DAY 1

Scientific Tracks & Abstracts

4th Edition of International Conference on

Polymer Science and Technology

June 04-05, 2018 | London, UK

DAY 1

June 04, 2018

Sessions

Polymer Science-The Next Generation Polymers And The Future Of Industries Polymer Material Science And Engineering Polymer Nanotechnology | Polymer Chemistry | Composite Polymeric Materials

Session Chair	**Session Chair**
Lianbin Zhang Huazhong University of Science and Technology, China	Szczepan Zapotoczny Jagiellonian University, Poland

Session Introduction

Title: **OEGylated dendronized polymers for stimuli-responsive materials**

Afang Zhang, Shanghai University, China

Title: **Characterization of poly(lactic acid) foams produced by extrusion with different chemical blowing agents**

Akos Kmetty, Budapest University, Hungary

Title: **Deposition and control of polymer dielectrics for OTFTs**

Hazel Assender, University of Oxford, UK

Title: **Evaporative structuring of solutions of active blends for molecular electronics applications**

Jasper Michels, Max Planck Institute for Polymer Research, Germany

Title: **Assembly of block copolymers in 3D confined geometries**

Jintao Zhu, Huahzong University of Science & Technology, China

Title: **Promising tailor made nanocapsules based on biopolymer for antibiotic therapy**

Sabrina Belbekhouche, University of Paris, France

Title: **Suface-grafted polymer brushes with ladder-like architecture**

Szczepan Zapotoczny, Jagiellonian University, Poland

Title: **Acrylic acid grafted biopolymer Chitosan/TiO_2 based nanocomposite for application in solar light induced photocatalytic degradation**

Dhiraj Sud, Sant Longowal Institute of Engineering and Technology, India

Title: **Incremental sheet forming for manufacturing customized UHMWPE cranial implants**

Isabel Bagudanch, Ines Ferrer, Maria Lusia, University of Girona, Spain

Title: **Combined/copolycondensation: sustainable methods for biobased polymers**

Rosica Mincheva, University of Mons, Belgium

Title: **Dynamic polymer networks based on reversible aromatic disulfide bond: From self-healing to processability, recyclability and more**

Alaitz Rekondo, CIDETEC Foundation, Spain

Title: **Semi interpenetrating networks of chitosan /acrylic acid / thiourea for sequestering cadmium from aqueous solution**

Kamlesh Kumari, Sant Longowal Institute of Engineering and Technology, India

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Afang Zhang et al., Polym Sci 2018, Volume 4
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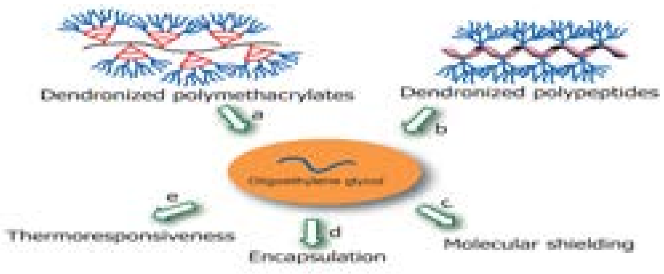
OEGYLATED DENDRONIZED POLYMERS FOR STIMULI-RESPONSIVE MATERIALS

Afang Zhang and Wen Li
Shanghai University, China

Dendronized polymers are formed through densely attaching dendrons along a linear polymer main chain, which adopt cylindrical wormlike morphology with tunable thickness. Inspired from the smart properties of biomacromolecules in nature, an intriguing class of stimuli-responsive dendronized polymers were constructed through combination of dendritic oligoethylene glycols (OEG) with various kinds of polymer backbones. Due to the densely covered OEG pendants, these macromolecules show unprecedented thermoresponsiveness and excellent biocompatibility. This presentation will discuss our findings in developing versatile thermoresponsive warm-like dendronized polymethacrylates and polypeptides by decorating with dendritic OEG pendants through covalent linkages, dynamic covalent linkages or supramolecular interactions. Depending mainly on the molecular topology, amphiphilic structure in these dendronized polymers plays different roles on mediating their stimuli-responsive properties. Based on the thickness effects, dendronized polymers undergo heterogeneous dehydration and collapse on individual molecular level. Therefore, guest molecules can be encapsulated and released based on the phase transition temperature, heating rate and thickness of the polymers, resulting in interestingly the formation of molecular containers. This encapsulation property affords these thick polymers tunable shielding ability to protonation and metal coordination in aqueous solutions. In a word, combination of unique thermoresponsive behavior, reversible encapsulation and switchable shielding to guests, protonation as well as metal coordination from these OEGylated dendronized polymers may lead to their promising applications in biomaterials, including drug delivery and targeting, enzyme activity control and transportation.



Recent Publications

1. Li W et al. (2008) Thermoresponsive dendronized polymers. Macromolecules. 41(10):3659-3667.
2. Junk M J N et al. (2010) EPR spectroscopic characterization of local nanoscopic heterogeneities during the thermal collapse of thermoresponsive dendronized polymers. Angew. Chem. Int. Ed. 49(33):5683-5687.
3. Liu L et al. (2011) Comblike thermoresponsive polymers with sharp transitions: synthesis, characterization, and their use as sensitive colorimetric sensors. Macromolecules. 44(21):8614-8621.
4. Yan J, Li W and Zhang A (2014) Dendronized supramolecular polymers. Chem. Commun. 50(82):12221-12233.
5. Yan J et al. (2016) Thermoresponsive dendronized polypeptides showing switchable recognition to catechols. Macromolecules. 49(2):510-517.

Biography

Afang Zhang is a Polymer Chemist. His research interest comprises dendronized polymers, supramolecular polymers, helical polymers, as well as polymers with switchable properties. He began his research work from 1988 at Chemistry Institute of Henan. After three years working at German Plastics Institute and Free University of Berlin, he joined Zhengzhou University as Distinguished Professor. From 2005, he started working in ETH Zurich as Senior Scientist. By the end of 2009, he returned to China and joined Shanghai University as Distinguished Professor. Thereafter, he became a 1000-plan Scholar affiliated to Shanghai Government. From 2017, he was offered a title of honor professor by the University of Queensland. He has hosted more than 40 projects from Chinese and Swiss Governments and received more than 10 Science And Technology Awards from Chinese Governments. He has published more than 120 journal papers and is the Inventor for more than 20 patents.

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CHARACTERIZATION OF POLY(LACTIC ACID) FOAMS PRODUCED BY EXTRUSION WITH DIFFERENT CHEMICAL BLOWING AGENTS

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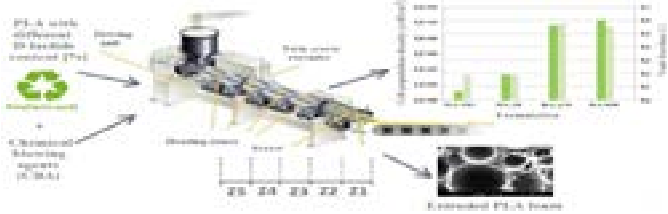
[2]MTA–BME Research Group for Composite Science and Technology, Hungary

Nowadays the number of polymers produced from renewable resources are increasing considerably. Global market forecasts predict a fourfold increase until 2019 (7.8 million ton/year). Polymer foams nowadays are mostly produced from petroleum-based petrochemical materials. Foamed products, such as packaging and insulating materials, are made by physical, chemical and bead foaming techniques. A great disadvantage of materials and products made from them is that they are difficult and costly to recycle, cannot be decomposed biologically and are a considerable load on the environment after they lose their function. Renewable resource-based and biodegradable polymers offer an environmentally friendly alternative. Of all biopolymers, poly(lactic acid) (PLA) receives the most attention nowadays. It is a thermoplastic polyester which can be produced entirely from agricultural sources, e.g. sugarcane, and is biodegradable by composting. PLA in itself is rigid (Young's modulus: ~2500 MPa), breaks easily (Charpy impact strength: ~4 kJ/m2) and has low strain at break (~3%). Its D-lactide content and functional additives can greatly influence its properties. The comprehensive characterization of its chemical foaming and the bio-foam produced this way is a new direction of research. PLA can be used to develop biopolymer foam products that can be a viable alternative to single-use non-biodegradable foam products, such as food industry trays and padding foams. The lecture presents the effects of various kinds (e.g. exothermic) of chemical foaming agents on the morphological and mechanical properties of PLA foam. We used PLAs with different D-lactide contents. The PLA foams were manufactured with a twin-screw extruder. We produced rod-shaped foam specimens. The chemical foaming agents and the PLA foams made with them were tested morphologically (e.g. Differential Scanning Calorimetry) and mechanically (e.g. foam strength). The cell structure was characterized by scanning electron microscopy.



Recent Publications

1. Nova Institute: Bio-based Building Blocks and Polymers in the World. Michael Carus. Page 1-24.
2. Auras R et al. (2010) Poly(lactic acid). synthesis, structures, properties, processing and application. Wiley. ISBN:978-0-470-29366-9.
3. Julien J M et al. (2015) Chemical foaming extrusion of poly(lactic acid) with chain-extenders: physical and morphological characterizations. European Polymer Journal. 67:40-49.
4. Zimmermann V G M et al. (2017) Poly(lactic acid) foams reinforced with cellulose micro and nanofibers and foamed by chemical blowing agents. Journal of Cellural Plastics.
5. Göttermann S et al. (2016) Modified standard polylactic acid (PLA) for extrusion foaming. AIP Conference Proceedings. 1779: 060001.

Biography

Akos Kmetty is working in Research Group for Composite Science and Technology, Hungary. His research interests are development of self-reinforced petroleum-based and bio-based polymer composites and the analysis of renewable resource-based polymer materials and composites. He works as an Assistant Professor in the Department of Polymer Engineering, Faculty of Mechanical Engineering, Budapest University of Technology and Economics, Hungry. In 2012 he joined the MTA–BME Research Group for Composite Science and Technology as a Research Fellow. His work focuses on the production and characterization of bio-polyester-based foams produced by extrusion techniques via chemical and physical blowing methods. His research activities include the analysis of the morphological and mechanical properties of bio-polymer foams and he is examining the relationships between the manufacturing parameters and material properties.

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DEPOSITION AND CONTROL OF POLYMER DIELECTRICS FOR OTFTS

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The breakthrough of flexible electronics depends upon suitable large-scale manufacturing routes, likely requiring very low cost, high-throughput processing techniques. Our approach to development of organic electronics considered high-speed roll-to-roll processing routes already employed industrially. We examined their applicability in creating transistors and circuits. Central to this is the high-throughput deposition of polymeric dielectric using a vacuum deposition route compatible with the preferred processing for molecular semiconductors, metal contacts and ceramic or other semiconducting active components. This paper will discuss the control of dielectric properties as determined by processing parameters during the thin-film deposition and by the surface segregation of one component of a monomer mixture to control interfacial properties of the dielectric. The dielectric performance will be demonstrated in OTFT devices and circuit elements.

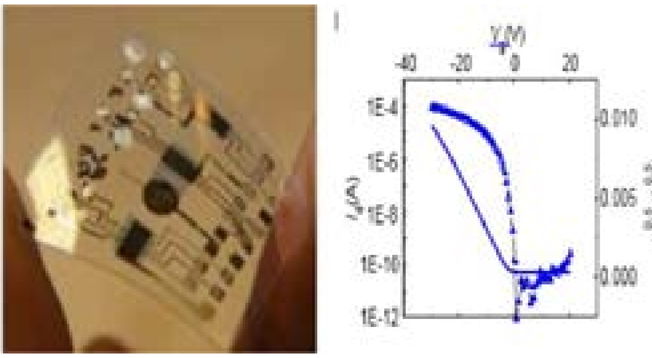

Figure 1: An array of OTFT and capacitor devices with polymer dielectric, and typical OTFT transfer curve.

Recent Publications

1. Abbas G et al. (2013) Hysteresis-free vacuum-processed acrylate-pentacene organic thin film transistors. IEEE Electron Device Letters. 34(2):268-270.
2. Ding Z et al. (2013) Improving the performance of organic thin film transistors formed on a vacuum flash-evaporated acrylate insulator. Applied Physics Letters. 103:233301.
3. Abbas G A W (2014) A high-yielding evaporation-based process for organic transistors based on the semiconductor. DNTT. Organic Electronics. 15(9):1998-2006
4. Avila Niño J A (2016) Stable organic static random access memory from a roll-to-roll compatible vacuum evaporation process. Organic Electronics. 31:77-81
5. Ding Z et al. (2016) Vacuum production of OTFTs by vapour jet deposition of dinaphtho[2,3-b:2’,3’-f] thieno[3,2 b]thiophene (DNTT) on a lauryl acrylate functionalised dielectric surface. Organic Electronics. 31:90-97.

Biography

Hazel E Assender graduated from the University of Cambridge, followed with a PhD and two years of Postdoc in the Department of Materials Science & Metallurgy in Cambridge before moving to an academic post in Oxford University. She has led a research activity in the Department of Materials, University of Oxford, UK since 1996 with a focus in the area of thin films and coatings both of polymer materials or onto polymer substrates. Her research spans fundamental studies of the thin film and near-surface properties of polymers, through to materials engineering of thin films and device structures in large area on polymer substrates. Her particular areas of interest include roll-to-roll deposition, gas barriers, photovoltaics, and transistors/circuits. Her research has a technology-facing approach bringing underpinning scientific understanding to development of materials and technologies that integrates research relevant to industrial processing such as scale-up of manufacture with the development of new materials and structures.

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EVAPORATIVE STRUCTURING OF SOLUTIONS OF ACTIVE BLENDS FOR MOLECULAR ELECTRONICS APPLICATIONS

Jasper Michels
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Many organic and hybrid thin film electronic devices (e.g. solar cells, light emitting diodes and sensors) contain a layer of a functional or responsive material based on a blend of polymeric or small-molecular components. Depending on the desired functionality, phase separation between the blend components during solution processing is desired or not. Predictive models that establish a link between processing dynamics and device performance have been highly desired to avoid trial-and-error experimentation. We study solution-stage spinodal decomposition of such blends under evaporative conditions using a combination of experimental and theoretical approaches. We provide an explanation for the decrease in the early stage spinodal wavelength under steady solvent evaporation. Scaling relations are derived that express the dependence of the emerging structure size and demixing time scale on evaporation rate. Besides giving experimental examples and summarizing our linearized theory, this contribution provides discussion on the experimental validation of the latter and in what way the dynamics change if instead of only one, two blend components are non-mass conserved. This scenario arises when water vapor condenses as a non-solvent into an evaporating polymer solution, e.g. during processing of thin-film memory elements based on multifluorinated polyhydrocarbons.

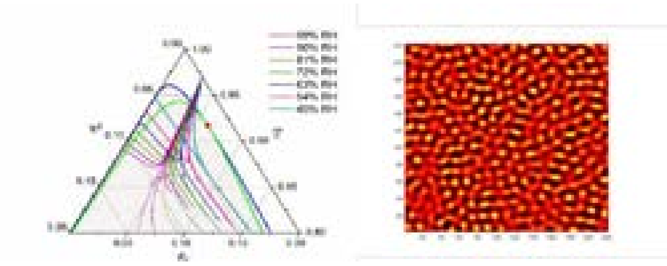

Figure 1: Left: calculated Phase diagram of a polymer/water/solvent blend with composition trajectories followed during solvent evaporation; Right: numerical simulation of spinodal decomposition of a polymer solution under conditions of simultaneous solvent evaporation and water condensation.

Recent Publications

1. Kouijzer S et al. (2013) Predicting morphologies of solution processed polymer: fullerene blends. J. Am. Chem. Soc. 135(32):12057-12067.
2. Van Breemen A et al. (2015) Surface directed phase separation of semiconductor ferroelectric polymer blends and their use in non-volatile memories. Adv. Func. Mater. 25(2):278-286.
3. Schaefer C, van der Schoot P and Michels J J (2015) Structuring of polymer solutions upon solvent evaporation. Phys. Rev. E 91(2):022602.
4. Schaefer C, Michels J J and van der Schoot P (2016) Structuring of thin-film polymer mixtures upon solvent evaporation. Macromolecules. 49(18):6858-6870.
5. Sharifi Dehsari H, Michels J J and Asadi K (2017) Processing of ferroelectric polymers for microelectronics: from morphological analysis to functional devices. J. Mater. Chem. C. 5(40):10490-10497.

Biography

Jasper Michels completed his PhD at the University of Twente (The Netherlands) in at the Supramolecular Chemistry and Technology group of Professor D N Reinhoudt, where he received his PhD Degree in 2001. After his graduation he held a Postdoctoral Research position for two years in the group of Professsor H L Anderson at Oxford University, UK. In 2003 he started working at TNO Science and Industry in Eindhoven, to join Holst Centre in 2006 as a Senior Scientist. In the period 2006-2016 he has been member and vice-chairman of the advisory board for IOP Self-Healing Materials program in The Netherlands. In September 2014 he joined the Department of Molecular Electronics at the Max Planck Institute for Polymer Research as a Group Leader. His research activities include modeling and simulation of phase transitions in semiconducting thin films that find applications in organic and hybrid electronics.

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ASSEMBLY OF BLOCK COPOLYMERS IN 3D CONFINED GEOMETRIES

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Block copolymer assemblies have attracted great attention due to their potential applications in the fields of drug delivery, targeting therapy, medical diagnosing and imaging. Three dimensional (3D) confinement, which can break the symmetry of a structure, has proven to be a powerful route to tailor the morphologies of block copolymer particles. Particle shape and internal structure can thus be tuned by using the supramolecular strategy or tailoring the interfacial interaction of the particles with the dispersion medium. We will introduce the generation of the nano-objects with well tunable shapes by taking advantage of 3D confined assembly and supramolecular chemistry. Particles with various internal structures can be obtained due to the 3D soft confinement in emulsion droplets. Moreover, we will show that selective disassembly of the structured particles will give rise to mesoporous particles or nano-objects with unique shapes, potentially useful for drug delivery, bio-imaging, separation and diagnostics.

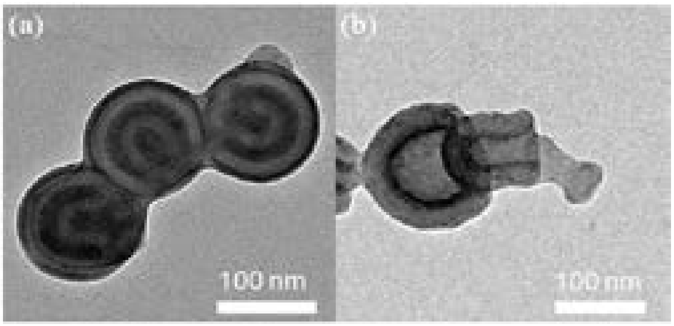

Figure 1: TEM images of self-assembled PS-P4VP(PDP) colloidal particles (a), and corresponding PS-P4VP nano-cups (b) after PDP was removed..

Recent Publications

1. J P et al. (2016) Block copolymer capsules with structure-dependent release behavior. Angewandte Chemie International Edition. 55(47):14633-14637.
2. Deng R H et al. (2015) Soft colloidal molecules with tunable geometry by 3D confined assembly of block copolymers. Macromolecules. 48(16):5855-5860.
3. Wang K et al. (2016) Electric-directed assembly of polymer-tethered gold nanorods in cylindrical nanopores. ACS Nano. 10(5):4954-4960.
4. Deng R H et al. (2014) Janus nanodisc of diblock copolymers. Advanced Materials. 26(26):4469-4472.
5. Deng R H et al. (2012) Mesoporous block copolymer nanoparticles with tailored structures by hydrogen-bonding-assisted self-assembly. Advanced Materials. 24(14):1889-1893.

Biography

Jintao Zhu received his PhD (Polymer Chemistry and Physics) in Changchun Institute of Applied Chemistry (CIAC), Chinese Academy of Sciences, China in 2005. Afterwards, he carried out Postdoctoral research in the University of Alberta, Canada and University of Massachusetts Amherst, USA. In 2009, he joined as a Professor in the School of Chemistry and Chemical Engineering at the Huazhong University of Science and Technology (HUST). Since 2016, he is the Dean of the School of the Chemistry and Chemical Engineering at HUST. His current research concentrated on confined assembly of block copolymers and inorganic nanoparticles, responsive photonic materials, functional polymer particles for drug delivery and imaging. He has published over 100 papers, contributed 3 book chapters and holds 5 patents. He is a Recipient of China National Funds for Distinguished Young Scholar (2015) and Chinese Chemical Society Youth Awards (2013).

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Sabrina Belbekhouche et al., Polym Sci 2018, Volume 4
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PROMISING TAILOR MADE NANOCAPSULES BASED ON BIOPOLYMER FOR ANTIBIOTIC THERAPY

Sabrina Belbekhouche, Ones Mansour and **Benjamin Carbonnier**
ICMPE (UMR7182), France

Recent progress in supramolecular chemistry leads to unparalleled control over the composition and shape factor of colloidal systems. Among them, the design of hollow capsules is a new expanding area of physical-chemical research. Herein, we report on the preparation of ultra-low sized (<100 nm in diameter) biodegradable polymeric capsules for potential applications as nanocontainers in antibiotic therapy. Hollow nanospheres based on the chitosan/poly (acrylic acid) pair are elaborated via (i) the layer-by-layer technique using gold nanoparticles (20 and 60 nm in size) as sacrificial templates, (ii) loading with amoxicillin, a betalactam antibiotic, and (iii) removal of the gold core via cyanide-assisted hydrolysis. Size, dispersity and concentration of the resulting nanocapsules are easily fixed by the nanoparticle templates, while wall thickness is controlled by the number of polyelectrolyte bilayers. Electrostatic interactions between the protonated amine groups of chitosan and the carboxyl groups of poly(acrylic acid) act as the driving attraction force allowing easy and fast design of robust and well-ordered multilayer films. Successful hydrolysis of the gold core is evidenced by time-dependent monitoring of the gold spectroscopic signature (absorbance at 519 nm and 539 nm for the gold nanoparticles with 20 and 60 nm, respectively). Crosslinked capsules are also prepared through crosslinking of the chitosan chains with gluteraldehyde. Chitosan-based nanocapsules are finally evidenced to be promising drug delivery vehicles of amoxicillin trihydrate with tuneable properties such as entrapment efficiency in the range of 62-75% and 3.5-5.5% concerning the drug loading. The drug-loading content was up to 5%.

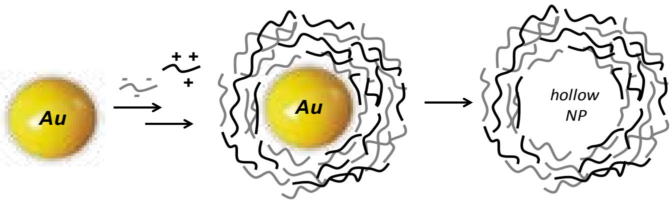

Figure 1: Schematic illustration of hollow nanocapsule elaboration by the polyelectrolyte layer by layer self-assembly strategy. (NP: nanoparticle).

Recent Publications

1. Peyratout C S and Dahne L (2004) Tailor-made polyelectrolyte microcapsules: from multilayers to smart containers. Angewandte Chemie. 43:3762-3783.
2. Borges J O and Mano J F (2014) Molecular interactions driving the layer-by-layer assembly of multilayers. Chemical reviews. 114:8883-8942.
3. Nguyen T T T et al. (2017) From the functionalization of polyelectrolytes to the development of a versatile approach to polyelectrolyte multilayer films with enhanced stability. Journal of Materials Chemistry A. 5(46):24472-24483. Doi:10.1039/C7TA06855G
4. Belbekhouche S et al. (2018) Glucose-sensitive polyelectrolyte microcapsules based on (alginate/chitosan) pair. Carbohydrate Polymers. 184:144-153.
5. Jiang H X, Ding Y, Chen Q and Yang C (2004) Core template free strategy for preparing hollow nanospheres. Advanced Materials. 16:933-937.

Biography

Sabrina Belbekhouche is an Associate Professor (East Paris Institute of Chemistry And Materials Science/ University of Paris, France). Her core expertise is in polymer science, macromolecular assembly and surface modification. This includes the polymer synthesis; the study of the physical chemistry of surfaces/interfaces; and the use of controlled assembly at the sub-micrometer scale (nanoparticle, nanocapsule.) as well as stimuli-responsive systems. Current applications of her research are mainly for biological application.

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SURFACE-GRAFTED POLYMER BRUSHES WITH LADDER LIKE ARCHITECTURE

Szczepan Zapotoczny
Jagiellonian University, Poland

Recent progress in supramolecular chemistry leads to Surface grafted polymer brushes refer to an assembly of macromolecules attached with one end to a surface and stretched away from it. The stretched conformation of the tethered chains and their conformational freedom leads to unique properties of the brushes and specific applications. Conductive polymer brushes grafted from surfaces, as examples of such structures, are very desirable for e.g. organic photovoltaics and molecular electronics since they would form directional nanoscale pathway for charge transport. However, synthesis of surface-grafted conjugated polymer brushes is still very challenging since there are no controlled polymerization techniques easily applicable for that purpose. We have introduced self-templating surface-initiated polymerization (ST-SIP) leading to synthesis of ladder-like brushes with one chain in a pair being conjugated. Iniferter-based photopolymerization was applied to obtain the macromonomer brushes grafted from gold surface and containing acetylene side groups. The pre-aligned groups subsequently reacted forming conjugated chains. Such obtained brushes after doping exhibited high conductivity in the direction perpendicular to the surface as showed using conductive atomic force microscopy. The general route was later used for synthesis of poly(thiophene)-based brushes and polyelectrolyte conjugated structures and may be easily applied for obtaining other polymer architectures comprising conjugated polymers (mixed brushes, block conductive-nonconductive brushes etc.). Using similar approach, photoactive polymer brushes with ordered phthalocyanine chromophores were also synthesized. Conjugated polymer brushes based on e.g. poly(acetylene) and poly(thiophene) with such ladder-like architecture were also shown to exhibit long term stability in air as compared to polymer films and brushes composed of single chains. The conjugated and photoactive ladder-like brushes are very promising for applications requiring high ordering of the chains and long term stability such as organic photovoltaics, nanoelectronics or fabrication of energy-storage devices.

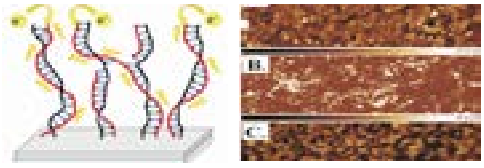

Figure 1: : (Left) Scheme of conjugated ladder-like brushes with ionic groups based on pyridine. (Right) Atomic force microscopy images of those brushes captured in topography(A), current (B), and adhesion (C) modes..

Recent Publications

1. Szuwarzyński M, Kowal J and Zapotoczny S (2012) Self-templating surface-initiated polymerization: a route to conductive brushes. J. Mat. Chem. 22(38):20179-20181.
2. Wolski K, Gruszkiewicz A and Zapotoczny S (2015) Conductive polythiophene-based brushes grafted from ITO surface via self-templating approach. Polym. Chem. 6:7505.
3. Wolski K, Szuwarzyński M and Zapotoczny S (2015) A facile route to electronically conductive polyelectrolyte brushes as platforms of molecular wires. Chem. Sci. 6(3):1754-1760.
4. Szuwarzyński M et al. (2017) Photoactive surface grafted polymer brushes with phthalocyanine bridging groups as an advanced architecture for light harvesting. Chem. Eur. J. 23:11239.
5. Szuwarzyński M, Wolski K and Zapotoczny S (2016) Enhanced stability of conductive polyacetylene in ladder-like surface-grafted brushes. Polym. Chem. 7 (36):5664-5670.

Biography

Szczepan Zapotoczny is a Professor at Jagiellonian University in Krakow (Poland) where he also completed his PhD in Chemistry working on synthesis and photophysics of polymeric photosensitizers. He joined the group of Professor G J Vancso (University of Twente, The Netherlands) as a Postdoctoral Researcher (1999-2001) working on force spectroscopy and surface chemistry of self-assembled systems. After coming back to Poland he focused his research on amphiphilic polymers obtained using controlled radical polymerizations and formation of photoactive polyelectrolyte multilayer films. Later on he initiated the studies on surface-grafted polymer brushes cooperating also with Professor Vancso. His current interests focuses on nanostructured polymeric and hybrid materials including films, brushes (conductive, stimuli-responsive), polymer coated nanoparticles, nanocapsules for photochemical and biomedical applications. He is a coauthor of 100 scientific papers and 6 patents.

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ACRYLIC ACID GRAFTED BIOPOLYMER CHITOSAN/TIO$_2$ BASED NANOCOMPOSITE FOR APPLICATION IN SOLAR LIGHT INDUCED PHOTOCATALYTIC DEGRADATION

Dhiraj Sud, M Bahal and **Nidhi Sharotri**
Sant Longowal Institute of Engineering and Technology, India

The present investigation reports the greener synthesis and characterization of acrylic acid grafted biopolymer chitosan/TiO$_2$ based nanocomposites. The nanocomposites formed from metal/metal oxide nanoparticles and polymers showed the improvement in material properties such as electrical, chemical or biochemical properties along with permeability and selectivity. The polymeric and inorganic hybrid materials can be tailored to have the desired applications. The eco-friendly synthesis of amphoteric chitosan was done by grafting of acrylic acid to chitosan in presence of potassium persulfate by free radical polymerization. The grafted chitosan was further employed to synthesize nanocomposite by in situ reaction with semiconductor TiO$_2$ prepared from titanium butoxide using ultrasonication cavitation technique. FT-IR spectroscopy, XRD, EDX and thermal analysis techniques were employed to characterize synthesized CA (acrylic acid/chitosan) and CATN (CA/TiO$_2$). The change in surface morphology was evident from appearance of uniform globular particles of synthesized hybrid material instead of cloudy flakes of grafted chitosan. The homogenous distribution of metal oxide nanoparticles in CA/TiO$_2$ hybrid material was achieved from grafted acrylic acid/ chitosan containing weak anionic group (-COOH) which lead to the coiling of the polymeric chains around TiO$_2$. The response of polymeric nanocomposite, CATN was investigated for degradation of dyes often present in the effluents of textile industries. Malachite green was selected as model dye to assess the photocatalytic efficiency using solar light. The degradation kinetics was studied by monitoring the photo catalytic reaction by employing spectrophotometric technique. The rate constant of reaction for degradation of malachite green was found to be 7.13x10-3min-1. The current research work opens vistas for the new dimensions in area of water treatment by solving the issues related to degradation reaction efficiency in visible light and cost effectiveness.

Figure 1: Synthesis of CAT nanocomposite for photocatalytic degradation of organic pollutants

Recent Publications

1. Moon Y E (2013) Poly (vinyl alcohol)/poly (acrylic acid)/TiO$_2$/graphene oxide nanocomposite hydrogels for pH-sensitive photocatalytic degradation of organic pollutants. Materials Science and Engineering: B. 178:1097-1103.
2. Bet Moushoul et al. (2016) TiO$_2$ nanocomposite based polymeric membranes: a review on performance improvement for various applications in chemical engineering processes. Chemical Engineering Journal. 283:29-46.
3. Sharotri N and Sud D (2017) Studies on visible light induced photocatalysis by synthesized novel Mn-S co-doped TiO$_2$ for remediation of pollutants. Separation and Purification Technology. 183. Doi: 10.1016/j.seppur.2017.03.053.
4. Hou C et al. 2017. Preparation of TiO$_2$ nanoparticles modified electrospun nanocomposite membranes toward efficient dye degradation for wastewater treatment. Journal of the Taiwan Institute of Chemical Engineers. 78:118-126.
5. Bhullar N, Kumari K and Sud D (2017) Studies on chitosan-based superhydrophilic adsorbent for phasing out Rhodamine 6G dye and Cd2+ ions from aqueous solutions. Desalination and Water Treatment. 95:3 55-364.

Biography

Dhiraj Sud is a Professor of Chemistry and currently working in the area of nanophotocatalysis and development of hybrid materials for various applications in particular for environmental remediation. She has expertise in design, synthesis and characterization of nonmaterial as well as polymeric materials. Another area of her interest is in reaction kinetics and mechanism of photo catalytic reactions by tracking the reaction pathway. Besides teaching inorganic chemistry to post graduate students, she has also contributed in development of education and research as Dean Academics. She has more than 80 publications in international journal of repute and presented her research in number of national and international conferences. She also had written many chapters and two books. She has worked on sponsored research projects in the area of photo catalysis, adsorption technology and for treatment of industrial effluents. She has guided ten PhD students and many postgraduate student projects.

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Isabel Bagudanch et al., Polym Sci 2018, Volume 4
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INCREMENTAL SHEET FORMING FOR MANUFACTURING CUSTOMIZED UHMWPE CRANIAL IMPLANTS

Isabel Bagudanch, Ines Ferrer and **Maria Luisa Garcia Romeu**
University of Girona, Spain

Statement of the Problem: Commonly, head injuries are produced by a punctual dynamic force. When fractures are produced, they are followed by tensile loads that generate more fractures on other cranium areas. Prostheses have the objective to patch a damaged area and heal the injury. Nowadays, research is focused on customized prostheses and there is no interest to develop a standard product to produce in mass series. Incremental Sheet Forming (ISF) is a technology useful to manufacture small batch or one-of-a-kind sheet products. This paper presents the use of ISF with the aim of manufacturing cranial prostheses in biocompatible polymeric sheet.

Methodology: The cranial implant is designed based on computerized tomographies (CT) of the patient, converting them into a 3D model using the software InVesalius. To generate the toolpath for the forming operation Computer Aided Manufacturing (CAM) software is employed. Once the cranial implant is manufactured in a Kondia CNC 3 axis milling machine, a 3D scanning system is used to determine the geometric deviation between the real part and the initial design.

Findings: The spindle speed is one of the most important parameters that affect the results of the final part. It has been shown that using 2000 rpm spindle speed and a negative dye it is possible to achieve an appropriate geometric accuracy of the prosthesis (with discrepancies below 1.5 mm) fulfilling the standardized mechanical requirements.

Conclusions: The use of polymeric implants in cranioplasty is advantageously because of their lightweight, low heat conductivity and mechanical properties similar to bone. The results demonstrated the huge potential of manufacturing polymeric cranial prostheses by ISF, as far as these processes provide high formability with appropriate geometric accuracy. Furthermore, the cost of the implant has been calculated revealing that it is a cheap process with a low lead-time.

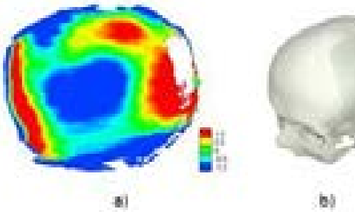

Figure 1. a) Cranial implant geometric deviation. b) adjustment of the implant to the biomodel

Recent Publications

1. Saldarriaga J F I et al. (2011) Design and manufacturing of a custom skull implant. American Journal of Engineering And Applied Sciences. 4(1):169-174.
2. Bagudanch I et al. (2018) Customized cranial implant manufactured by incremental sheet forming using a biocompatible polymer. Rapid Prototyping Journal. 24(1).120-129.
3. Castelan J (2014) Manufacture of custom-made cranial implants from DICOM images using 3D printing, CAD/CAM technology and incremental sheet forming. Brazilian Society of Biomedical Engineering. 30(3):265-273.
4. Duflou J R (2013) Manufacture of accurate titanium cranio-facial implants with high forming angle using single point incremental forming. Key Engineering Materials. 549:223–230.
5. Fiorentino A et al. (2012) Rapid Prototyping Techniques for Individualized Medical Prosthesis Manufacturing. Proceedings Of 5th International Conference On Advanced Manufacturing Engineering And Technologies. 1:589-594. Doi: 10.1201/b11341-94.

Biography

Isabel Bagudanch is a Researcher at the Product, Process and Production Engineering Research Group (GREP), University of Girona, Spain. Her research focuses on advanced manufacturing processes such as incremental sheet forming and additive manufacturing.

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COMBINED/COPOLYCONDENSATION: SUSTAINABLE METHODS FOR BIOBASED POLYMERS

Rosica Mincheva, Jean Marie Raquez and **Philippe Dubois**
University of Mons, Belgium

Environmental and economic concerns, associated with commodity petrol-based plastics production and disposal, forced academy and industry to join efforts in the design of easily applicable sustainable technologies. Greatest priorities became methods avoiding the use of polluting and unsafe volatile solvents; and allowing the facile replacement of the petrol-based monomers by monomers issued from annually renewable resources. With this respect, the polycondensation – a step-growth polymerization attracted much attention. Widely used in nature, where it builds the basis for the biosynthesis of proteins, nucleic acids, and cellulose. In man-made technology, the process plays an important role in the synthesis of commodity polyesters and polyamides - versatile classes of polymers covering applications from fibers to high-performance polymers, thermoplastics and elastomers. However, despite its "green" aspect, polycondensation is often complicated by slow rate and side reactions, resulting in low molecular weight and yield of the polycondensation polymer. Moreover, the obtained polymers are limited in applications because of the lack of functionalities. For overcoming these problems, we have designed combined polycondensation (to other synthetic procedures as chain-coupling or "click" reactions; and/or have used (functional) comonomers for tailoring the properties of the resulting copolyesters. In other terms, such combined/copolycondensation can be used as "green" method to sustainable plastics with applications from reinforcing agents to dispersants and curable coatings.

Figure 1: Linear/branched (functional) biobased copolymers via combined/copolycondensation

Recent Publications

1. Mulder KF (2007) Innovation for sustainable development: from environmental design to transition management. Sustainability Science 2(2): 253-263.
2. Weissbach H, Pestka S (1977) Molecular mechanism of protein biosynthesis. Elsevier Inc. ISBN: 978-0-12-744250-1.
3. Mark HF, Bikales NM, Overberger CG, Menges G (1988) Encyclopedia of Polymer Science and Engineering. Wiley-Interscience: New York. DOI: 10.1002/aic.690340622.
4. Billiet L, Fournier D, Du Prez F (2009) Step-growth polymerization and 'click' chemistry: The oldest polymers rejuvenated. Polymer 50: 3877–3886.
5. Mincheva R, Raquez JM, Lison V, Duquesne E, Talon O, Dubois P (2012) Stereocomplexes from biosourced lactide/butylene succinate-based copolymers and their role as crystallization accelerating agent. Macromolecular Chemistry and Physics 213: 643-653.

Biography

Rosica Mincheva received her PhD degree in polymer chemistry from the Laboratory of Bioactive Polymers, Institute of Polymers-BAS, Sofia, Bulgaria. In 2007 she moved to a postdoctoral stay in the University of Mons where she is now an associate researcher. Her research is mainly focused on biopolymers and biobased polymers covering synthesis and modification, physicochemical and thermomechanical characterization, preparation of micro- and nanostructured materials by different methods including melt processing and electrospinning. A major point is the design of sustainable and industrially applicable methods for polymer materials preparation and modification. Her work is published in 36 peer-reviewed scientific publications (including 4 book chapters), more than 40 personal communications at conferences, and is coinventor in 1 patent.

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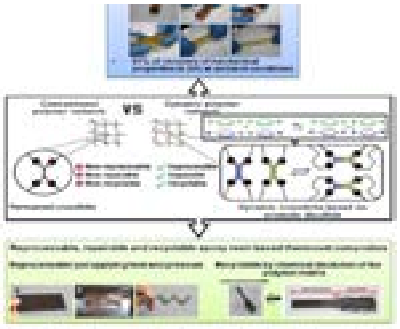
DYNAMIC POLYMER NETWORKS BASED ON REVERSIBLE AROMATIC DISULFIDE BOND: FROM SELF-HEALING TO PROCESSABILITY, RECYCLABILITY AND MORE

Alaitz Rekondo
Cidetec Foundation, Spain

Thermoset materials are those having a crosslinked network fixed by irreversible covalent bonds. These polymers exhibit excellent mechanical strength, solvent resistance and thermal stability. The above mentioned properties make thermoset materials suitable for numerous applications, such as, biomedical materials, adhesives, coatings and structural applications. Due to their thermosetting nature, one of the major drawbacks of classical thermosets is the impossibility to be melted after their curing step. This makes their reprocessing and recycling impossible limiting their use in some applications. This limitation has been overcome by means of the polymeric networks containing dynamic covalent bonds that have found applications in reprocessable/recyclable thermosets and self-healing polymers. The idea underneath is to introduce exchangeable bonds in a polymer network, which can rearrange thermally (or under another stimulus), while keeping the network integrity. This enables unprecedented functionalities to such polymer networks, such as self-healing capacity, thermoforming, repairing, reprocessing or recycling. Cidetec has developed an interesting range of innovative dynamic thermoset materials by using as a crosslinking agent a commercially available hardener containing reversible aromatic disulfide bonds. The introduction of dynamic aromatic disulfide moieties in different polymer matrixes has enabled the development of i) novel polyurethane elastomers with complete self-healing capacity at room temperature or ii) reprocessable, repairable and recyclable epoxy resin based thermoset composites. Such systems constitutes a step forward towards the implementation of advanced polymeric materials in industrial applications and offers the possibility of obtaining a new generation of fiber-reinforced composite structures with enhanced functional properties.



Recent Publications

1. Y Jin et al. (2013) Recent advances in dynamic covalent chemistry. Chem. Soc. Rev. 42(16):6634-6654.
2. N Roy, B Bruchmann and J M Lehn (2015) Chem. Soc. Rev. 261, 155.
3. C J Kloxin and C N Bowman (2013) Covalent adaptable networks: smart, reconfigurable and responsive network systems. Chem. Soc. Rev. 42(17):7161-7173.
4. A Rekondo et al. (2014) Catalyst-free room-temperature self-healing elastomers based on aromatic disulfide metathesis. Mater. Horiz. 1(2):237-240.
5. R Martin et al. (2014) The processability of a poly(urea-urethane) elastomer reversibly crosslinked with aromatic disulfide bridges. J. Mater. Chem. A. 2:5710-5715.

Biography

Alaitz Rekondo is currently working in Cidetec Foundation, Spain. She has been developing her research in the field of elastomeric PUU materials since 2003. Before joining Cidetec she worked for 6 years in the R&D Department of an industrial company focused on the field of adhesives and sealants, where she developed and coordinated several research projects. She has been Head of the Laboratory of Sealants and Adhesives for a year in the same company, leading projects aimed to new product development. She is the Head of the Polymers & Composites Unit of CIDETEC, where her main research activities focus on the development of new families of dynamic materials (composites, elastomers, adhesives and coatings) based on reversible chemical bonds.

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SEMI INTERPENETRATING NETWORKS OF CHITOSAN/ACRYLIC ACID/ THIOUREA FOR SEQUESTERING CADMIUM FROM AQUEOUS SOLUTION

Kamlesh Kumari, Navneet K Bhullar and **Dhiraj Sud**
Sant Longowal Institute of Engineering and Technology, India

The issue of remediation of heavy metal ions from environmental matrices is one of the biggest challenges owing to their persistence, bioaccumulation and resistance to biodegradation. Crosslinked networks have gained attention in the recent past due to their mechanical strength, sorptive properties and offer the possibility of reusability. The present paper deals with the synthesis of novel chitosan based crosslinked networks and explore its potential for removal of Cd2+ ions from aqueous solution. Microwave radiation induced free radical polymerization is carried out using chitosan (CS) and acrylic acid (AA) monomers in presence of initiator (K2S2O8) and crosslinked with thiourea (CH4N2S). FTIR (Fourier transform infrared spectroscopy), XRD (X-ray powder diffraction), SEM (scanning electron microscope) and thermal analysis techniques (TGA/DTG/DTA) are employed to characterize the synthesized network metrics. The physico-chemical analysis confirmed the formation of crosslinked network. The effect of polymerization variables such as amount of solvent, concentration of initiator, monomer and crosslinker, reaction time are maximized as a function of percentage grafting (Pg). The liquid uptake potential of the synthesized crosslinked network is evaluated in terms of percentage swelling (Ps). The crosslinked network exhibited maximum percentage grafting (3845%) and percentage swelling (311.25%) under maximized conditions. The results obtained for removal of cadmium (II) are analyzed using adsorption isotherm models and better fit is obtained with Freundlich isotherm model. Crosslinked network is found to be an efficient device for facile sequestering of Cd2+ ions from an aqueous solution.

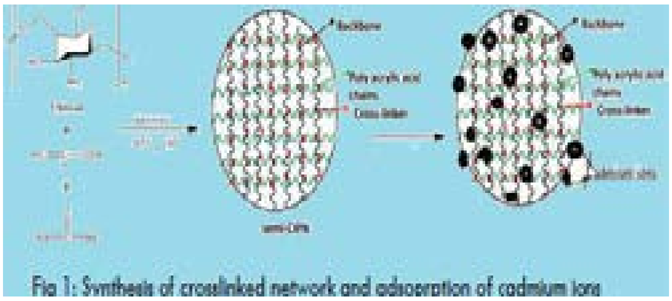

Fig 1: Synthesis of crosslinked network and adsorption of cadmium ions

Recent Publications

1. Crini G and Badot P M (2008) Application of chitosan a natural aminopolysaccharide for dye removal from aqueous solutions by adsorption processes using batch studies: a review of recent literature. Prog. Polym. Sci. 33(4):399-447.
2. Ngwabebhoh F A, Gazi M and Oladipo A A (2016) Adsorptive removal of multi-azo dye from aqueous phase using a semi-IPN superabsorbent chitosan-starch hydrogel. Chemical Engineering Research and Design. 112:274-288.
3. Chiou M S, Ho P Y and Li H Y (2004) Adsorption of anionic dyes in acid solutions using chemically cross-linked chitosan beads. Dyes Pigments. 60(1):69-84.
4. Chiou M S, Kuo W S and Li H Y (2003) Removal of reactive dye from wastewater by adsorption using ECH cross-linked chitosan beads as medium. Journal of Environmental Science and Health Part A. 38(11):2621-2631.
5. Cadaval T R, Dotto G L and Pinto L A (2015) Equilibrium isotherms thermodynamics and kinetic studies for the adsorption of food azo dyes onto chitosan films. Chem Eng Commun. 202(10):1316-1323.

Biography

Kamlesh Kumari is a Professor Sant Longowal Institute of Engineering and Technology, Indiaand presently working in the area of biopolymers and development of new biobased materials for various applications, particularly in environmental remediation. She has expertise in design, synthesis and characterization of polymeric biomaterials. Another area of her interest is development of carrier (beads/films/tablets) for modulated delivery of drugs and fertilizers. She is currently teaching undergraduate and postgraduate students of Chemical Engineering. She has more than 30 publications in international journal of repute and presented her research in number of national and international conferences. She also had written many book chapters. She has guided two PhD students and many postgraduate student projects.

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DAY 2

Scientific Tracks & Abstracts

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DAY 2

June 05, 2018

Sessions

Polymer Physics | Role Of Polymers In Biology And Biological Systems | Applications Of Polymers | Advanced Polymer Structures |Polymers In Wastes And Their Environmental Impact

Session Chair
Afang Zhang
Shanghai University, China

Session Co-Chair
Hazel Assender
University of Oxford, UK

Session Introduction

Title: Polymeric photothermal membranes for interfacial solar heating
Lianbin Zhang, Shanghai University, China

Title: Bismuth additives for silicon oils as a “green” alternative
Andres Eduardo Ciolino, PLAPIQUI (DIQ-UNS), Argentina

Title: Exploration of the metal-organic framework/polymer interface in mixed matrix membranes
Sergio Tavares, Université de Montpellier, France

Title: Near-surface crystallization in polyesters
Hazel Assender, University of Oxford, UK

Title: Precisely tuning helical twisting power via photoisomerization kinetics of dopants in chiral nematic liquid crystals
Yonggui Liao, Huazhong University of Science and Technology, China

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POLYMERIC PHOTOTHERMAL MEMBRANES FOR INTERFACIAL SOLAR HEATING

Lianbin Zhang
Huazhong University of Science and Technology, China

Water evaporation under the solar light irradiation plays a critical role in both the global water cycle and many industrial processes. In some remote and rural areas where access to centralized drinking water supply is unavailable, solar distillation is used to produce freshwater, which uses solar energy to heat and evaporate seawater or brackish water. However, the relatively slow evaporation rate of the conventional solar evaporation limits their performance and applications, as in the conventional solar evaporation bulk water is heated up and thus it would unavoidably result in unnecessary heat/energy loss due to the energy transfer to the non-evaporative portion of the bulk water. Therefore, targeting at enhancing only the local temperature of the interfacial water is more meaningful and energy-efficient for a high evaporation rate. Aiming at enhancing the solar-driven water evaporation rate, we rationally designed and fabricated a photothermal polymer-based interfacial heating membrane, which spontaneously stayed at the water-air interface due to its hydrophobicity, collected and converted solar light into heat with high efficiency, and locally heated only water near the air/water interface. Moreover, given the likelihood of losing its hydrophobicity during application, a self-healing capability was readily introduced to the polymeric membrane due to the relatively large free volume of polymeric materials. The hydrophobicity self-healing capability ensures the long-term stability of the photothermal membrane for practical applications. Furthermore, we also prepare bi-layered photothermal membranes, which effectively prevent the heat loss from the photothermal materials to the bulk water due to the conduction. This kind of bi-layered structures exhibits great potential for the practical applications in solar driven evaporation. This work provides a new concept for next-generation solar-driven water desalination.

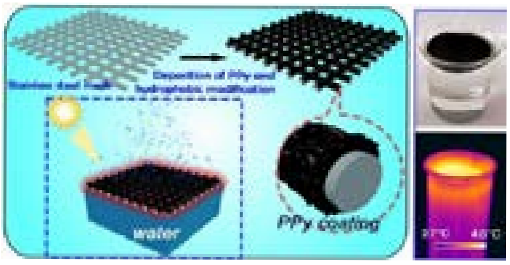

Figure 1: Polymeric light-to-heat conversion membranes for interfacial solar heating are fabricated by deposition of light-to-heat conversion material of polypyrrole onto porous stainless steel mesh, followed by hydrophobic fluoroalkylsilane modification. The mesh-based membranes spontaneously stays at the water-air interface, collects and converts solar light into heat, and locally heats only the water surface for an enhanced evaporation.

Recent Publications

1. **Zhang L B and Wang P (2016) Smart Materials for Advanced Environmental Applications. Royal Society of Chemistry. 9781782621089.**
2. **Jin Y, Zhang L B and Wang P (2017) Atmospheric water harvesting: role of surface wettability and edge effect. Global Challenges. 1(4):1700019.**
3. **Li R Y, Zhang L B, Shi L and Wang P (2017) MXene Ti3C2: an effective 2D Light-to-heat conversion material. ACS Nano. 11(4):3752-3759.**
4. **Zhang L B, Li R Y, Tang B and Wang P (2016) Solar-thermal conversion and thermal energy storage of graphene foam-based composite. Nanoscale. 8(30):14600-14607.**
5. **Zhang L B et al. (2015) Hydrophobic light- to-heat conversion membranes with self-healing ability for interfacial solar heating. Advanced Materials. 27(33):4889-4894.**

Biography

Lianbin Zhang received his BSc Degree in Polymer Material and Engineering in 2005 and PhD Degree in Polymer Chemistry and Physics in 2010, both from Jilin University, China. He then conducted Postdoctoral research studies in Hong Kong University of Science and Technology, Hongkong in 2010 and at King Abdullah University of Science and Technology, Saudi Arabia from 2010 to 2012. He is currently a Full Professor at the School of Chemistry and Chemical Engineering of Huazhong University of Science and Technology, China. He also worked as Research Scientist in King Abdullah University of Science and Technology from 2012 to 2016, after which he joined in the Huazhong University of Science and Technology as a Full Professor. His scientific interests are focused on functionalized interfacial materials, stimuli-responsive nanomaterials, and their applications in environmental and biological fields.

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Andrés Ciolino et al., Polym Sci 2018, Volume 4
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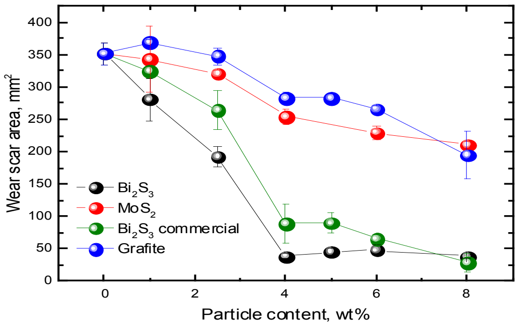
BISMUTH ADDITIVES FOR SILICON OILS AS A “GREEN” ALTERNATIVE

Andrés Ciolino[1],**Camila Müller**[1], **Mariana Dennehy**[2], and **Walter Tuckart**[3]
[1]DIQ-UNS, Argentina
[2]INQUISUR CONICET - UNS, Argentina
[3]IFISUR, Argentina

Fluids formulations with good properties were developed by using an environmentally friendly additive. The performance of these formulations was studied at high and low contact pressure conditions on steel/steel and polymer/steel systems. Bismuth (III) sulfide powder (Bi_2S_3) was obtained by employing solvothermal synthesis procedures. An orthorrombic crystal lattice (DRX) and a high-purity product (FRX) was evidenced for the powder obtained, which was added to a vinyl-terminated silicone fluid to obtain different wt% mixtures. The tribological performance of the formulations prepared was studied from Reichert´s (steel/steel system) and block on ring (polymer/steel tests), according to standardized methodologies. The results obtained for these formulations were compared with those formulations prepared with commercial Bi_2S_3, commercial molybdenum (IV) sulfide (MoS_2) and graphite. Lubricity properties increased when wt% of solvothermal Bi2S3 increased. The wear area decreased up to 90% according to Reichert´s tests. In addition, it was observed that solvothermal Bi_2S_3 shows a better tribological behavior when compared to commercial Bi_2S_3, MoS_2, and graphite. These results show the possibility to replace lead (Pb) or molybdenum (Mo) derivatives in lubricants´ formulations by an environmentally friendly additive, suitable for extreme pressure (EP) formulations. Moreover, solvothermal Bi_2S_3 displayed an excellent performance in silicon oil formulations when compared to commercially used additives that opens a window for its use in lubricant´s formulations at high-temperatures.



Recent Publications

1. Li Y et al. (2013) Selected-control hydrothermal synthesis and photoresponse properties of Bi2S3 micro/nanocrystals. Cryst. Eng. Comm. 15(33):6611-6616.
2. Xu X(2016) Extreme pressure synergistic mechanism of bismuth naphthenate and sulfurized isobutene additives. Surface Review and Letters. 24(5):1-12.
3. Heilig M and Egli M (2006) Pharmacological treatment of alcohol dependence: target symptoms and target mechanisms. Pharmacology and therapeutics. 111(3):855-876.
4. Li X et al. (2008) Acute alcohol intoxication potentiates neutrophil-mediated intestinal tissue damage after burn injury. Shock 29(3):377-383.
5. Room R, BaborT and Rehm J (2005) Alcohol and public health. Lancet. 365(9458):519-530.

Biography

Camila Müller is currently a PhD student in the Department of Chemical Engineering, Institute of Chemistry of the South. Dr. Mariana Dennehy is Researcher at the Instituto de Química del Sur (INQUISUR-CONICET UNS)). Dr. Andrés Ciolino is Researcher at the Planta Piloto de Ingeniería Química (PLAPIQUI-CONICET UNS). Dr. Walter Tuckart is a Researcher at the Instituto de Física del Sur (IFISUR-CONICET UNS).

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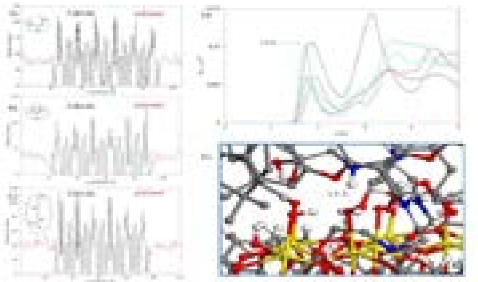
EXPLORATION OF THE METAL-ORGANIC FRAMEWORK/POLYMER INTERFACE IN MIXED MATRIX MEMBRANES

Sergio Rodrigues Tavares[1], **Guillaume Maurin**[1], **Osama Shekhah**[2], **Youssef Belmabkhout**[2], **Karim Adil**[2] and **Mohamed Eddaoudi**[2]
[1]Institut Charles Gerhardt Montpellier UMR 5253, France
[2]King Abdullah University of Science and Technology, KSA

Statement of the Problem: Mixed matrix membranes (MMMs) composed of polymers and metal-organic frameworks (MOFs) have attracted a great interest for potential application in the field of gas/liquid separations. One of the main challenges to overcome in this field is the fabrication of uniform and defect-free MMMs. Therefore, understanding what makes a MOF/polymer pair compatible is essential to advance the development and utility of these composites. To this end, the microscopic origins of the MOF/polymer compatibility must be investigated. Recently, the interfacial properties of PIM-1 (Polymer of Intrinsic Microporosity)/UiO-66 (MOF) nanocomposite were investigated by means of a joint experimental-theoretical exploration. Compared to the use of other flexible polymers, e.g. PVDF and PEG, this nanocomposite presents a rather poor compatibility, with the presence of substantial microvoids at the interface. The functionalization of PIM-1 would be a feasible way to circumvent this problem. Hence, a theoretical exploration consisting of investigating three functionalized forms of PIM-1 was proposed in order to anticipate a better compatibility of the corresponding MMMs.

Methodology & Theoretical Orientation: A hybrid methodology integrating quantum- and force field-based simulations was used to construct and characterize the different PIM-1/UiO-66(Zr) models.

Findings: The three investigated functionalization forms led to the improvement of the overlap length between the polymer and the UiO-66, thus leading to a better compatibility compared to the PIM-1/UiO-66 nanocomposite. We evidenced that a strong hydrogen bonding between the polymer and the MOF surface favors this compatibility enhancement. Furthermore, the aliphatic chains are able to penetrate the MOF pockets (Figure 1), increasing even more the interactions between. the composite components. **Conclusion & Significance:** The simulations of the three polymer modifications clearly indicated that a better compatibility can be achieved by the presence of strong hydrogen bonds with the terminal hydroxyls of the MOF surface and by long aliphatic chains, being able to interpenetrate the surface pockets.



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Recent Publications

1. Lin R et al. (2016) Ionic Liquids as the MOFs/Polymer Interfacial Binder for Efficient Membrane Separation. Appl. Mater. Interfaces 8:32041-32049
2. Friebe S et al. (2016) MOF-Based Mixed-Matrix Membranes in Gas Separation – Mystery and Reality. Chemie Ingenieur Technik 88:1788-1797
3. Lin R et al. (2018) Metal Organic Framework based Mixed Matrix Membranes: an Overview on Filler/Polymer Interfaces. Journal of Materials Chemistry A 6:293-312
4. Semino R et al. (2018) Understanding the origins of Metal-Organic Framework/Polymer Compatibility. Chemical Science 9:315-324
5. Semino R et al. (2015) Microscopic model of the MOF/Polymer interface: a first step towards understanding the compatibility in Mixed Matrix Membranes. Applied Materials & Interfaces 8:809-819

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NEAR-SURFACE CRYSTALLIZATION IN POLYESTERS

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The near-surface properties of thermoplastic polymers are of interest, particularly where thin film coatings or other structures are to be subsequently applied. Previous work by AFM and ellipsometry has established that the glass-transition temperature in the near-surface region is depressed by up to tens of Kelvin, leaving the surface vulnerable to deformation and penetration during coating processes such as metallization. We have also shown that the near-surface region of PET shows enhanced crystallinity. This paper will report our AFM studies of PET, PEN and copolymers thereof and the near-surface crystallization that can be induced by annealing at temperatures at which the surface molecular segments are mobile, but those in the bulk underneath are not. We demonstrate the characteristic morphologies associated with the surface crystallization and changes in the crystal orientation as growth proceeds. Comparison is made with other polymer systems we have studied including near-surface phase separation and unique crystal morphologies at the surface in polyurethanes.

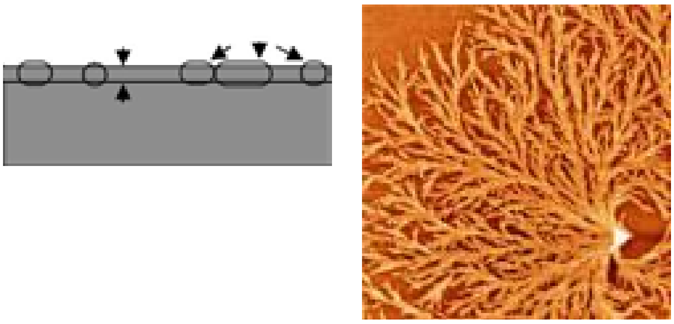

Figure 1: Schematic and AFM micrograph of crystals formed 1.0μm exclusively in the near-surface region.

Recent Publications

1. Pratt FL, Lancaster T, Brooks M, Blundell SJ, Prokscha T, Morenzoni E., Suter A, Luetkens H, Khasanov R, Shinotsuka K, Assender HE (2005) Surface dynamics of a thin polystyrene film probed by low energy muons. Physical Review B 72:121401
2. Shinotsuka K, Bliznyuk VN, Assender HE (2012) Near-surface crystallization of PET. Polymer 53:5554-5559
3. Jiang L, Wu J, Nedolisa C, Saiani A, Assender HE (2015) Phase separation and crystallization in high hard block content polyurethane thin films. Macromolecules 48:5358-5366
4. Shinotsuka K, Assender, HE (2016) In-Situ AFM study of near-surface crystallization in PET and PEN. J. Applied Polymer Science 133:44269
5. Shinotsuka K, Assender HE, Claridge TDW (2018) Synthesis of statistical PET/PEN random block copolymers and their crystallizability in the bulk and at the surface. J. Applied Polymer Science Early view APP46515.

Biography

Prof Hazel Assender has led a research activity at the Department of Materials, University of Oxford, since 1996, with a focus in the area of thin films and coatings both of polymer materials or onto polymer substrates. She graduated from the University of Cambridge, following this with a PhD, and two years of postdoc in the Department of Materials Science & Metallurgy in Cambridge before moving to an academic post in Oxford. Her research spans fundamental studies of the thin film and near-surface properties of polymers, through to materials engineering of thin films and device structures in large area on polymer substrates. Particular areas of interest include roll-to-roll deposition, gas barriers, photovoltaics, and transistors/circuits. Her research has a technology-facing approach bringing underpinning scientific understanding to development of materials and technologies that integrates research relevant to industrial processing such as scale-up of manufacture with the development of new materials and structures.

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Yonggui Liao et al., Polym Sci 2018, Volume 4
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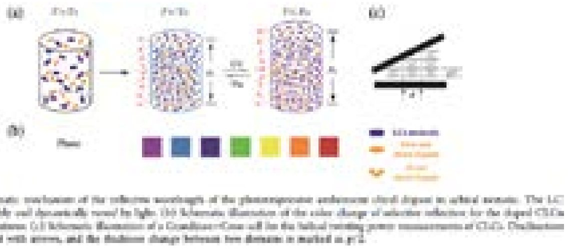
PRECISELY TUNING HELICAL TWISTING POWER VIA PHOTOISOMERIZATION KINETICS OF DOPANTS IN CHIRAL NEMATIC LIQUID CRYSTALS

Yonggui Liao, Dongxu Zhao, Yajiang Yang and **Xiaolin Xie**
Huazhong University of Science and Technology, China

It has been paid much attention to improve the helical twisting power (β) of dopants in chiral nematic liquid crystal (CLC). However, the correlations between the β value and the molecular structures as well as the interaction with nematic LCs are far from clear. In this work, a series of reversibly photo-switchable axially chiral dopants with different lengths of alkyl or alkoxyl have been successfully synthesized through nucleophilic substituent and the thiol-ene click reaction. Then, the effect of miscibility between these dopants and nematic LCs on the β values, as well as the time-dependent decay/growth of the β value upon irradiation, has been investigated. The theoretical Teas solubility parameter shows that the miscibility between dopants and nematic LCs decreases with increasing of the length of substituent groups from dopant 1 to dopant 4. The β value of chiral dopants in nematic LCs decreases from dopant 1 to dopant 4 both at the visible light photostationary state (PSS) and at the UV PSS after UV irradiation. With increasing of the length of substituent groups, the photoisomerization rate constant of dopants increases for trans-cis transformation upon UV irradiation and decrease for the reverse process upon visible light irradiation either in isotropic ethyl acetate or in anisotropic LCs, although the constant in ethyl is several times larger than the corresponding value in LCs. Also, the color of the CLCs could be tuned upon light irradiations. These results enable the precise tuning of the pitch and selective reflection wavelength/color of CLCs, which paves the way to the applications in electro-optic devices, information storage, high-tech anti-counterfeit, and so forth.



Recent Publications

1. Li Q et al. (2016) Nano-silica enhanced liquid-crystalline composite gels. Chinese Science Bulletin. 61: 2155-2162.
2. Wang XT et al. (2015) Photomechanically controlled encapsulation and release from pH-responsive microcapsules. Langmuir. 31(19):5456-5463.
3. Long S J (2014) Concurrent solution-like decoloration rate and high mechanical strength from polymer dispersed photochromic organogel. Macromol Rapid Commun. 35(7):741-746.
4. Bi S G (2013) High modulus and low-voltage driving nematic liquid-crystalline physical gels for light-scattering display. Soft Matter. 9(13):7718-7725.

Biography

Yonggui Liao is a Full Professor of Polymer Physics and Chemistry at School of Chemistry and Chemical Engineering, Huazhong University of Science and Technology, China. His current research activities focuses on multi-phase and multi-component polymers/supramolecules, ordered functional polymeric/supramolecular composites, physical behaviors of polymers/supramolecules under specific conditions, etc.

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FINITE ELEMENT MATERIAL MODEL FOR THE PREDICTION OF THE THERMAL CONDUCTIVITY OF HIGHLY FILLED POLYMERS

Gaiser Jochen[1], **Henning Frank**[2] and **Stripf Matthias**[1]
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Advanced polymer composites are increasingly used in the development of efficient and resource-conserving applications which require a high thermal conductivity. To optimize the thermal properties of the composites, fillers are added into the matrix material. To predict the effective thermal conductivity of the composites, several theoretical and empirical models have been presented. To enhance the prediction of the influence of various fillers on the effective thermal conductivity a 3D finite element based material model is presented. Thereby, different properties of the filler such as filler geometries, filler proportions, filler size distributions and filler orientations can be considered. To evaluate the model, specimens of polyphenylensulfid (PPS) with cuboid aluminum silicate (AlSi) fillers are injection-molded. The filler fraction is gradually increased up to the processing limit. The filler-dependent thermal conductivity is determined by different measuring methods and compared with the prediction from the material model. The results show that the prediction with the material model matches the measurements very well. Therefore, it is assumed that the developed material model can be used for the reliable virtual development of new highly filled thermally conductive polymer composites. Using the model first studies have been conducted to establish guidelines for the development of advanced polymer composites.

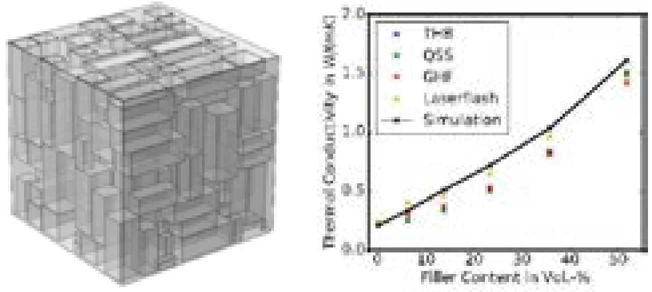

Figure 1: a) 3D finite element material model of PPS/AlSi with 60 Vol.-% filler content, b) simulated and measured filler-dependent thermal conductivity of PPS/AlSi.

Recent Publications

1. Progelhof R C, Throne J L and Ruetsch R R (1976) Methods for predicting the thermal conductivity of composite systems: a review. Polymer Engineering and Science. 16(9):615-625.
2. Hongyun Chen et al. (2016) Thermal conductivity of polymer-based composites: fundamentals and applications. Progress in Polymer Science. 59:41-85.
3. Ich Long Ngo, S V Prabhakar Vattikuti and Chan Byon (2017) A modified Hashin-Shtrikman model for predicting the thermal conductivity of polymer composites reinforced with randomly distributed hybrid fillers. International Journal of Heat and Mass Transfer. 114:727-734.
4. Hill R F and Strader J L (2007) Rudimentary finite element thermal modeling of platelet-filled polymer-ceramic composites. IEEE Transactions on Components and Packaging Technologies. 30(2):235-241.
5. Ich Long Ngo, Sangwoo Jeon and Chan Byon (2016) Thermal conductivity of transparent and friable polymers containing fillers: a literature review. International Journal of Heat and Mass Transfer. 98:219-226.

Biography

Gaiser Jochen is a PhD student at the University of Applied Sciences Karlsruhe, Germany. He is currently conducting research on measuring and simulation methods for the determination of the thermal conductivity of highly filled polymers. The aim of his work is to ensure the reliable design of thermally stressed injection-molded components.

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Sara Naderizadeh et al., Polym Sci 2018, Volume 4
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SUPERHYDROPHOBIC COATINGS FROM WATER-BASED BEESWAX EMULSIONS

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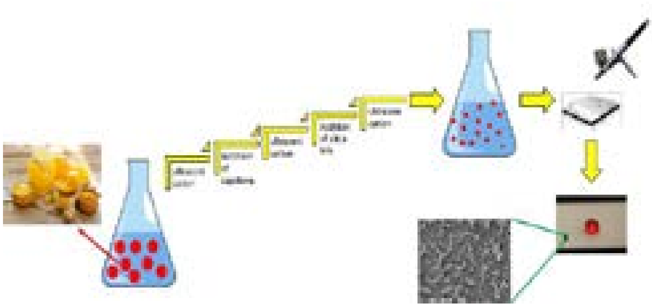
Italian Institute of Technology, Italy

Superhydrophobic coatings have attracted a lot of attention due to their wide applications in different aspects of the life. However, the practical applications of the artificial superhydrophobic coatings are restricted by issues related to durability and environmental concerns due to chemicals used. Herein, an organic solvent-free superhydrophobic coating based on natural wax- beeswax- was developed through oil-in-water emulsion process. An aqueous perfluorinated acrylic copolymer (PFAC; Capstone ST-100) is used as an internal surfactant to make stable beeswax emulsion. Ultrasonication of the wax emulsion is useful to decrease the emulsified particle size and better dispersion of beeswax in water. The coatings were prepared by spray coating method along with thermal annealing at 170°C. The contact angle and roll-off angle of this coating were measured about 116.18° and 90° (sticky water droplet), respectively. To reach superhydrophobicity level and to create rough structures on the surface, silica nanoparticles (Aerosil-300) were added to the emulsion. By adding proper amount of hydrophilic silica nanoparticles, the contact angle of the resulted nanocomposite improved to higher value and roll-off value reached less than 10°°. The wetting properties of the obtained coatings revealed self-cleaning property. The particle size distribution and structure of the particles inside the emulsion were studied by dynamic light scattering (DLS) and transmission electron microscopy (TEM), respectively. Both of these measurements proved the core-shell structure of the emulsified particles. The coating's surface morphology and average roughness value were examined by scanning electron microscopy (SEM) and atomic force microscopy (AFM). It is obvious that by utilization of silica nanoparticles, the average roughness value increased, which agrees with the results of the wetting properties. Due to the simple fabrication method and biodegradability of the materials, it can be used as a coating in different applications, such as; textile, water-based paint, oil phase separation and biomedical applications.



Recent Publications

1. Wei Wang et al. (2016) Superhydrophobic Coatings with edible materials. ACS Appl. Mater. Interfaces. 8(29):18664-18668.
2. Sara Naderizadeh, Athanassia Athanassiou and Ilker S Bayer (2018) Interfacing superhydrophobic silica nanoparticle films with graphene and thermoplastic polyurethane for wear/abrasion resistance. Journal of Colloid and Interface Science. 519:285-295.
3. Reshmi C R et al. (2017) Fabrication of superhydrophobic polycaprolactone/beeswax electrospun membranes for high-efficiency oil/water separation. RSC Adv. 7(4):2092-2102.
4. Wewei Zhang et al. (2014) Fabrication of superhydrophobic paper surface via wax mixture coating. Chemical Engineering Journal. 250:431-436.
5. Wang P, Qian X and Shen J (2018) Superhydrophobic coatings with edible

Biography

Sara Naderizadeh is a second year PhD student in Smart Materials Group at the Italian Institute of Technology, Genova, Italy with a background in Polymer chemistry. She is an expert in fabrication of polymer nanocomposites and is continuing her work in the field of polymer science and mainly the application of polymers in different aspects. She is currently researching on superhydrophobic coating based on different materials mainly polymers via different methods, which can be used in various areas.

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INVESTIGATION OF BIOCOMPATIBLE THIOL/YNE FORMULATIONS FOR 3D PRINTING OF MEDICAL SCAFFOLDS

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In recent years UV-based 3D printing technologies such as stereolithography have become a growing field of research in biomedical engineering. The fabrication of drilling guides for dental implants or ear-shaped hearing aids is already considered as standard. More novel applications such as bone scaffolds are yet to be mastered. With the advance of this novel technique production cost and time are expected to drastically decrease. For these applications, including bone screws and stents, a variety of materials, reaching from metals, ceramics to polymers can be considered. Polymers represent the most adaptable class of materials due to the great freedom of design in their molecular structure. Commonly used resins for lithographic 3D printing are multifunctional (meth-)acrylates, which polymerize via chain-growth mechanism. This results in a heterogeneous network structure with a high internal stress and a monomer conversion ranging from 60-90%. The remaining (meth-)acrylates, which are known to act as Michael acceptors can migrate and interact with physiological thiols and amines, e.g. proteins or DNA molecules. Thiol-yne systems have been explored as biocompatible photoreactive resins. The polymerization of these monomers proceeds via step-growth mechanism, causing a delayed gelation point, which results in a significantly lower internal stress and a higher overall conversion of >98%. In our work we present the direct modification of commercially used bifunctional acrylate to obtain multifunctional alkynes which can be used for thiol/yne formulations. We report on the synthesis, the photochemical characterization, the mechanical properties of the cured monomers, the biocompatibility and the 3D printing behavior. The increased monomer conversion, and the resulting improved biocompatibility make the proposed thiol/yne systems interesting candidates for photoreactive resins for the 3D printing of biocompatible structures for hard tissue engineering.

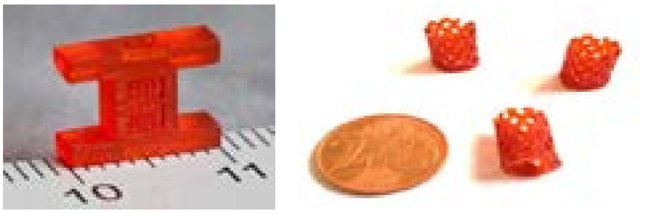

Figure 1: 3D printed test patterns out of a thiol/yne formulation; using Sudan II as a light absorber. (Scale on the left shown in cm).

Recent Publications

1. F Valente, G Schiroli and A Sbrenna (2009) Accuracy of computer-aided oral implant surgery: a clinical and radiographic study. Int. J. Oral Maxillofac. Implants. 24(2)234-242.
2. A Dawood, B M Marti, V Sauret Jackson and A Darwood (2015) 3D printing in dentistry. Br. Dent. J. 219(11):521-529.
3. Li Xiaoling, Schwacha M G, Chaudry I H and Choudhry M A (2008) Acute alcohol intoxication potentiates neutrophil-mediated intestinal tissue damage after burn injury. Shock. 29(3):377-383.
4. M Schuster et al. (2009) Gelatin based photopolymers for bone replacement materials. J. Polym. Sci: Part A Polym. Chem. 47(24):7078-7089.
5. S C Ligon Auer et al. (2016) Toughening of photo-curable polymer networks: a review. J. Poly. Chem. 7(2):257-286.

Biography

Daniel Hennen studied Chemistry at the University of Bonn (Germany) and obtained his Master´s Degree in the field of Macromolecular Chemistry in the working group of Professor Doctor S Höger. He is currently a PhD candidate at the Christian Doppler Laboratory for Functional and Polymer Based Ink-Jet Inks at the University of Leoben (Austria) in the working group of Professor Doctor T Griesser. He is working in the field of biocompatible photopolymers and investigates novel compounds for thiol/yne and thiol/ene formulations which are used for rapid prototyping. Additionally, he works on the synthesis of novel water-soluble photoinitiators for UV curable water-based inkjet inks.

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M José Carrero et al., Polym Sci 2018, Volume 4
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STUDY OF COUMARIN INCORPORATION IN THERAPEUTIC POLYMERS

M José Carrero, María J Ramos, Ana M Borreguero and **Juan F Rodríguez**
ITQUIMA - University of Castilla-La Mancha, Spain

Poly(ethylene oxide)-poly(propylene oxide) (PEO-PPO) block copolymers stand out among amphiphilic molecules due to the possibility of modifying their hydrophilic/hydrophobic character easily, just varying the proportion between the PEO and PPO molecules respectively. This property together with their biocompatibility and biodegradability make them, and their derivatives, suitable for products formulation in industries ranging from agriculture to pharmaceuticals and controlled release of drugs. Thus, these copolymers are able to form thermodynamically stable micelles in aqueous solution above a certain copolymer concentration, CMC (critical micelle concentration) that can improve the poor solubility of the drugs. Moreover, the introduction of glycidyl propargyl ether (GPE), which contains triple bonds, in the copolymer chain allows to obtain functionalized terminal alkynyl-polyethers suitable for future click attachment, with the objective of enlarging the drug lifetime in the body. The ultimate purpose of this work is to obtain a tailor-made polymeric drug carrier able to incorporate the coumarin (anticancer agent) which will provide the two aforementioned benefits. First, PEO-PPO-GPE triblock copolymers were synthesized through nucleophilic ring-opening polymerization, maintaining the mass ratio between hydrophilic/hydrophobic segments (50/50) in all cases, but changing the ratio for the hydrophobic monomers (PPO and GPE) to increase the GPE mass percentages in the final copolymer from 0 to 15 percent. Subsequently, on the one hand, the coumarin was loaded in polymeric micelles with different percentages of GPE using direct dissolution method. Based on the DLS (Dynamic Light Scattering) results, the micelles size was in the suitable range (10-200 nm) to enable its absorbability by the target cells and this size increased when coumarin was added, confirming its incorporation. On the other hand, the click reaction based on the use of Cu (II) as catalyst, between the PEO-PPO-GPE copolymers and azide-coumarin was successfully carried out according to FTIR and NMR analysis.

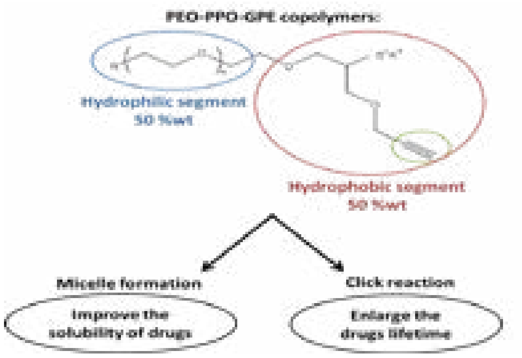

Figure 1: PEO-PPO-GPE copolymers structure and their possibilities of drugs incorporation

Recent Publications

1. **Gracia E et al. (2017) Functionalization and optimization of PLA with coumarin via click chemistry in supercritical CO2. Journal of CO2 Utilization. 20:20-26.**
2. **De Haro J C, Rodríguez J F, Pérez Á and Carmona M (2016) Incorporation of azide groups into bio-polyols. Journal of Cleaner Production. 138(1): 77-82.**
3. **Borreguero A M et al. (2016) Zidovudine insertion in tailor-made propylene and ethylene oxide copolymers. Reactive and Functional Polymers. 101:1-8.**
4. **Cabezas L I et al. (2013) Production of biodegradable porous scaffolds impregnated with 5-fluorouracil in supercritical CO2. Journal of Supercritical Fluids. 80:1-8.**
5. **Velencoso M M et al. (2013) Click-ligation of coumarin to polyether polyols for polyurethane foams. Polymer International. 62(5):783-790.**

Biography

M José Carrero is PhD student at the University of Castilla-La Mancha (UCLM). Her research focuses on the synthesis of polymer-drug conjugates to controlled delivery of drugs, and currently she has participated in one congress obtaining the best presentation award in 2017.

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POLY(PHENYLENE METHYLENE): A THERMALLY STABLE, PROCESSABLE HYDROCARBON POLYMER WITH UNEXPECTED PHOTOLUMINESCENCE

A Braendle[1], A Perevedentsev[1], P Schwendimann[1], N J Cheetham[2], P N Stavrinou[3], J A Schachner[4], N C Mösch Zanetti[4], M Niederberger[1] and **W R Caseri[1]**
[1]ETH Zurich, Switzerland
[2]Imperial College London, UK
[3]University of Oxford, UK
[4]University of Graz, Austria

Poly(phenylene methylene) (PPM) lies structurally between linear polyethylene and poly(p-phenylene). It can readily be synthesized in large quantities on laboratory scale (>150 g) and in absence of solvents by catalytic polymerization of benzyl chloride with SnCl4. Molar masses up to 61,000 g/mol were achieved, which are an order of magnitude above previously reported values. The polymer can be processed easily into fibres, films and foams. TGA analysis revealed an exceptionally high onset of the decomposition temperature around 470°C. Remarkably, PPM exhibits photoluminescence between 400-600 nm. This phenomenon cannot be caused by π-electron delocalization of alternating double and single bonds. Instead, the results of extended investigations are in line with homoconjugation as the origin of the photoluminescence. Homoconjugation only arises in special chemical structures for which conjugation across individual π-electron systems can occur by overlap of p-orbitals although those systems are separated by an electronically insulating group, e.g. a methylene group. Notably, π-stacking, aggregation/crystallization and impurities were excluded as the origins of fluorescence. PPM also shows a remarkably long photoluminescence lifetime of 8.55 ns (thin film) and a quantum efficiency of 69% (solution). We believe that poly(phenylene methylene) will serve as an example of a new class of fluorescent polymers characterized by homoconjugation along the main chain.

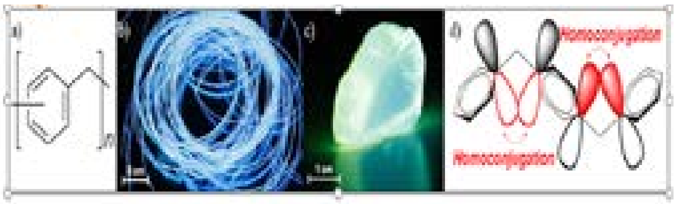

Figure 1: a) Chemical structure of PPM. Photographs taken under UV-light (365 nm) illumination of b) drawn fibers and c) bulk PPM. d) Schematic representation of homoconjugation in a chain segment of poly(phenylene methylene).

Recent Publications

1. A Braendle et al. (2017) Synthesis and fractionation of poly(phenylene methylene). J. Polym. Sci: Part A Polym. Chem. 56(3):309-318.
2. A Braendle et al. (2017) Homoconjugation in poly(phenylene methylene)s: a case study of non π conjugated polymers with unexpected fluorescent properties J. Polym. Sci: Part B Polym. Phys. 55(9):707-720.
3. A Braendle et al. (2017) CHIMIA. 71:733.
4. H Zhang et al. (2017) Why do simple molecules with "isolated" phenyl rings emit visible light? J. Am. Chem. Soc. 139:16264-16272.
5. Q Yan et al. (2016) Three-dimensionally homoconjugated carbon-bridged oligophenylenevinylene for perovskite solar cells. J. Am. Chem. Soc. 138(34):10897-10904.

Biography

A Braendle holds a MSc in Interdisciplinary Sciences from ETH Zürich with a focus on polymer chemistry and materials sciences. He is currently a PhD candidate in Walter Caseri's research team at ETH Zürich. His research interests include synthesis of hydrocarbon polymers and their optical properties. More specifically, his work examines the synthesis of poly(phenylene methylene)s by Friedel-Crafts-type catalysts and the analysis of its peculiar materials properties with advanced spectroscopic methods.

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NOVEL APPROACHES TO ANALYZE INTERIOR LAMELLAE AND ASSEMBLY IN SPHERULITIC MORPHOLOGY OF POLY(3-HYDROXYBUTYRIC ACID-CO-3-HYDROXYVALERIC ACID) CRYSTALLIZED WITH POLY(VINYL METHYL ETHER)

Chung Hao Chen and **Eamor M Woo**
National Cheng Kung University, Taiwan

In 2012 Woo et al. first explored the interior lamellar assembly of banded spherulites leading to optically repetitive rings in poly(ethylene adipate) (PEA). In-depth view and mechanistic correlations between top surface and interior lamellae arrangement in banded PEA were built through accurate 3D interior analyses. Ring-banded spherulites upon crystallization are common in some semicrystalline polymers including poly(3-hydroxybutyric acid-co-3-hydroxyvaleric acid) (PHBV). This study focuses on interior structure of PHBV double ring-banded spherulites. The lamellar assembly of PHBV spherulites in the blend with amorphous poly(vinyl methyl ether) (PVME) has been examined to elaborate the formation mechanisms of banded PHBV spherulites in non-isothermal and isothermal crystallization process. The behavior of PHBV spherulite crystals by continuous heating/cooling crystallization temperatures (Tcs) was recorded and analyzed by using polarized optical microscopy (POM) and scanning electron microscopy (SEM). Under POM observation, PHBV/PVME (75/25) 4 wt% exhibits double-ring banded morphology with both orange and blue color bands alternatingly arranged along radial direction at a wide temperature range (60 to 100°C). However, the band spacing and irregularity of the ring patterns on spherulites vary accordingly with Tc from wider-irregular rings at high Tc into slimmer-regular rings at low Tc. SEM (scanning electron microscope) was used to observe the interior lamellae arrangement of PHBV spherulites. Correlations between crystallization temperatures(Tcs) and interior lamellar ring-banded patterns were collected and analyzed for possible formation mechanisms.

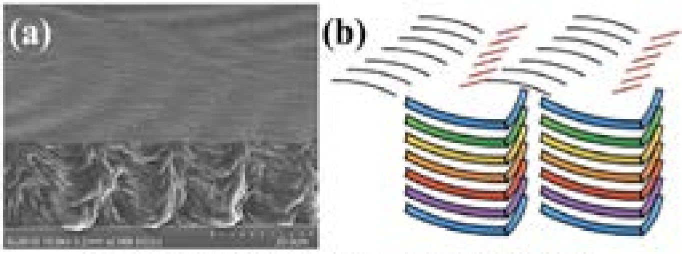

Figure 1(a)SEM micrographs revealing the interior lamellar arrangement(b)Schematic illustration for interior structure and top surface.

Recent Publications

1. C C Su, E M Woo and Y T Hsieh (2013) Perpendicularly orient lamellae in poly(3-hydroxybutyric acid-co-3-hydroxyvaleric acid) blended with an amorphous polymer: ultra-thin to thick films. Physical Chemistry Chemical Physics. 15(7):2495-2506.
2. A Meyer et al. (2010) Atomic-force and optical microscopy investigations on thin-film morphology of spherulites in melt-crystallized poly(ethylene adipate). Industrial and Engineering Chemistry Research 49(23):12084-12092.
3. E M Woo and G Lugito (2015) Origins of periodic bands in polymer spherulites. European Polymer Journal. 71:27-60.
4. E M Woo, L Y Wang and S Nurkhamidah (2012) Crystal lamellae of mutually perpendicular orientations by dissecting onto interiors of poly(ethylene adipate) spherulites crystallized in bulk form. Macromolecules. 45(3):1375-1383.
5. E M Woo, G Lugito, J H Tsai and A J Müller (2016) Hierarchically diminishing chirality effects on lamellar assembly in spherulites comprising chiral polymers. Macromolecules. 49(7):2698-2708.

Biography

Chung Hao Chen is a Master-Degree student in the Department of Chemical Engineering from National Cheng Kung University, Taiwan. He is currently conducting experiments under supervision of Professor Eamor M Woo in Polymer Physics Laboratory. He had an oral presentation in the Polymer Processing Society (PPS) Europe Africa Conference 2017 held in Dresden, Germany. from June 26th - June 29th, 2017. In addition, he had a poster presentation in the 8th Taiwan-Japan Bilateral Workshop on Nano-Science (2017TJBW) held from September 4th - September 5th, 2017 in National Cheng Kung University, Taiwan. He was awarded for the excellent student poster presentation. He is currently working on the project about ring-banded spherulites packed with discontinuous positive- and negative-birefringence lamellae constructed by crystallization temperature and wants to discover the growth mechanism of ring-banded spherulites by using biodegradable polymer PHBV.

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SYNTHESIS AND MORPHOLOGICAL INSIGHTS INTO NOVEL, STABLE AND BIOCOMPATIBLE SMART HYDROGELS WITH PROSPECTIVE WOUND HEALING PROPERTIES

Deepa Suhag and **Monalisa Mukherjee**
Amity University, India

A latticework of hydrophilic macromolecular structures results in the formation of hydrogels. These hydrogels are usually synthesized by chemical or physical crosslinking strategies. Owing to their striking attributes such as hydrophilic nature, high biocompatibility and flexible morphology, they are rendered as promising candidates for potential biomedical applications. In this current study, we present the mechanism of formation of stable, smart, pH-responsive hydrogels via one-step, facile, free radical aqueous copolymerization. The stability of the hydrogels along with their predisposed macroporous structure are attributed to the phenomenon of phase separation along with monomer feed ratio and water content. Molecular level evaluation further divulge the interrelation between hydrogen bonding and strong electrolytic complexation amongst the monomers. Furthermore, we successfully established the remarkable biocompatibility of pAcD (poly(AAc-co-DEAEMA)). More importantly, oral administration of the hydrogels to the rat model did not produce any significant change in the vital organs, namely, hippocampus (CA1 section) of the brain, myofibrillar and myocytes nuclei of heart, hepatocytes and central vein of liver and parenchyma, tubules and glomeruli of kidney. Owing to their remarkable biocompatibility, stimulus (pH) responsiveness, and cost-effective production, pAcD hydrogels can be used for the targeted delivery and sustained release of various pharmaceutical formulations. As a future directive, we have also looked at the wound healing properties of this hydrogel with herbal formulations and it resulted in exceptionally speedy wound healing process.

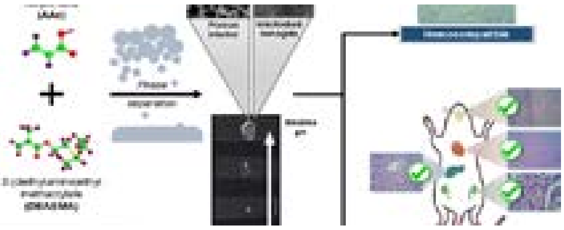

Figure 1: Macroporous interior with interlocked nanoglobules as stable building blocks in pAcD gels with high in-vitro and in-vivo biocompatibility.`

Recent Publications

1. Suhag, D et al. (2017) Sustainable growth and lipid production from Chlorella pyrenoidosa using N-doped carbon nanosheets: unravelling the role of graphitic nitrogen. ACS Sustainable Chemistry & Engineering. 6(1):774-780. Doi:10.1021/ acssuschemeng.7b03103.
2. Suhag D et al. (2017) Electrochemically synthesized highly crystalline nitrogen doped graphene nanosheets with exceptional biocompatibility. Scientific Reports. 7:537. Doi:10.1038/s41598-017-00616-8.
3. Suhag D et al. (2016) Hydrothermally functionalized biocompatible nitrogen doped graphene nanosheets based biomimetic platforms for nitric oxide detection. J. Mater. Chem. B. 4(27):44780-4789. Doi: 10.1039/ C6TB01150K.
4. Suhag D et al. (2015) Hydrothermal synthesis of nitrogen doped graphene nanosheets from carbon nanosheets with enhanced electrocatalytic properties. RSC Adv. 5(50):39705-39713. Doi: 10.1039/C5RA05060J.
5. Suhag D et al. (2015) N-doped carbon nanosheets with antibacterial activity: mechanistic insight. RSC Adv. 5(30):23591-23598. Doi: 10.1039/C4RA17049K.

Biography

Deepa Suhag is the Asst. Professor at Amity University, India. She has her expertise in material sciences, electrochemistry and biomimetics. Her major efforts are focused towards exploring the biocompatibility properties of the as-synthesized materials. Furthermore, she aims to establish the materials synthesized by her for their prospective biomedical applications such as biosensing, bio-imaging and theranostics. She aims to contribute towards the wellbeing and uplifting of human life standards by making theranostics as non-invasive as possible while maintaining their affordability.

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