the bare oxide.

Therefore, PPy-Pani additives can be used as conductive agents and cathode materials. Reports pointed out that the PPy coating on $LiMn_{1/3}Ni_{1/3}Co_2$ [4], or Pani on $LiMn_{1/3}Ni_{1/3}Co_2$ [5] had a benefit to its electrochemical performance. But up till now, using (PPy and Pani) powder as additives for $LiMn_{1/3}Ni_{1/3}Co_2$ cathode has not been reported.

A nanocomposite PPy-Pani/ $LiMn_{1/3}Ni_{1/3}Co_2$ was prepared with different amount of pyrrole and pani (25, 5 and 2 wt.%). The materials were characterized by IR spectroscopy, ultraviolet-visible spectroscopy (UV-Vis), X-ray diffraction (XRD), and scanning electron microscopy (SEM).

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SOLID PHASE EXTRACTION OF Fe(III), Bi(III) AND Cr(III) FROM AQUEOUS SOLUTIONS USING AMBERLITE IRA-900 RESIN IMPREGNATED WITH B-AMINO ALCOHOLS

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Three chiral β-amino alcohols were prepared by the reaction of three polyamines with mixture of *cis*/ *trans*-limonene oxide in the presence of water as a catalyst. Amberlite IRA-900 resin was impregnated with β-amino alcohols via the dry method of impregnation. FTIR spectroscopy studies approved that the impregnation with β-amino alcohols occurred. The obtained resins were then assayed to evaluate their efficiency to extract metallic ions such as Fe^{3+}, Bi^{3+} and Cr^{3+} from aqueous solutions. These chelating resins were found to extract these ion at high level (> 95 %) with a clear selectivity and seemed to have an affinity following the order $Fe^{3+} > Bi^{3+} > Cr^{3+}$.

Keywords: limonene oxide, β-amino alcohols, Amberlite IRA-900, extraction, heavy metals.

Synthesis of new isoxazolo[5,4-d]pyrimidine derivatives

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Isoxazole derivatives are an important class of heterocyclic compounds and their chemical properties have been studied over the years. They can be converted into several major units. Isoxazoles derivatives possess wide variety of **biological activities** and pharmacological properties such as hypoglycemic, analgesic, anti-inflammatory activity. In previous works several new isoxazole compounds were achieved from aminocyanoisoxazole **1** [1, 2]. Taking into account the bibliographic data of the synthesis of compound **1**, we used in the first method that described by Taylor and Garcia [3] by reacting the enol ethers with hydroxylamine under ethanol reflux. Consideration for different difficulties in this first method such as: long time, multistep and highly expensive. For these reasons, we decided to introduce our new approach to directly access substrates **1** via the MCR method by reacting simultaneously nitrilmalonate, orthoester and hydroxylamine.
After that, we showed that 5-amino-4cyano isoxazole **1** synthesized has two very reactive centers in 1,4: a nucleophilic center that is the doublet of the nitrogen, the second is the electrophilic carbon of the nitrile function. We intend initially to study the reactivity of the substrate **1** vis-à-vis orthoesters to generate imidates **2**. Finally, we opposed aniline on these imidates to yield isoxazolopyrimidines **3**.

Keywords: Aminocyano-isoxazoles, Imidates, Isoxazolopyrimidinones, Multi-components reaction (MCR).

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Amperometric nitrate biosensor based on Chitosan/Polypyrrole/Nitrate reductase biofilm electrode

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This study describes the construction and characterization of an amperometric nitrate biosensor based on the chitosan film. Nitrate reductase (NR) was both entrapped into the growing PPy film and chemically immobilized in the film electrode. The optimum amperometric response for nitrate was obtained in 0.1 M phosphate buffer solution (PBS), pH 7.5. including 0.1 M lithium chloride and 7 mM potassium ferricyanide with an applied potential of 0.13 V (vs. Ag/AgCl, 3 M NaCl). Sensitivity was found to be 300 nA/mM in a linear range of 0.44–1.45 mM with a regression coefficient of 0.97. The biosensor response showed a higher linear range in comparison to standard nitrate methods which were tested in this study and NADH based nitrate biosensors. A minimum detectable concentration of 0.17 mM (S/N=3) with a relative standard deviation (RSD) of 5.4% (n=7) was obtained for the biosensor. Phenol and glucose inhibit the electrochemical reaction strictly at a concentration
of 1 µg/L and 20 mg/L, respectively. The biosensor response retained 70% of its initial response over 10 day usage period when used every day.

Physicochemical characterization and in-vitro drug dissolution study of niflumic acid/ß-cyclodextrin complexe inclusions

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The Niflumic acid is a non-steroidal anti-inflammatory drug (NSAID) and a poorly water-soluble derivative of nicotinic acid with relatively low bioavailability. So, the present paper is devoted to the preparation of new formulations based on the combination of niflumic acid and the beta-cyclodextrin in order to optimize its pharmaceutical and physic-chemical properties. The effect of beta-cyclodextrin on the aqueous solubility and dissolution rate of niflumic acid was studied and elucidated. The binary systems of the compounds (1:1) molar ratios were prepared by different methods and the inclusion complexes were characterized by FTIR, XRD, and UV. The interaction between niflumic acid and ß-cyclodextrin in solution was studied by phase solubility analysis. The results of this study revealed that the complexation of niflumic acid with ß-cyclodextrin can improve the therapeutic efficacy of the drug through the greater efficiency of the drug dissolution.

Key words: ß-cyclodextrin, complexation, niflumic acid, phase solubility.

STRUCTURAL CHARACTERIZATION, VIBRATIONAL PROPERTIES, MAGNETIC MEASUREMENTS AND DFT CALCULATION OF A NEW POLYMERIC MATERIAL

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A new organic-inorganic hybrid material of formula $(C_{10}H_{16}N_2)CoCl_4$ was elaborated and characterized by X-Ray diffraction analysis. It crystallizes in the monoclinic space group $P2_1/c$ with the following unit cell parameters a= 7.7400 (9) Å, b= 20.278 (3) Å, c= 9.6257 (12) Å, Z=4 and V= 1458.5 (3) $Å^3$. The crystal structure has been determined and refined to R1 = 0.023 and wR2 = 0.054 using 3335 independent reflections. The title compound contains two basic components, one $[CoCl_4]^{2-}$ anion and one $(C_{10}H_{16}N_2)^{2+}$ organic dication. The examination of the structure shows polymeric anionic ribbons linked by N-H···Cl hydrogen bonding. Three different $[CoCl_4]^{2-}$ anions act as hydrogen-bonding acceptors to phenylpiperazinium dication forming two different ring motifs, $R_2^4(14)$ and $R_4^4(12)$. IR, Raman and UV-Visible spectroscopies were also used to characterize this compound. Solution ^1H and ^{13}C NMR spectroscopy results are in agreement with the X-ray structure. The thermal properties of the 1-Phenylpiperazine-1,4-diium Tetrachloridocobalt (II) has been studied by differential scanning calorimetry (DSC). Moreover, magnetic susceptibility measurements indicate that the compound exhibits weak antiferromagnetic coupling interaction. Theoretical calculations were performed using density functional theory with the B3LYP/LanL2DZ level for studying the molecular structure and vibrational spectra of the title compound. Good consistency is found between the calculated results and the experimental structure, IR and Raman spectra.

Keywords: Polymeric materials, Crystal structure, IR-Raman Spectroscopy, Band-gap, NMR Spectroscopy, Magnetic properties, DFT Calculations.

CONTRIBUTION TO THE STUDY OF THE ELECTROCHEMICAL POLYMERISATION OF PIPERAZINE

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Compounds containing piperazine ring possess special importance among nitrogen containing heterocyclic compounds for the generation of polymeric structures [1].

Our aim in this work concerns the anodic oxidation of piperazine in acetonitrile solution and the subsequent electrodeposition of its corresponding polymer on platinum electrode. It is shown that an electroactive film could be obtained through Nitrogen-Nitrogen bonds formation occurring consecutively to one electron ejection. By means of cyclic voltammetry study, we report the oxidation of this compound in three successive and irreversible anodic waves that the potentials are notably sensitive to the pH of the electrolyzed solution, the substrate concentration, the electrolyte nature and the scan rate. Recurrent cycling of the potential gives rise to a visible nucleation phase. The modified electrode exhibits a biggest oxidation facility than the initial piperazine ring.

Key words: Piperazine, Cyclic voltammetrie, Electrodeposition, Electropolymerisation.

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ADSORPTION OF ACID BLUE 25 IN FIXED-BED SYSTEM USING MODIFIED JUNCUS ACUTUS L FIBERS

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Amine groups were introduced on the Juncus Acutus L fibers by the reaction of chlorodeoxycellulose (CDC) with diethylenediamine (DET) to obtain DET–Smar. Evidence of attaching amine groups onto cellulosic fibers were confirmed through Fourier transform-infrared (FTIR) analysis. The obtained material was then loaded with copper ions in order to prepare an adsorbent named [Cu(II)/DET-Smar]. Adsorption performance of Acid Blue 25 from aqueous solutions onto [Cu(II)/DET-Smar] has been tested in continuous column system. The effects of various experimental conditions, such as the bed height and the internal diameter of the column, have been evaluated. The bed depth service time (BDST), Thomas and Yoon–Nelson models were applied to investigate the experimental data and to predict the characteristics column parameters useful for process design. The BDST model was found the most suitable for the description of breakthrough curves at all experimental condition.

Key words: Juncus Acutus L fibers, continous adsorption, Acid Blue 25, Breakthrough curves, modeling.

A novel approach to leather waste valorization

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Today, the disposal of hundreds of tons of leather wastes (shaving and trimming) is one of the most problems of great concern for leather industries. The recovery of these considerable amounts of solid wastes has become a major challenge for sustainable development. In fact, it raises many concerns regarding the environmental effects and escalating landfill costs. Consequently, the conversion of leather wastes into valuable materials such as composite and polymer materials presents a promising way, which continues to be developed.

In this field, many attempts have been made to prepare commercially acceptable leather substitutes by combining leather fibers or wastes with natural or synthetic fibers and binders. A diversity of synthetic binders such as vinyl resins[1,2], synthetic latex[3], polyurethanes[4], have been studied in order to enhance and improve the properties of composite material.

The main purpose of this work is to develop new composite materials that can meet the requirements of environment protection, economy of raw materials and the production of higher quality materials in terms of physical and chemical as well as mechanical proprieties. The waste leather particles were incorporated into a mixture of polyvinyl resins according either dry or wet processes.

The chemical structure of the obtained composite has been analyzed by Fourier Transformer Infrared Spectroscopy (FTIR). Several mechanical tests were used in this work to determine the properties of leather composite, such as tear strength, thickness and tensile strength.

Key words: Leather wastes, Valorization, Composite material

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Preparation of Nanocomposite dispersions Based on polyvinyl acetate and Cellulose nanofiber by Pickering suspension polymerization

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Polymerization using Pickering emulsion droplets as reaction vessels is being developed to become a powerful tool for fabrication of hybrid polymer particles. In this work, Pickering suspension polymerizations using cellulose nanofiber (NFC) as a sole stabilizer and vinyl acetate as monomer have been successfully accomplished. This approach led to the production of PVA beads with size between 300 to 800 nm and that were coated with NFC. After separation by filtration the PVA beads were compressed molded in the form of a nanocomposite film.

The presence of cellulose nanofiber (NFC) at a content ranging from 1 to 10% (with respect to monomer during was shown to reduce the droplet aggregation during the polymerization reaction and behave as a protective colloid. Scanning electronic observation has confirmed the binding of NFC to the polymer particles. The mechanical and optical properties of the nanocomposite were investigated by dynamic mechanical analysis (DMA) and transmittance measurement. The presence of NFC was shown to enhance the stiffness and the strength of the PVA, confirming the strong reinforcing effect brought by NFC inclusion.

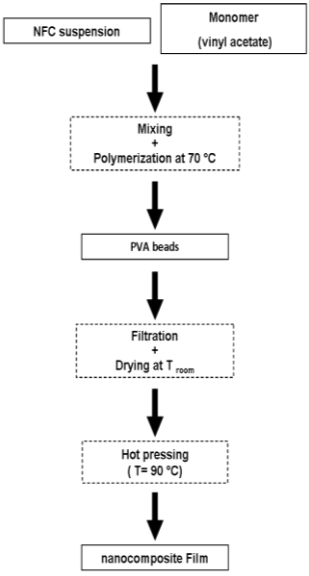
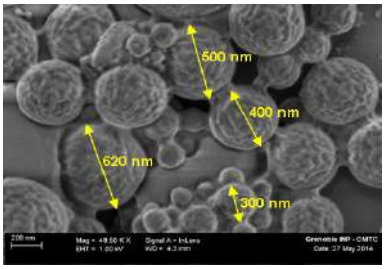


Fig: Flow chart of the experimental procedure for the preparation of the nanocomposite



Quantum dots-imprinted polymers with size and shell-selective recognition properties

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The research in the detection of toxic nanoparticles disseminated in the environment has become an important societal challenge because of their impact on health. In this context, we have extended the approach of molecularly imprinted polymers to nanoparticle-imprinted polymers in order to detect selectively and specifically quantum dots (QDs). The imprinting concept consists in creating cavities of roughly the same size and shape as that of the nanoparticle template in a cross-linked polymer matrix. These cavities formed in the polymer are complementary, both sterically and chemically, to the template. The bulk QDs-imprinted polymers (QD@IPs) were prepared by photopolymerization of a prepolymer mixture composed of methacrylic acid (MAA) as the functional monomer, ethylene glycol dimethacrylate (EGDMA) as the cross-linker and azobis-isobutyronitril (AIBN) as a photoinitiator, in the presence of QDs. The QDs were then removed from the polymer matrix by immersing the QD@IPs in aqueous acetic acid, breaking the interactions between the target QDs and the imprinted cavity. The recognition ability of QD@IPs was demonstrated by photoluminescence spectroscopy, reveling excellent size and shell-s**e**lective properties. The detection limit was found to be better than 1 nM of QDs in water.

Key words: Molecularly imprinted polymers, photopolymerization, quantum dots, Fluorescence.

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Detection of Trace Heavy Metal Ions Using Sodium Alginate Modified Electrodes

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Single-walled carbon nanotubes and alginate (SWNTs/SA) composite have been used for modification of glassy carbon electrode (GC).The modified electrode was employed for the sensitive determination of metal ions using differential pulse anodic stripping voltammetry (DPSV). First the carbon nanotubes were mixed with sodium alginate (SA) and deposited on electrode surfaces. Then, heavy metals ions were accumulated on the alginate - carbon nanotubes electrode. The results showed that the modified electrode exhibited high sensitivity and good reproducibility for detection of Pb^{2+}, Cd^{2+} and Cu^{2+} ions.

Keywords: Single-walled Carbon Nanotubes, Sodium Alginate, Heavy Metal Ions, Differential pulse voltammetry

LOCALIZED ELECTROGRAFTING OF MONOMERS ON METALLIZED SUBSTRATES USING AN INTEGRATED ELECTROCHEMICAL AFM PROBE

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A combination of SECM with other scanning probe microscopy techniques, such as atomic force microscopy (AFM) has shown great promises for directing localized modification purpose, which is of great interest for chemical, biological or technical applications. Those combined methods could offer an alternative manufacturing process to the currently used methods primarily based on lithography steps.
The present work shows the potential of a local conducting probe to induce electrochemically a non conducting organic grafting (called electrografting) in the direct mode on a conducting substrate with an electrochemical AFM (el-AFM) [1-3].
By combining the diazonium/vinylic monomers electrochemistry and the el-AFM tool in dynamic mode, we were able to draw localized electrografted lines on a gold substrate with a submicrometer lateral resolution. The resulting thin films were characterized by topographical AFM analysis and by optical microscopy.

Key words: AFM, Electrografting process, Thin films, Nanotechnology.

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Analytical modeling for organic thin film transistors (OTFTs): Effects of channel widths and thicknesses of active layer application to the 6,13(triisopropylsilylethynyl) pentacene

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The TIPS-pentacene transistors with various channel widths and different thicknesses of the active layer (TIPS-pentacene: 300 nm and 135 nm) were fabricated and photo characterized. The photo-response and gate field dependence of the charge transport characteristics of the TFTs were studied. The threshold voltage values of the TIPS-pentacene (300 nm) transistor shift from a negative value to positive value with light illumination, while the threshold voltage values of the TIPS-pentacene (135 nm) transistor shift from a smaller negative value to a higher negative value with light illumination, which can be attributed to the well-known photovoltaic effect resulting from the transport of photogenerated holes and trappings of photogenerated electrons near the source electrode in organic phototransistors. The different electrical parameters of the two thin film transistors based TIPS-pentacene (300 nm) and (135nm) with channel widths 1500µm and 1000 µm, respectively were extracted. Finally, using extracted parameters we based on the MTR model; we developed an analytical model to reproduce the experimental I_{ds} (V_{ds}) characteristics of organic thin film transistors based TIPS-pentacene.

Key words: TIPS-pentacene transistor, Photoresponsivity, MTR model.

Chemical modification onto PES membranes by grafting PAA in an aqueous medium

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The aim of this work is toimprove the surface modification of PES membrane by radical grafting polymerization.

The surface modification of porous PES membranes by graftpolymerization of PAA wasperformedusing radical polymerizationtreatment as initiation process.

The grafting polymerization on the PES membrane matrix was developed in the aqueous medium, ammonium persulfate($(NH_4)_2S_2O_8$) wasusedas initiator, AcrylicAcid (AA) wasused as monomerand temperature was varied from T = 60°C to T = 90 °C.

The surface and sub-layer morphologies of the modified PES-gr-PAA membrane were analyzed by ATR- FTIR, scanning electronmicroscopy (SEM), atomic force microscopy (AFM), X-Ray Diffraction (XRD) and thermogravimetricanalysis (TGA).

The ATR-FTIR spectra, SEM and AFM images confirmedthat the modification on the PES membrane surface wascarried out by graftingpolymer of acrylicacidmonomers.

The results obtained show that AA may be used for the preparation of modified membrane functionalized with carboxylic groups.

Role of polymers in the stabilization of poorly soluble drug

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The poor aqueous solubility and dissolution rate of active pharmaceutical ingredient (API) is one of the biggest challenges in pharmaceutical industrial [1].
One of the most successful ways to solve this problem is to improve the drug release of such pharmaceutical solids by developing an amorphous form [2]. The higher solubility of amorphous solids is due to their higher energy and molecular mobility compared to their corresponding crystalline counterpart.
However, the high energy and molecular mobility also make amorphous solids physically unstable. During manufacturing operations and/or storage amorphous forms are likely to revert into the stable or a metastable crystalline form if they are not adequately stabilized.
In order to improve the stability of an active pharmaceutical ingredient (API) in the amorphous state, a well-known strategy consists in co-milling it with a polymeric excipient to produce an amorphous dispersion.
In this work, we investigate the physicochemical properties of binary amorphous dispersions formed by poorly soluble Atorvastatin calcium and polymeric excipient (polyvinylpyrrolidone, polyethylene glycol and hydroxypropylmethyl cellulose), prepared by ball milling method.
Co-milled systems were characterized by powder X-ray diffraction; Differential Scanning Calorimetry and Fourier Transform Infrared (FT-IR) spectroscopy.
The results have shown the formation of amorphous states of Atorvastatin after co-milling with PVP and HPMC during 30 min. In the same conditions, the amorphization of the drug alone has taken about 12 hours of treatment.
Furthermore, the amorphous co-milled mixtures of (ATR+ PVP) and (ATR+ HPMC) were found to be physically stable during storage at 40°C and 75% RH for up to 3 months.

Key words: Atorvastatin calcium; drug stability; polymorphism, co-milling.

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Synthesis and Characterization of some 1,3,4-Oxadiazole Derivatives

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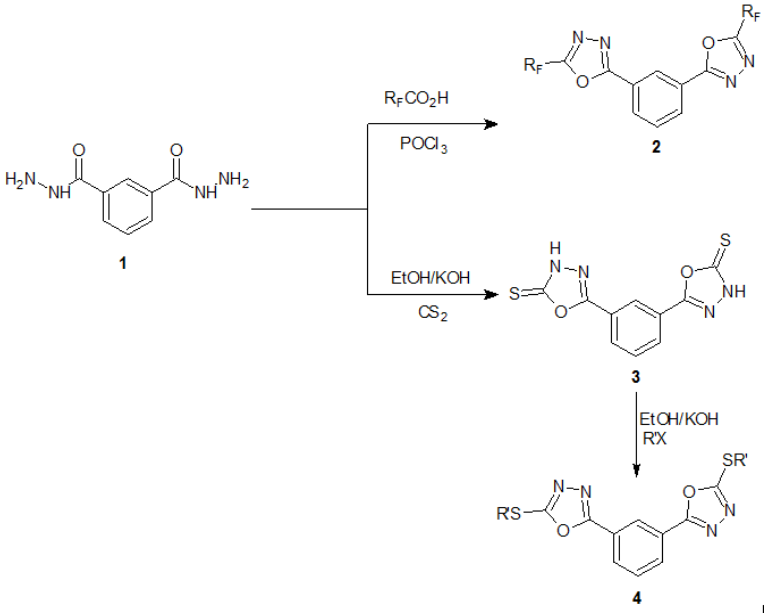
Starting from isophthalic dihydrazide **1**, a series of novel dioxadiazole derivatives **2** and **4** were synthesized. The obtained new compounds were characterized by spectroscopic techniques and are under investigation to evaluate their liquid crystal properties.



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SYNTHESIS, CRYSTAL STRUCTURE, THERMAL ANALYSIS, SPECTROSCOPIC AND MAGNETIC PROPERTIES OF A NOVAL ORGANIC CATION TETRACHLOROCOBALTATE (II)

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The preparation and structural characterization of a new complex $(C_{11}H_{18}N_2O)_2[CoCl_4]_2.H_2O$ (I) are described. The crystal structure determination shows that the title compound crystallizes in the Pccn space group of the orthorhombic system. The unit cell dimensions are: a = 29.090 Å, b = 9.774 Å, c = 11.751 Å, with Z = 4. The crystal structure of this salt was solved by Patterson methods and refined by full-matrix least squares on F^2 to final values of R = 0.0333 and wR = 0.0771. The tetrahedral $(CoCl_4)^{2-}$ anions are connected to the 1-(2-methoxyphenyl)piperazinium cations by hydrogen bonding (N–H…Cl and O–H…Cl) to polymeric chains. The new material was characterized by employing several techniques such as single crystal X-ray diffraction, differential thermal and thermal gravimetric analyses, IR, RMN and UV–vis spectra and fluorescence properties. Moreover, magnetic susceptibility measurements indicate that the compound exhibits weak antiferromagnetic coupling interaction.

Keywords: Transition metal compounds, Crystal structure, spectroscopies, DTA/TGA, Magnetic properties, Photoluminescence

Estimation of optical bandgap and charge transport properties of poly–phenylene–vinylene derivatives: A DFT study

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In this work, the optical absorption properties of poly–phenylene–vinylene containing thiophene– thiadiazole – thiophene in the main chain were investigated by means of Time–Dependant Density Functional Theory (TD–DFT) [1]. The impact of substituent is discussed. $S_1 \leftarrow S_0$ electronic transitions were calculated by combining various functionals. The TD-DFT functionals include B3LYP and CAM-B3LYP with lower fractions of Hartree Fock exchange and M06HF with higher percentage of Hartree Fock exchange. These results were fitted to Kuhn equation for each oligomer in order to obtain a theoretical estimation of the optical bandgap for each polymer [2]. The best result was obtained for TD–M06HF//B3LYP with an error of 0.1 eV relative to the experimental values. The impact of substituent on optical bandgap is pronounced only in the shortest oligomers. Based on Marcus energy electron transfer, intramolecular and intermolecular charge transfer properties were studied.

Key words: TD–DFT, poly–phenylene–vinylene, optical bandgap, electron transfer

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Modeling of Single Molecule Transistor

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In this work, we present a theoretical study of Single Molecule Transistor (SMT) based the density functional theory in conjugation with non-equilibrium green's function (NEGF) formalism on a pentacene device. This device consists of two gold electrodes coupled with a pentacene molecule. The conduction properties of the junction is controlled by a third gold electrode—the gate—. The good functionality and characteristics of our devices are confirmed by simulations using MATLAB simulator. We have presented the influence of various parameters on the single molecule transistor I-V characteristics FET configuration.

Key words: single molecule transistors, organic, FET, Quantum molecular devices.

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HYDROTHERMAL SYNTHESIS AND ELECTROCHEMICAL PROPERTIES OF VANADIUM OXIDE NANOTUBES

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In the past decades, nanostructured materials have been at the forefront of applied research because of their unique properties, which are different from their bulk materials [1]. Vanadium oxide nanotubes (VOx-NTs), one of the most interesting one-dimensional nanoscale electrode materials, have received considerable attention because of their higher discharge capacity and better cycling performance than the corresponding traditional materials [2].

The present communication deals with the electrochemical performances of vanadium oxide nanotubes VOx-NTs. Electrochemical measurements were carried out on thin films deposited on ITO modified glass electrodes and revealed reversible redox behavior corresponding to reduction of vanadium oxide, with charge-discharge cycling corresponding to the reversible lithium ions charge/discharge into the crystal lattice of the nanostructures. In order to identify the electrochemical reaction kinetics of electrode materials, EIS measurements were carried out for 50 cycle in the frequency range between 0.01 Hz and 1 MHz. Nyquist plots consisted of a small intercept at high frequency, two partially overlapped semicircles in the high and medium frequency regions and a long low frequency line which corresponds to the Warburg impedance of Li^+ diffusion. Thus, the EIS curves were fitted with the equivalent circuit in order to found Warburg parameter and to evaluate diffusion coefficient value ($D_{Lithium}$). The $D_{Lithium}$ is found to be varying between 5.64×10^{-9} and 1.47×10^{-10} cm^2 s^{-1}.

Key words: Nanocomposite; Electrochemical properties.

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ULTRASONIC ACTIVATION OF SUZUKI CROSS-COUPLING REACTION CATALYZED BY NICKEL

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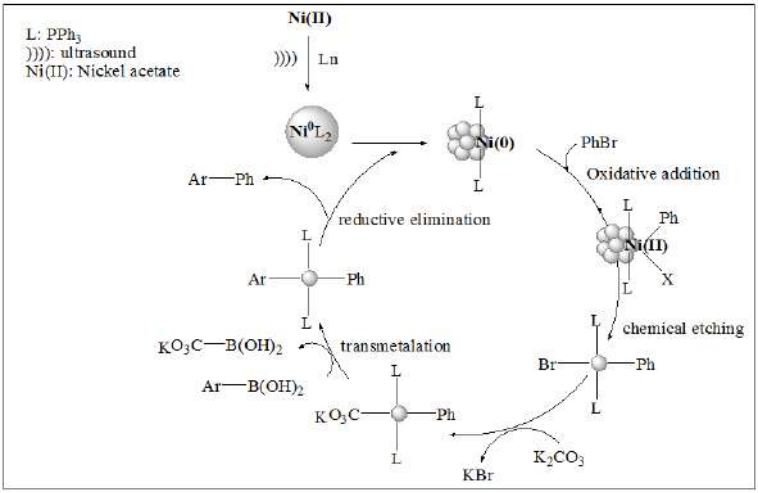
Effect of ultrasound on the Ni(0) catalyzed reaction of arylboronic acid with halobenzenes was investigated. The effect of catalyst, base as well as solvent was evaluated. Heterogenous reaction of aryl bromide with different arylboronic acids, catalyzed by Ni(II) and K_2CO_3 as the base in imethylformamide :water mixture resulted a high yields of cross-coupling products. Reaction time of sonochemical reaction [1] was 8 minutes while 10 h of reflux was necessary to achieve comparable results. Bromobenzenes gave best results using aqueous solution of $Ni(OAc)_2$ as the catalyst, potassium carbonate as the base in toluene:water two phase system using Aliquat-336 as PTC catalyst The regioselectivity of the studied reaction, in each case, was based on the ^1H NMR data. Therefore, all the results can be explained by the following mechanism.



Proposed mechanism for the Suzuki cross-coupling reaction catalyzed by Nickel under ultrasound.

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SYNTHESIS, CRYSTAL STRUCTURE, PHYSICO-CHEMICAL CHARACTERIZATION AND DIELECTRIC PROPERTIES OF A NEW ORGANIC MATERIAL 1-BENZHYDRYLPIPERAZINIUM TARTRATE

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A new single crystal of organic material, 1-benzhydrylpiperazinium tartrate ($C_{17}H_{21}N_2$) ($C_4H_5O_6$) was synthesized and characterized by single-crystal X-ray diffraction. It crystallizes in the $P2_1$ of the monoclinic system. The grown crystal was characterized by FT-IR which confirms the presence of the principal bands assigned to the internal modes of cations and anions in the title compound. The placement of carbons was determined using ^{13}C NMR analysis. The optical band gap was calculated and found to be 3.46 eV. The thermal properties were investigated by differential scanning calorimetric analyses. Different molecular motions are separated via dielectric relaxation spectroscopy. The study of dielectric behaviour as a function of temperature reveals one anomaly at 363 K. The dielectric study, the (AC) electrical conduction and the impedance spectroscopy confirm the observed transition. Besides the impedance spectroscopy analysis reveal that the conduction in this material is due to a hopping process. The compound was screened its activity as antioxidants using DPPH (2,20-Diphenyl-1-picrylhydrazyl) and ABTS (2,20-azinobis-(3-ethylbenzo thiazine-6-sulfonic acid)) methods.

Keywords: Organic material, Differential scanning calorimetry (DSC), dielectric properties, conductivity measurements, antioxidant activity.

STRUCTURE, SPECTROSCOPIC, ELECTRICAL PROPERTIES AND ANTIOXIDANT ACTIVITY OF A NEW ORGANIC MATERIAL 2-METHYLPIPERAZINUM MALEATE

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A new single crystal of organic material, 2-methylpiperazinium maleate $(C_5H_{14}N_2)(C_4H_3O_4)_2$ was synthesized and characterized by single-crystal X-ray diffraction. It crystallizes in the $P\bar{1}$ of the triclinic system. The grown crystal was characterized by FT-IR which confirms the presence of the principal bands assigned to the internal modes of cations and anions in the title compound. The placement of carbons was determined using ^{13}C NMR analysis. The optical band gap was calculated and found to be …eV. The thermal properties were investigated by differential scanning calorimetric analyses. The study of the impedance spectroscopy analysis reveal that the decrease of the resistance versus temperature is in agreement with the important contribution of conductivity in this material. Different molecular motions are separated via dielectric relaxation spectroscopy. The compound was screened its activity as antioxidants using DPPH (2,20-Diphenyl-1-picrylhydrazyl) and ABTS (2,20-azinobis-(3-ethylbenzo thiazine-6-sulfonic acid)) methods.

Keywords: Organic material, Differential scanning calorimetry (DSC), electrical properties, conductivity measurements, antioxidant activity.

Posters
Communications' Abstracts

Session 3
Saturday 27 March

DROP IMPACT PHENOMENOM: EFFECT OF KNITTED FABRICS CONSTRUCTION

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In this paper, we present the results of an experimental study of determining the impact of water drop on surface of knitted cotton fabrics at different construction parameters. All experiments were carried out using water drop with the same free fall high. Digidrop with high resolution camera is used to measure the different parameters characterizing this phenomenon.
Results show an important effect of the knit structure on the drop profile and the spreading behaviour: In fact, an important drop deformation at the surfaces impact was observed.
Then, for jersey knitted fabric made out of cotton yarns, an increase of the tightness factor causes a decrease in penetration and increase in the spreading rate. Therefore, the impact energy was modified and the drop shape was affected, which directly influenced the spreading rate.

Key words: Drop Impact, knitted cotton fabric, Knit structure, Spreading behaviour, Penetration, tightness factor, drop shape.

EVALUATION OF SILICA NANOPARTICLES IN THE TREATMENT AND PROTECTION OF ARCHITECTONIC AND ARTSTIC SURFACES

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The growing interest in the conservation of stone monuments encourages the development of consolidation and water-repellent materials. The aim of the current work to evaluate the effectiveness of nanosized particles of silica (SiO_2) dispersed in ethyl silicate consolidant, commonly used as a water-repellent/consolidant for sandstone monuments affected by different kinds of decay. The nanocomposites obtained by dispersing the silica nanoparticles in polymeric matrices (SILRES® BS OH 100) by solution method, in order to obtain a new nanocomposite, with hydrophobic and consolidation properties, to improve the physical and mechanical properties of the stone material.
Some tests were performed in order to estimate the superficial consolidating and protective effect of the treatment; the selected products were tested under thermal ageing. Scanning electron microscopy examination was performed to evaluate penetration depth, re-aggregating effects of the deposited phase and the surface morphology. Improvement of stone mechanical properties were evaluated by compressive strength tests, Changes in water-interaction properties were evaluated by water absorption capillarity measurements and colorimetric measurements were used to evaluate the optical appearance.
All the results confirmed that, silica / polymer nanocomposite is efficient material for the consolidation of artistic and architectural sandstone monuments, SEM showed that the applied nanocomposite is completely compatible, enhance the effectiveness of consolidant and protective materials. They induce substantial changes of surface morphology of the coating layer and counter the physical damage observed during artificial weathering, in addition, coatings containing SiO_2 nanoparticles improved the stone mechanical properties, good water-repellence obviously obtained. Alteration of the original features has not existed compared to the samples treated with pure SILRES® BS OH 100 without silica nanoparticles.

Keywords: Silica nanoparticles, consolidation, nanocomposites, sandstone, artificial weathering, Colorimetric measurements, compressive strength.

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Phosphate functionalized monolith: Application to flow-through cationic dyes complexation

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Pollution is a worldwide issue and is continuously amplified by human activities. Industrial waste was spread directly into the aqueous environment through various means. Many efforts have been performed in order to purify the contaminated water. The adsorption technique is widely used to remove certain types of pollutants, especially those which are not available for biodegradable process. Removal of cationic dyes from wastewater such as textile wastes, printed papers, leather and pharmaceutical either other industries present a majors source of dyes. In this task, monolithic polymer matrices was prepared by photo-initiated copolymerization of N-acryloxysuccinimide (NAS) and ethylene glycol dimethacrylate (EDMA) before being functionalized in a second step by phosphate groups in order to design materials for capture of Methylene Blue dye. The functionalization is indirectly carried out by photografted phosphorus monomer. The success of the functionalization of the monolithic matrix by the phosphate of ethylene glycol methacrylate was evidenced by a simple comparison concerning the percentage exchange of the methylene blue under flow complexation. Primary results carried out by UV measurements showed the amount of methylene blue complexed with the phosphate groups of the poly (ethylene glycol phosphate methacrylate) grafted.

BIOPOLYMER/CLAY NANOCOMPOSITES AS POTENTIEL SYSTEMES FOR DRUG DELIVERY

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Nowadays, modifications of clays have become increasingly important because it can be used to prepare polymer/clay nanocomposites and applied in some new applications such as adsorbents of organic pollutants in soil, water and air, rheological control agents, paints, medicine. Up to now, the majority of works dealing with organoclays was addressed to study the interactions between clays and quaternary ammonium salts, or to the preparation of polymer- based nanocomposite and few studies directly investigated the intercalation of polymers inside clays interlayer **[1].** Recently, the adsorption of polyethylene glycol copolymers onto Na^+-montmorillonite has been reported as a possible surface treatment to facilitate the formation of clay polyethylene nanocomposites**[2].**

In this work a series of PEG/MMT hybrids were synthesized using solution intercalation method. The effect of three parameters, such as time, temperature and initial concentrations in solution was studied.

A full microstructural characterization of the synthesized nanocomposites polymers/clays by XRD, FT-IR, TGA and DSC was performed. The XRD patterns and the FTIR spectra of the MMT/PEG composites revealed that PEG was successfully intercalated into the galleries of MMT in all of the composites since the basal spacing of the modified clay minerals was increased. The interaction between PEG and silicates were found to be rather strong as revealed by the FTIR study. The TGA study revealed that the nancomposites had an improved thermal stability in comparison to virgin PEG.The effect of the introduction of the clay on the cristallisation temperature (Tc), melting temperature and cristallisation degree of PEG in the nanocomposites was prospected by DSC.

It was found that the nanoclay particles act as nucleating agent and increase the cristallisation temperature of PEG.

Key words: PEG, composites, Clay, montmorillonite, intercalation.

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ELABORATION AND COMPATIBILIZATION OF BLEND POLYMER BY USE OF COPOLYMER PEP

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The work developed in my study focuses on elaboration and characterization of a newclass of polymers..Blends polypropylene / ethylene-diene-monomer have been studied formany years. Mixes polypropylene matrix have attracted the attention of academic and industrial researchers, because of the commercial interest is improving the impact resistance of the polymer at low temperatures.
To this end, the way which comprises mixing the polypropylene with a compound of lower glass transition temperature or higher ductility (elastomer, PE, ...). in our case it is particles elastomeric EPDM to remedy the incompatibility problem between PP and EPDM, two compatibilizers were used: block copolymer 'PEP' and copolymer 'PP-g-MAH' to improve the interfacial adhesion between the two phase, and to improve the rigidity of the material, inorganic particles of silica has been added. These lead to materials with high mechanical properties both in terms of rigidity in terms of ductility and impact resistance. The study of mechanical properties such as tensile strength and impact strength show typical as hybrid materials. The introduction of the modified and not modified filler has allowed to improve rigidity of composites. In addition, the use of compatibilisants has allowed to improve interfacial adhesion of the phases in presence by giving mechanical properties higher than those of the pure mixtures.

Key words: blend of polymer, copolymer, compatibilizer, interfacial adhesion

MODIFICATION OF SILICA PARTICLE USING IN BLEND OF POLYMER

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The work developed in my stady focuses on improving the mechanical and morphological properties and of a new class of polymers.. The polymers that currently dominate the plastics market can not satisfy all applications and expectations of potential users. However, if the synthesis of new macromolecules is quite rare and sometimes too expensive, a large scientific and industrial interest is now focused on the modification and mixture of existing polymers. The ultimate result is to obtain new materials with new or improved properties. The strategy is to improve compatibility by using interfacial agents and mineral particles modified on the surface. the effect of the incorporation of a surface treated and without treatment of mineral filler on the mechanical, morphological and thermal behavior of composite systems(LDPE/EPDM). The objective is to combine at the same time the advantages of a reinforcing filler and rubber particles SiO_2. It is a question of leading to materials having high mechanical properties as well in terms of rigidity as in terms of ductility and impact resistance. The investigation of the linking coupling agent on the particles of silica was studied by Fourier transform infrared spectroscopy (FTIR). The characterisation has revealed the effect of the treatment applied to the surface of the solide. The study of mechanical properties such as tensile strength and impact strength show typical as hybrid materials. The introduction of the modified and not modified filler has allowed to improve rigidity of composites. In addition, the use of compatibilisants has allowed to improve interfacial adhesion of the phases in presence.

Key words: Polypropylene, Polyethylene low density, nanocomposites, coupling agent, compatibilizers, silica.

Amberlite XAD-4 fonctionalized with Pyrocatechol Violet and its application to the extraction of Zinc (II)

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Industrial waste streams contaminated with heavy metal ions are frequently encountered in practice. Such streams often containing solutions of metal ions such as copper, nickel, zinc, cobalt, chromium, lead, mercury, and aluminium may be produced as effluents from various industrial processes. Conventional chemical treatment methods including precipitation, solvent extraction, ion exchange, adsorption, electrochemical recovery, membrane separation and other techniques are frequently used for their removal from environmental matrices. These techniques may be ineffective or uneconomical because of several technical and environmental constraints.

The preconcentration method utilizing solid sorbents is considered to be superior to liquid-liquid extraction in terms of simplicity, reliability and the ability to obtain a high enrichment factor. Furthermore; it reduces consumption of and exposure to solvent and disposal costs. A number of different solid sorbents such as naphthalene, cellulose, C_{18}-bonded silica membrane discs, silica gel, glass beads, silica frit, metal hydroxides, activated carbon and polymer supports have been investigated for the preconcentration of trace metals.

Of all the preconcentration methods, chelating resins sorption method is one of the most effective multi-element preconcentration methods because it can provide more flexible working conditions together with good stability, selectivity, high concentrating ability, high capacity of metal ions and simple operation. However, at the same time, the synthesis resins by the reaction with a commercial resin and a suitable chelating agent for trace element determination and concentration are ever increasing.

A new grafted polymer has been developed by the chemical modification of Amberlite XAD-4 polymeric matrix with pyrocatechol violet (PV). The resulting resin has been characterised by elemental analysis, IR spectra and textural analysis (BET). The resin was used for the preconcentration of Zn (II) prior to its determination by flame atomic absorption spectrometry (AAS). The effect of various physico-chemical parameters during the quantitative extraction of Zn (II) by the resin phase are studied and optimized. The phase exchange kinetic studies performed of Zn (II) revealed that equal 60min was sufficient for reacling equilibrium metal ion sorption. Sorption is quantitative in the pH range of 5 – 5.5 (recovery 98 – 99%).

Key word: Amberlite XAD-4, Pyrocatechol violet, Zinc, Sorption, Chelating resin.

PROGRESS IN AMORPHOUS POLYSTYRENE WEAR COMPREHENSION

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Polystyrene (PS) is a thermoplastic widely used in materials engineering applications, e.g. materials handling and transport processing (e.g., screw, pneumatic and hydraulic convey) [1]. In many of these industrial processes PS is used as granulates and subjected to various stressing conditions. However, the whole description of chemical, physical, rheological and interfacial origins of the granule damage is not yet entirely explored [2].
This wirk focuses on the attrition analysis induced by the rub of hemispherical PS particles against smooth and functionalized silicon walls. Indeed, a homemade tribometer, shown in the figure below, was used to carry out a single slide of PS hemispherical particle onto different silicon walls.

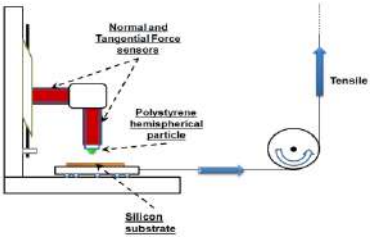

Figure: A homemade original tribometer for attrition experiments.

Several experimental and structural factors affecting attrition of polymeric particles such as velocity, the applied normal force, polymer molecular weights, and the wall surface energy, are discussed.

Key words: Wear, attrition, polystyrene, interface, surface.

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Mechanical, thermal ageing, UV ageing and chemical properties of Polypropylene/Polychloroprene rubber blend

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The objective of this work is to study the effects of adding polychloroprene (PCP) rubber to a blend prepared by melt extrusion in which the polypropylene (PP) is the major component. The loading of the elastomeric component (PCP) was 10, 20, 30, 40 and 50 phr (parts per hundred parts of rubber). The blend was subjected to mechanical testing, thermal ageing water uptake and toluene dissolving.

The results obtained show an acceptable decrease of the blend tensile strength and a valuable increase of the elongation at break when the content of the Polychloroprene is equal to 10 wt. %. The results obtained were almost the same concerning the tensile strength and elongation at break after thermal ageing of the samples. The shore A hardness decrease slightly as the percentage of polychloroprene increase until 30 phr, afterwards, the hardness decrease notably until 50 phr. The water uptake is very low for all the formulations and remains lower than 0.1 %. The resistance to dissolution by toluene is very good because the weight decrease of the samples increase slightly as function of polychloroprene loading and does not exceed 2 % up to 50 phr.

Keywords: Polypropylene; polychloroprene rubber; mechanical properties; thermal ageing; chemical properties.

STUDY OF THE CHARACTERISTICS OF A FOOD PAKAGING BASED WITH BIODEGRADABLES POLYMER MODIFIED WITH FIBER OF DATE STONES.

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Within the framework of sustainable growth, the use of biodegradable polymers as an alternative to synthetic polymers seems to be the best solution that could resolve waste disposal problems. However, the major drawback of this new technology is the relatively high cost compared with materials synthesized from petroleum **[1].**

In this research, we succeeded to develop the palm date stones by adding them as fiber reinforcement in the synthesis of biopolymers **[2]**. The main aim of this work was to improve the chemical-physical and mechanical properties of the alimentary commercial polymer **[3].**

The mater-Bi bag was used as reference **[4].** The solvent effect shows a slight modification of the mechanical and alimentary properties. The DSC analysis shows a crystallinity decrease by increasing the percentage fiber. On the other hand, this increase results in fewer mechanical properties accompanied by an increase in the ratio of heavy metals **[5].** Food analysis shows a rather high overall migration due to poor dispersion of the fibers to the surface of films [6].

Key words: Bio composite, Date stones. Natural fibers, overall migration, food packaging

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THERMAL, MECHANICAL AND MELT PROPERTIES OF PLASTICIZED PVC-MONTMORILLONITE COMPOSITES

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In this study, PVC/Montmorillonite (OMMT) composites with various clay contents were prepared by melt processing using two methods. The first one consists of the direct mixing of all the formulations components at the same time on a two roll mill. While in the second method the different quantities of the OMMT were mixed with 7 phr of Methylmethacrylate-Butadiene-Styrene (MBS) in a brabander internal mixer as a first step, then the obtained mixture was mixed with the PVC and the other formulations components on a two roll mill.
The obtained composites showed a slight yellowness discoloration while PVC alone kept good processing stability. It is suggested that the decomposition of the quaternary ammonium modifier and the following catalytic effects on the dehydrochlorination of PVC are the reasons for the discoloration of the PVC/OMMT composites [1]. Discoloration of all the composites was investigated by UV-vis spectroscopy, the gelation ratio of the different formulations was studied using differential scanning calorimetry. All the composites were characterized using infrared spectroscopy, thermogravimetric analysis, tensile testing and atomic force microscopy.

Key words: PVC, Montmorillonite, Composites, Gelation ration, Thermal properties.

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PREPARATION AND CHARACTERIZATION OF THE CELLULOSE BASE BIOFILM AND ITS DERIVATIVES CROSS-LINKED WITH GLUTARALDEHYDE AND / OR MODIFIED WITH GLYCEROL

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Gelatin and carboxymethylcellulose are biodegradable polymers. They are used as excipients for a long time in the pharmaceutical industry. They enter the manufacture of suppositories, hard and soft capsules. They are biocompatible, making them good candidates for the production of adhesives hemostatic biofilms.

For this study, we were interested in the preparation of different biofilms gelatin associated with carboxymethylcellulose. Biofilms are obtained by solubility of grains in the presence and absence of glycerol at an adequate temperatures. Drying is carried out in the open air on hydrophobic supports made of polystyrene; however, it leads to the formation of too fragile films.

The reaction of the crosslinking in the presence of glutaraldehyde in water has proved easy and quick. It is done at room temperature. By cons, after drying, biofilms are deformed and represent a considerable shrinkage.

The addition of glycerol to the biopolymer solution resulted in a decreased fragility and withdrawal.

Key words: gelatin, carboxymethylcellulose, glutaraldehyde, glycerol.

MECHANICAL CHARACTERISATION OF DATE STONE FLOUR REINFORCED POLYSTYRENE COMPOSITE

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Abstract: This work aims to study the effects of date stone flour (DSF) on mechanical properties of polystyrene (PS) composites. DSF was added to the PS matrix at loading rates of 10, 20, and 30 wt %. Several composite formulations of polystyrene/date stone flour (PS/DSF) were melt-blended together by extrusion process. The results showed that tensile strength and percentage elongation of the composite exhibited a gradual decrease with increase in filler loading while hardness showed gradual improvement with increase in filler loading.

Key words: polystyrene, naturel fiber, mechanical properties, composites.

Polyoxometalate $[PMo_{11}O_{39}]^{7-}$ / carbon nanocomposites for sensitive amperometric detection of nitrite

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The polyoxometalate $[PMo_{11}O_{39}]^{7-}$ was synthesized and used as catalyst for the reduction of nitrite ions. This mono-lacunary keggin anion, cited as PMo_{11}, was confined within a matrix of either oxidized single-walled carbon nanotubes (ox-SWCNTs) or reduced graphene oxide (rGO) on glassy carbon (GC) electrodes to improve the electron transfers. Furthermore, an intermittent chitosan (CS) layer was tested for improved stability of the PMo_{11}/carbon composite. At total, five different configurations were characterized using cyclic voltammetry and evaluated in an amperometric sensor setup for nitrite detection where the amount of the different components were optimized. The configuration using only SWCNTs and PMo_{11} on GCE showed best sensitivities of up to 44.41 mA $Lmol^{-1}$, a high reproducibility. Furthermore, a linear range of 3.0 10^{-5}-1.6 10^{-2} $molL^{-1}$ with a detection limit of 3.0 10^{-5} $molL^{-1}$ was obtained. The final sensor setup also showed a very satisfying selectivity, i.e. no electrocatalytic activity towards similar ions such as nitrates, phosphates, or perchlorates at an applied potential of -0.15 V vs SCE.

Keywords: Nitrite sensor, Single-wall Carbon Nanotubes, Reduced Graphene Oxide, Monolacunary Keggin anion

Modification of the physicochemical properties of polymer PANI doped with ZnO nanoparticules : A multinuclear (^{1}H, ^{13}C and ^{17}O)NMR study

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Conductive polymers have generated a great interest because of their physical and chemical proprieties. The polyaniline (PANI) is a conductive conjugated-π polymer. When the conduction mechanism is through hole, it was used in various applications due to its chemical stability, electrical and ease of synthesis and doping. The aim of this work is to study the electrical and magnetic properties of the polymer doped with different concentrations of magnetic nanoparticule (ZnO) using multinuclear magnetic resonance (NMR). In this work, we present the NMR spectra of pure PANI and of the hybrid material (PANI-ZnO), respectively. The detection of changes of physico-chemical proprieties of the polyaniline is deduced from the different NMR data on both pure and doped PANI.

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Aminoalkylated Merrifield Resins Reticulated by Tris-(2-chloroethyl) Phosphate for metallic ions Extraction from aqueous solutions

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We aimed to synthesize novel substituted polymers bearing functional groups to chelate heavy metals during depollution applications. Three polyamine functionalized Merrifield resins were prepared via ethylenediamine (EDA), diethylenetriamine (DETA), and triethylenetetramine (TETA) modifications named, respectively, MR-EDA, MR-DETA, and MR-TETA. The aminoalkylated polymers were subsequently reticulated by tris-(2-chloroethyl) phosphate (TCEP) to obtain new polymeric resins called, respectively, MR-EDA-TCEP, MR-DETA-TCEP, and MR-TETA-TCEP. The obtained resins were characterized via attenuated total reflectance Fourier transform infrared spectroscopy (ATR-FTIR), elemental analysis (EA), and thermogravimetric (TGA), thermodynamic (DTA), and differential thermogravimetric (DTG) analysis. The synthesized resins were then assayed to evaluate their efficiency to extract metallic ions such as Cd^{2+}, Cu^{2+}, and Fe^{2+} from aqueous solutions.

Key words: functionalized polymer, extraction of metallic ions.

Synthesis and characterization of Au-immobilazed onto polysaccharides reduced graphite oxide sheets

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Graphene typically refers to a monolayer of carbon atoms packed into a honeycomb crystal structure, which are one-atom thick of sp2 bonded carbon, thus yielding a two-dimensional array of carbon arranged in a hexagonal structure. The fundamental properties of the single flat monolayer of graphite have been intensively investigated after the successful isolation of graphene layers by simple mechanical exfoliation [1-2]. Functionalising the carbon substrate with polymers includes the well known 'grafting to' and 'grafting from' approaches. The classical approach first involves aggressive oxidation of graphite according to the Hummers' method [3] leading to the formation of graphite oxide (GO) with a highly oxygenated surface bearing high density of epoxy and hydroxyl groups on both sides of the basal carbon plane and carboxyl groups around their edges. For example, we have demonstrated that the treatment of graphite oxide with organic alkoxy silanes (e.g., acryloxy propyl trimethoxysilane (APTMS) and triethoxysilane-terminated PDMS) and radical initiators can lead to the derivatization of both the edge carboxyl and surface hydroxyl functional groups [4,7]. Cellulose is a polysaccharide exhibiting excellent properties such as nontoxicity, hydrophilicity, biocompatibility, and biodegradability so that can be used in the functionalization of graphene for potential applications in the areas of biocomposites, biomedical areas, and biosensors. In addition, Au nanoparticles (AuNPs) are often employed in electronic materials, the detection of heavy metal ions, and catalysis. However, nanoparticles (NPs) tend to aggregate when fabricated alone and therefore a supporting material is needed to grow and anchor the metal nanoparticles that is why GO has been used as a support material for many types of NPs including Au, Pd, Pt [8-9]. Experiments reported here for cellulose assess the ethylenediamine nucleophilic addition onto carboxylic acid and epoxide groups located on the GO sheets' surface. Then, chloro-cellulose and chitosan were grafted onto the formed amino-grafted graphite oxide sheets and doped by gold nanoparticles. Fig. 1 and 2 shows the morphology and the dispersion of the differents simples respectively. In the case of chitosan the grafting procedure involves an amide linkage with GO. The powder electrical conductivity of the resulting materials were studied as a function of temperature.

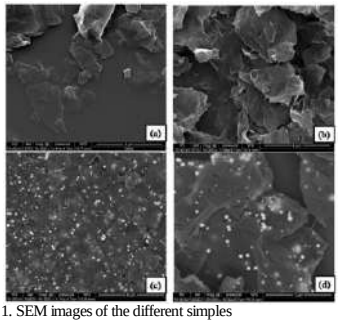

Fig. 1. SEM images of the different simples

Fig. 2. Dispersion of the different simples in DMF: (C=0.35mg/mL)

Key words: composite materials; chemical synthesis; polysaccharides; electrical properties

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Chitosan-dithiooxamide-grafted rGO sheets decorated with Au nanoparticles : Synthesis, characterization and properties

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Graphene typically refers to a monolayer of carbon atoms packed into a honeycomb crystal structure, which are one-atom thick of sp2 bonded carbon, thus yielding a two-dimensional array of carbon arranged in a hexagonal structure. The fundamental properties of the single flat monolayer of graphite have been intensively investigated after the successful isolation of graphene layers by simple mechanical exfoliation. Functionalising the carbon substrate with polymers includes the well known 'grafting to' and 'grafting from' approaches. The classical approach first involves aggressive oxidation of graphite according to the Hummers' method leading to the formation of graphite oxide (GO) with a highly oxygenated surface bearing high density of epoxy and hydroxyl groups on both sides of the basal carbon plane and carboxyl groups around their edges. For example, we have demonstrated that the treatment of graphite oxide with organic alkoxy silanes (e.g., acryloxy propyl trimethoxysilane (APTMS) and triethoxysilane-terminated PDMS) and radical initiators can lead to the derivatization of both the edge carboxyl and surface hydroxyl functional groups. Cellulose is a polysaccharide exhibiting excellent properties such as nontoxicity, hydrophilicity, biocompatibility, and biodegradability so that can be used in the functionalization of graphene for potential applications in the areas of biocomposites, biomedical areas, and biosensors. In addition, Au nanoparticles (AuNPs) are often employed in electronic materials, the detection of heavy metal ions, and catalysis. However, nanoparticles (NPs) tend to aggregate when fabricated alone and therefore a supporting material is needed to grow and anchor the metal nanoparticles that is why GO has been used as a support material for many types of NPs including Au, Pd, Pt. Experiments reported here the grafting of Au nanoparticles onto reduced graphite oxide sheets (GO) having attached chitosan chains was investigated through the use of glutaraldehyde and dithiooxamide as linkers. First, the functionalization of graphite oxide sheets by dithiooxamide was accomplished followed by the grafting of chitosan onto the activated graphite oxide sheets in the presence of glutaraldehyde. Finally, the corresponding material was doped with gold nanoparticles after a chemical reduction and their electrical properties were studied as a function of temperature.

Key words: composite materials; chemical synthesis; polysaccharides

ANTIBACTERIAL ACTIVITY AND CHARACTERIZATION OF COTTON FIBERS LOADED WITH SILVER NANOPARTICLES

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An antibacterial support was prepared by loading cotton fibers with silver nanoparticles. This was realized in two steps. The first step deals with the preparation of cotton/Ag^+ by treating cellulosic material with an aqueous solution of $AgNO_3$. The second step consists on the reducing of Ag^+ containing cotton fibers in order to obtain the antibacterial support named cotton/Ag^0. The presence of nano silver particles on the surface of treated cotton support was proved using Fourier Transform Infrared spectroscopy (FTIR) and Differential scanning colorimetry (DSC) analysis. The antimicrobial property of prepared samples was evaluated using five kinds of bacterial stains: Staphy lococus aureus (S.au) ATCC 6538, Bacillus subtilis (B.S) ATCC 6633, Salmonela enteric (S.E) CIP 8039, Candida albicans (C.A) ATCC 10231 and Escherchia Coli (E.Coli) ATCC 8739.

Key words: cotton, Ag nanoparticles, antibacterial activity.

Pressure produced by single and multilayer elastic textile in the therapeutic treatment of venous leg

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This paper presents the first theoretical and practical work on compression therapy using the Laplace law to estimate pressures under the bandages [1]. The logic behind using compression therapy in the treatment of venous ulcers is to provide an external pressure that works gainst the hydrostatic pressure and aids venous blood return [2]. The mode of action is not clearly understood, but the application of external compression by means of elasticity bandages serves to increase the velocity of blood flow within the veins by providing support to the calf muscles. The level of pressure exerted on the leg is a function of the tension and it must be between 12 and 40 mm Hg. There is no evidence that high compression is more effective than moderate pressure for prevention, but the uniform pressure gives results [3]. Three articles are considered: the first with the warp highly-twisted on cotton, the second with the warp on polyamide and the third with spandex wrapped by cotton yarn [4]. Starting from these woven fabrics, three models, E_5, E_6 and E_f have been developed with respective elongations of 108 %, 86 % and 92 % and specific mechanical behavior [5]. The results show that than the single layer bandages develop much higher pressure than the multilayer bandages but the multilayer bandages exert much more uniform pressure than single layered bandages. Obtaining uniform pressure along the length of the leg is a positive result in this treatment.

Keywords: textile; pressure; elastic; weave; veins.

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Dispersion of mineral fillers as barriers to solar radiations in PVC-based formulations

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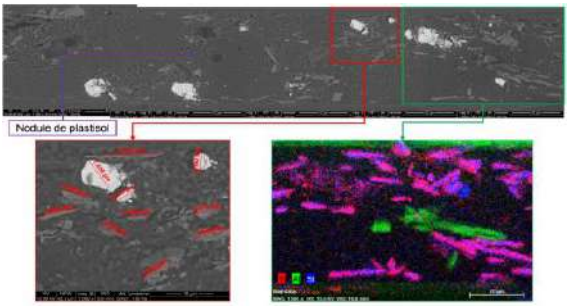
In the frame work of FUI (Fond Unique Interministériel) project; our work aims to develop polymer films having barrier properties against solar radiation. The dispersion of mineral fillers such as Mica, titane, alumina and glass bubbles in PVC plastisol matrix has been studied. Various key parameters of the formulation (fillers nature, concentration, process temperature…) were tested in order to control the morphology, size and the dispersion of the fillers and to obtain the optimum thermal and optical properties of the material. Moreover, the effect of surface modification of the fillers on the dispersion quality has been explored. Preliminary results showed the impact of Mica and Titane concentration and process parameters (film thickness, process temperature) on viscoelasticity and thermal properties of PVC plastisols/ Mica and titane-based composites



SEM observations of Mica and Titane in PVC plastisol matrix

Key words: Films, Solar radiation, PVC plastisol, Mica

COPPER (II) UPTAKE BY NATURAL POLYMERS: PHENOMENON OF ADSORPTION

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Wastewater containing dissolved copper ions and released at different concentrations. This heavy metal in mineral effluent exceeds trace is harmful and carcinogenic for living organisms [1]. The copper ions may be removed from the water or wastewater physically or chemically due to the fact that they are not biodegradable. Several techniques have been proposed for the removal of copper ions from wastewater and water including chemical precipitation, membrane filtration, ion exchange, electrolysis and adsorption [2]. Chitosan is a linear cationic aminopolysaccharide obtained from chitin after deacetylation. It has been used in different field such as textile [3], drug delivery [4], and environmental protection [5]. The present work focuses on the study of the copper uptake by natural adsorbents (chitin, chitosan) powders. Chitosan has a significantly higher capacity of adsorption than chitin due to the presence of chelating groups. The sorption of the metal by both natural polymers was evaluated by intra particle diffusion model at different concentrations of Cu^{2+}; pH of the solution in the sorption process was studied. The sorption of Cu^{2+} by chitin and chitosan is strongly pH dependent, indicating an ion exchange mechanism. Thermal analysis, SEM was used for the detection of the phenomenon of sorption.

Keywords: chitin, chitosan, sorption, copper, intraparticle, wastewater treatment

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EXPERIMENTAL INVESTIGATION OF MECHANICAL AND THERMAL PROPERTIES OF BIO -POLYMERS BASED NEW ECO-COMPOSITES

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In the past few years, there have been a lot of research efforts to use natural fibers and biopolymers so as to produce low cost building materials.

The aim of this study is to investigate the effect of the addition of untreated and alkali treated date palm fibers on mechanical and thermal behaviors of new eco-composites composed of fibers, cement and sand. Lignocellulosic materials and extracted biopolymers were characterized by attenuated total reflection infrared spectroscopy (ATR-FTIR), and scanning electron microscopy (SEM).

The results showed that the thermal conductivity and mechanical properties of the eco-composite decrease by increasing the untreated or alkali treated fibers concentration. As a consequence, one can say that the new eco-composite has a good thermal insulation and acceptable mechanical resistance.

Keywords: Eco-composite, biopolymers, Thermal conductivity, mechanical properties.

Rheological and morphological properties of PP/EVA/Silica ternary blends

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Mixing a polymer with another one is an attractive way to develop new materials. In Fact, the incorporation of nanofillers in immiscible polymer blends has very important role in improving different properties (mechanical, barrier, thermal ...), and in the modification of miscibility and morphology of the blends.

In this study, immiscible Polypropylene/Poly (ethylene-co-vinyl acetate) PP/EVA blends filled with silica nanoparticles (SiO_2) were prepared by mixing in a Haake mixer at a dispersed phase fraction (EVA) 20%. The volume fractions of added silica varied from 1 to 10%.

The morphology and rheological behavior of the system PP/EVA/silica were investigated in order to understand the mechanisms of action of nanoparticles that are based on their localization, their interactions with the polymer components, and how they disperse inside the blend.

Keywords: Immiscible polymer blends, Nanoparticles, Rheology

EXTRACTION AND CHARACTERIZATION OF CELLULOSE NANOCRYSTALS ORIGINATED FROM TUNISIAN ALMOND SHELLS: BIO-SORBENT FOR HEAVY METAL IONS

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The development of cellulose nanocrystals (CNC) has attracted considerable attention in recent decades in many fields of application: Food additives, cosmetics, packaging, controlled porosity membranes, nano- composites and bio-sorbents. Nanocellulose was mostly isolated from the wood, bacteria, marine animals, fiber crops such as cotton and increasingly agricultural wastes [1]. The cellulose nanocrystals are extracted by acid hydrolysis from the purified cellulose [2].

In this context, the objective of our work is the isolation of cellulose nanocrystals (CNC) from Tunisian almond shells. CNC were extracted by acid hydrolysis and subsequently characterized to assess their potential use in industrial wastewater treatments.

The extraction of cellulose by acid hydrolysis nanocrystals was successful. The effect of hydrolysis was studied using different techniques such as Fourier Transform Infrared spectroscopy, scanning electron microscopy, transmission electron microscopy, X-ray diffractometry and calorimetry. Lyophilization of the extracted cellulose provides porous nanoparticles. These particles have a highly crystalline structure (67.5 %) type Iβ and a high thermal resistance. This study shows that cellulose nanocrystals could be an effective bio- sorbent for the removal of heavy metals from aqueous solutions.

Key words: Bio-polymer, almond shell, cellulose nanocrystals, extraction, bio-sorbent.

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Effect of anion type in the electromechanical performance of ionic liquid/poly(vinylidene fluoride) composites

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Low voltage actuators based on poly(vinylidene fluoride) with 10, 25 and 40 % 1-hexyl-3methylimidazolium chloride [C_6mim][Cl] and 1-hexyl-3-methyl imidazolium bis(trifluoromethylsulfonyl)imide [C_6mim][NTf_2] are prepared by solvent casting with the objective of analyzing the effect of anion size in the bending properties. Independently of the IL type and content, its presence leads to the PVDF crystallization into a spherulitic structure and mostly in the β-phase [1]. The addition of IL into the polymer matrix decreases significantly its degree of crystallinity and the elastic modulus. The AC conductivity strongly depends on the IL content on the polymer matrix, but it is also affected by the different anion size.

The bending movement of the IL/PVDF composites is correlated to the degree of crystallinity and ionic conductivity value [2] and the best value of bending response is found for IL/ PVDF composite with 40 wt% of [C_6mim][Cl] at 20V.

Key words: PVDF, Ionic Liquid, Electroactive polymers, EAP.

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Backbone twisting in fluorinated MEH–PPV polymers: Experiment and Theory

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A combined theoretical and experimental study of the structure, optical and photophysical properties of fluorinated (MEH–PPDVF) and non-fluorinated (MEH–PPV) of alkoxy-substituted poly-phenylene vinylene is presented. The ground state (S_0) geometries of oligomers of different chain length are optimized by density functional theory (DFT) using the B3LYP functional. MEH–PPDVF is significantly more twisted than MEH–PPV in S_0, which is due to a pronounced steric effect of fluorine, as previosuly reported [1]. In order to gain further insight into this effect the optical properties at the polymer limit were predicted by extrapolation of the calculated transition energies of oligomers.[2] Different time-dependent (TD) DFT methods were studied to provide an accurate description of the chain length evolution of the $S_1 \leftarrow S_0$ transitions E*vert*, starting from B3LYP optimized geometries using various TD-DFT functionals, i.e. B3LYP, CAM–B3LYP and M06HF strongly overestimates the chain length dependence for both series. The TD– CAM–B3LYP extrapolated polymer value is close to experiment with an error of 0.15 eV for both series.
In the first excited state S_1 the geometry becomes more planar; however, MEH-PPDFV remains substantially twisted. This has important consequences on the excited state deactivation: the emission spectrum of the fluorinated compound is significantly broadened against the non-fluorinated polymer. Furthermore, fluorescence quantum yield is significantly lowered due to an increase of the non radiative decay k_{nr}, as induced by the twisted S_1 structure of MEH-PPDFV.

Key words: optical properties, photophysical propertiers, polymer

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Preparation of New material from Olives Stone for CO_2 Storage

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This study was an attempt to produce a new carbon material from olives stones like monolith carbon and carbon foam. First activated carbon pellets (ACP) was prepared from olives stones by chemical activation with phosphoric acid H_3PO_4. In the other hand carbon foam was prepared by thermo –foaming of activated carbon powder dispersions in an aqueous sucrose resin.

The analysis of adsorption-desorption isotherms of liquid nitrogen at 77 K, we found that the specific surface area of ACP and CF reaches 1280 m^2/g and 20 m^2/g respectively. Finally application of the two materials in CO_2 storage reveals a promoters results and open interesting perspectives

Key words: Olives stones, Activated Carbon Pellets, Carbon Foam and CO2 Storage.

Diazonium salt as a route for new MMT/IIPs nanocomposites for selective removal lead (II) ions.

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In this work, the clay-grafted ionic imprinted polymer of Pb(II) were prepared. IIPs-Pb(II)/MMT nanocomposite material was synthesized by photopolymerization of acrylamide as monomer, bisacrylamide as crosslinking agent and benzophenone as initiator in the presence of Pb–dithizone complex. The adsorption and recognition properties of IIPs-Pb(II)/MMT for Pb^{2+} were studied in detail. The maximum adsorption capacity and the relative selectivity coefficients of clay-grafted ionic imprinted polymer for Pb(II)/Zn(II) and Pb(II)/Fe(III) were calculated. Compared with non-imprinted polymer particles, the IIPs-Pb(II)/MMT had higher selectivity for Pb(II).

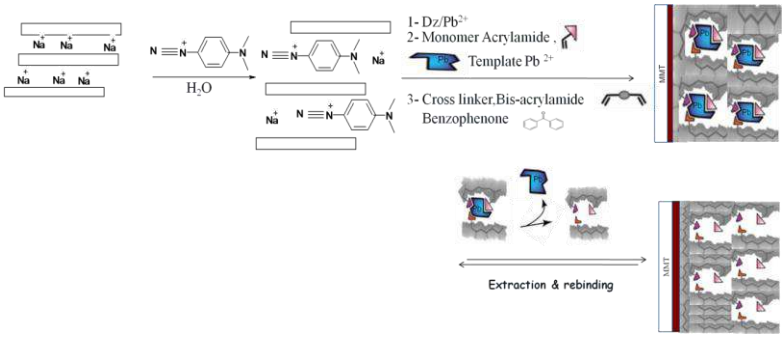

Figure 1. Sequential steps for the fabrication of ion imprinted polymer-grafted montmorillonite nanocomposites.

Keywords: Heavy metal ions; Adsorption mechanism; Clay; Montmorillonite; Lead, ionic imprinted polymer,

EFFECT OF METHYLCELLULOSE AS AN ADDITIVE ON THE STRUCTURE AND PERFORMANCES OF POLYSULFONE MEMBRANES

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The growth of membrane science and technology is mainly due to the impressive developments in materials used for membrane fabrication and modification. Pressure-driven membrane processes include microfiltration (MF), ultrafiltration (UF), nanofiltration (NF) and reverse osmosis (RO). Ultrafiltration membranes are made from a wide variety of chemically and thermally stable synthetic polymers, including polysulfone [1]. In order to improve membrane permeability, several studies have been devoted to this subject. According to the literature, we notice that synthetic polymeric additives like the polyvinylpyrrolidone (PVP) and poly (ethylene glycol) (PEG) have been used extensively in membrane preparations in order to improve their separation properties [2], while natural plant-based polymers are rarely reported in this field. Among these polymers, the methylcellulose (MC) which is classified as an amphiphilic natural plant-based polymer due to the presence of hydrophilic and hydrophobic areas and can be used as an additive to prepare membranes.

In this work, polymer solutions of polysulfone (PSf) and methylcellulose (MC) in 1-methyl-2-pyrrolidone (NMP) were used to prepare ultrafiltration membranes by the phase inversion technique induced by water as a non-solvent. The effect of MC as an additive on the pure water flux and PEG rejection was studied. The obtained membranes were characterized in term of morphology by scanning electron microscopy (SEM). It was found that all the PSf/MC membranes exhibit an asymmetric finger type structure. With an increase in MC content in the membrane of the casting solution from 0.5% to 1.5%, the pure water flux increases from 8.75 to 63.26 $L.m^{-2}.h^{-1}$ at 1 bar, while the rejection decreases from 98.37% to 94.84% with PEG 35000.

Keywords: Polysulfone, membrane, methylcellulose

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Synthesis of New Bis-Triazoles Derivatives from bis-amidrazones

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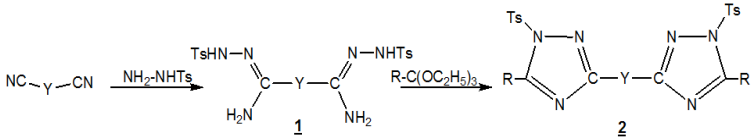
Much attention has been devoted to the synthesis of bisheterocyclic compounds, which exhibit strong biological activities, including anticancer, antibacterial, anti-tumor, and anti-mycobacterial activities [1-3].

We present a new method for the synthesis of bis-triazoles **2**, which result from the processing of novel bis-amidrazones **1** with orthoester. The bis-amidrazones **1** are prepared by the reaction of the aliphatic or aromatic dinitrile with two equivalents of p-Toluenesulfonyl hydrazide.

The structures of the new products were characterized by IR, ^{1}H NMR and ^{13}C NMR.



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Effect of Film Thickness and side chains on Optical Properties for Photovoltaic Applications

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In organic photovoltaic cells (OPVs) photoconversion is limited by the short exciton diffusion length (LD) that restricts exciton diffusion to the dissociating electron donor-acceptor interface. So, Exciton diffusion length is an important parameter to the future design of high efficiency organic photovoltaic OPV solar cells. In order to design new materials for efficient devices, improvement in the active layer of the OPV cells in general is needed. In particular, the following questions should be answered: what factors influence the exciton diffusion length? And how ameliorate the performance of solar cells? To know the answer, we present here a theoretical approach that seeks to enhance LD by optimizing the donor layer, we are interested in the impact of the film thickness and the side chains on the length diffusion. In fact, to determinate the length diffusion LD, experimental data and suitable theory are required, here we used Forster thory. It was found that by increasing the film thickness of six alkowy-substituted poly(p-phenyleneethynylene)-alt-poly(p-phenylenevinylene)s (PPE-PPVs) polymers of constitutional structure (-Ph-CC-Ph-CC-Ph-CH=CH-Ph-CH=CH-)n, the Forster radius and so the diffusion length were calculated are found to be improved and can reach a 25 nm diffusion length. In fact increasing the film thickness, the inter-chain interactions increase which is influenced also in a parallel fashion by the side chains.

Mots clés: Exciton diffusion length, conjugated polymer PPE-PPVs, and Forster energy transfer mechanism.

SYNTHESIS AND CHARACTERIZATION OF PLA BASED BIOCOMPOSITES

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Polymers from renewable resources constitute an interesting approach to produce environmentally friendly materials because theyare non-toxic, biodegradable and can thus be used in many applications particularly in biomedical and agrochemical industries to develop packaging materials. These polymers can be used alone or mixed with other polymeric or non-polymeric components depending on the intended application [1-2].

Biopolymers show however some drawbacks such as a poor thermal, mechanical, and solvent resistances, low flame retardance and limited barrier properties for small molecules (water and oxygen) which often limit their end use. Nowadays, research efforts are devoted to improvement of biopolymer performances mainly by means of blending with other biopolymers, additives or nanofillers [3].

The incorporation of nanofillers such as organo-modified clays in biopolymers was extensively studied [4-5]. It allows the improvement of the barrier properties against oxygen, carbon dioxide, water vapor and odor compounds and the mechanical performances of the final materials. The use of organoclays may also enable access to high-active antimicrobial bionanocomposites due to their high surface by volume ratio and the strong surface reactivity of such nanostructured antimicrobial agents.

In this context, we were interested on the preparation of new series of Gemini-quaternary ammonium surfactants bearing different spacer and hydrophobic chain lengths. Their micellization behavior was studied on the basis of surface tension measurements and particle size profiles in comparison with that of classical hydrocarbonated surfactants. These organoclays were used to prepare PLA-clay composites by solvent casting method. Their thermal stability and morphological properties have been also investigated.

Key word: Gemini surfactants, organoclay, biocomposites, PLA, thermal properties.

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STUDY OF PROPERTIES OF AGED BUTT-WELDED POLYETHYLENE PIPES USED IN GAS DISTRIBUTION SYSTEMS

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Joining of polyethylene pipes is usually done by the so called butt-welding method which has been used for many years for gas distribution systems. During the welding process, the material in the weld zone undergoes melting, deformation, and molecular interpenetration, followed by recrystallization which can affect the microstructure of the material and consequently their long term performance. Therefore, it was interesting to studding the properties of welded pipes in service for long periods and comparing them with un-welded counterpart. In this work, old butt-welded polyethylene pipes with different ages that have been used in Algerian gas distribution systems were characterized. Samples prepared by butt welding new pipes were used as reference. Morphological and mechanical studies were performed using differential scanning calorimetry (DSC), tensile and hydrostatic pressure testing. The materials stabilization was also examined.
The results showed that a slight increase of material crystallinity at the weld zone due to the different cooling process. The mechanism of plastic deformation was strongly influenced by welding but any effect of ageing was observed. Compared to reference, the results revealed that hydrostatic pressure strength of welded pipes was not affected by ageing as the un-welded counterpart. Furthermore, DSC measurements showed that welds are more sensitive to thermo-oxidative degradation than pipes. However, the remaining amount of antioxidants after ageing is sufficient to protect the material for a long service continuation period.

Key words: Polyethylene pipes, butt welding, ageing.

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