APTEC

4th Annual Meeting

Louisiana State University

Baton Rouge, LA

7 November 2016

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Notices from the Organizers

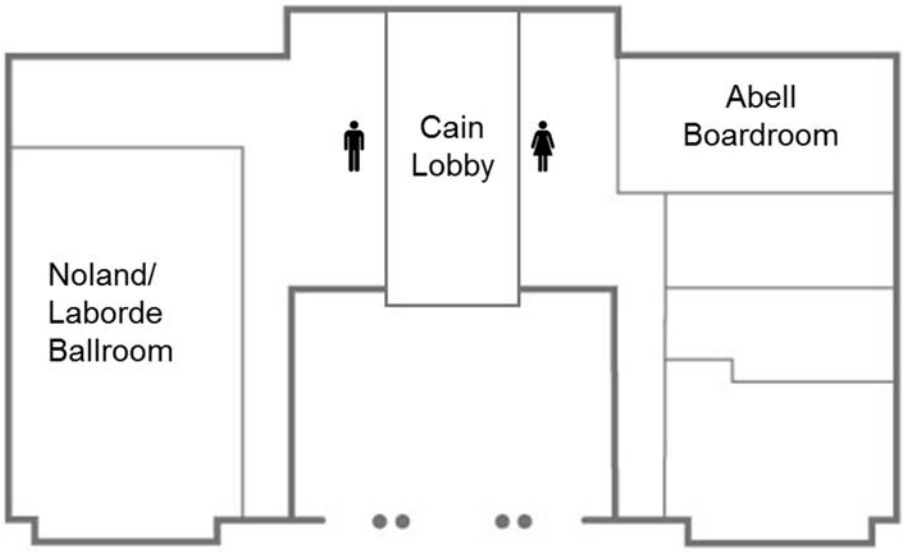
Hello Attendees! Thank you for attending the 4th Annual APTEC Meeting at LSU! Below is some general information you need to know.

- Posters are going to be displayed the entire meeting. You can leave them up until you leave for the day.
- Posters are to be hung using Velcro only! Velcro will be available in the ballroom throughout the day.
- Please stand by your poster during the assigned time as indicated on the meeting schedule and use the other poster session to view the rest of the research being presented.
- Onsite registration for the social will be available until lunch. Stop by the registration table, or find one the organizers if you need to register.
- APTEC pocket protectors are available with a $5 donation at the registration table.
- Coffee will be available during all breaks.

We hope you all enjoy the conference, and please do not hesitate to find any of us if you have any questions.

-The 2016 APTEC Meeting Organizers

Lod Cook Map



Meeting Schedule

Registration and Breakfast (Noland/ Laborde Ballroom)	**8:00—9:00**
Introduction (Noland/Laborde Ballroom) Cynthia Petersen, Dean, LSU College of Science Paul Russo, Chairman of the Board	**9:00—9:30**
Poster Session I: **Posters 1-16** (Noland/Laborde Ballroom)	**9:30—10:30**
Break	**10:30—10:45**
Oral Presentations (Abell Boardroom) 1. Christopher Arges, LSU 2. Ian Brettell-Adams, UA 3. Jean-Baptiste Decombe, LSU 4. Joseph Lott, USM	**10:45—12:00**
Lunch Buffet (Noland/Laborde Ballroom)	**12:00—13:00**
Poster Session II: **Posters 17-32** (Noland/Laborde Ballroom)	**13:00—14:00**
Keynote Address (Abell Boardroom) Erick Soto-Cantu	**14:00—14:45**
Break	**14:45—15:00**
Oral Presentations (Abell Boardroom) 1. Kyoungtae Kim, USM 2. Chunwa (Peter) Kei, LSU 3. Yoan Simon, USM	**15:00—16:00**
Career Panel (Abell Boardroom)	**16:00—17:00**
Networking Social* (Cain Lobby)	**17:00— until**

*Tickets required for the networking social.

Oral Presentation Abstracts
Morning Session

1. Molecular Level Engineering of Block Copolymer Electrolytes via Directed Self-assembly
Christopher Arges, Louisiana State University

Polymer electrolytes are ubiquitous to numerous electrochemical processes that store and convert energy, synthesize chemicals, and purify water. An important property of these materials is their ionic conductivity — a key transport characteristic that governs the ohmic resistance in electrochemical devices. Block copolymer electrolytes (BCEs) are attractive materials because their microphase separated architecture yields greater conductivity over their random copolymer counterparts. However, there is a poor understanding between microstructure and bulk material properties like ionic transport.

In this work, the process of directed self-assembly controlled the microphase separated structure in BCEs with astonishing fidelity. The ordered BCE was achieved by first directing the self-assembly of the non-ionic variant block copolymer. Then, an invasive gas phase reaction incorporated ionic moieties into the block copolymer while being benign to the nanostructured material. X-ray scattering and electron microscopy substantiated the introduction of ionic groups without detriment to structural integrity. Key results highlight that ionic conductivity followed an exponential growth curve with respect to ionic domain connectivity. Ionic domain alignment to electrode surfaces with a tortuosity of 1 yielded a 2 order of magnitude improvement in ionic conduction over anti-aligned ionic domains. The results have far reaching implication for the rationale design of BCEs.

2. Polyborafluorene and Borafluorene Copolymers, Boron Doped Variants of Polyparaphenylene
Ian Brettell-Adams, University of Alabama

Electron deficient conjugated systems are of increased interest to the fields of novel semiconductor and sensing materials; this is because there are relatively few compared to electron rich conjugated systems. One powerful strategy to control the electron donating or accepting nature of a conjugated polymer system is through the incorporation of inorganic elements. In addition, copolymerization of different donating and accepting conjugated monomers is a simple and comparable approach to tuning electronic properties. Our research is focused on the synthesis and characterization of novel borafluorene, a boron congener of fluorene, polymers and copolymers. We will be discussing our data collected on the properties of these polymers and future borafluorene synthesis.

3. Binding Forces Measurement on Thiol-Acrylate Polymer Surfaces Using Optical Tweezers

Jean-Baptiste Decombe, Louisiana State University

Initial binding forces are the first step in the cell adhesion process which includes cell spreading and cell migration. It has been proven that cell adhesion plays an important role in cell survival and cell differentiation. Those binding forces have been measured quantitatively using optical tweezers between human adipose stem cells and Thiol-Acrylate polymers. Optical tweezers are based on the forces exerted by a tightly focused infrared laser beam due to momentum exchange of incident photons to the object. Those optical forces are in the piconewton range thus this tool is ideally suited for measuring very weak interaction such as cells initial binding force. It allows 3D manipulation of colloidal objects in a wide size range from microns down to nanometers without any mechanical contact and with extreme accuracy. Its noninvasive and nondestructive character makes it the perfect tool for studying biological objects like viruses and bacterium or single living cells.

4. Fluorimetric Stimuli Responsive Polymers

Joseph Lott, University of Southern Mississippi

A new approach to optically active stimuli responsive polymers is presented. The materials are based on precisely engineered “molecular reporters” that exhibit vibrationally-dependent emission intensity. For these molecules, no fluorescence is observed when molecular motions are unhindered, yet when vibrational freedom is impinged, fluorescence emission is turned on. Owing to the many stimuli that can be used to perturb the vibrational (and therefore the fluorescence) ability of the small molecules, innovation over a broad portfolio of polymer-based systems is enabled. Demonstrations of this concept include optical responses triggered by gelation, curing of epoxies, and traversing the glass transition.

Oral Presentation Abstracts
Afternoon Session

5. Investigation of Structural and Viscoelastic Properties of Novel POSS/Pglass Nanocomposites

Kyoungtae Kim, University of Southern Mississippi

The structural and rheological properties of novel POSS/Pglass nanocomposites composed of polyhedral oligomeric silsesquioxane (POSS) and ultra-low Tg tin flurophosphate glass (Pglass) was investigated using structural and rheological characterizations. The structure of the novel nanocomposites was investigated by attenuated total reflectance Fourier transform infrared spectroscopy (ATR-FTIR), X-ray photoelectron spectroscopy (XPS) and Solid state NMR. The results indicated that Pglass homogeneously incorporates dispersed POSS with chemical bonds in molecular level. In addition, the solid-state NMR revealed that increasing the content of POSS caused the increase of ratio Q1 to Q2 suggesting that POSS chemically reacted with the Pglass chains resulting in the decrease of the chain size of Pglass in the nanocomposites. The novel chemical bonds between POSS and Pglass were investigated by ATR-FTIR and XPS. Also, the nanostructure of the POSS/Pglass nanocomposites was characterized by scanning electron microscopy (SEM) - energy-dispersive X-ray spectroscopy (EDX) and atomic force microscopy (AFM) supporting the homogeneous dispersion of POSS in the Pglass matrix. The rheological behavior of the POSS/Pglass nanocomposites was investigated using strain control rheometer. It is observed that the complex viscosity of the nanocomposites was dramatically affected by POSS concentration.

6. Nanoparticles of Unsubstituted Polythiophene by Chain-Growth Dispersion Polymerization

Chunwa (Peter) Kei, Louisiana State University

Externally initiated Catalyst-Transfer Polycondensation was applied to develop a novel method for preparing unsubstituted polythiophene nanoparticles. An electron acceptor molecule N,N-Di(2,6-diisopropylphenyl)-1,7-di(-bromo-2,2-bithien-5-yl)perylene-3,4:9,10-tetracarboxylic bisimide (PDCI) was covalently incorporated into the external initiator, and the donor acceptor chemistry of a PTh/PDCI excimer reveals the internal spatial distribution of PDCI. These structural investigations revealed agglomerates of primary rod particles hidden within, and in certain conditions, nanofibers of PDCI-PTh could be generated. Finally, a two stage model for the formation of these nanostructures is proposed.

7. Making polymers smart by making them locally weak?
Yoan Simon, University of Southern Mississippi

Materials that adapt to their environment and respond to it in a desirable manner are particularly interesting both from a fundamental and application-oriented perspective. In order to direct the stimuli-responsiveness of polymeric materials, one must control their overall architectures, both at the molecular and supramolecular level. To achieve this goal, our group takes advantage of polymer chemistry and engineering to fabricate materials that will respond on command upon application of a given cue. Mechanoresponsive materials, i.e. materials that transduce mechanical force into a usable chemical potential will be broached and the design principles for such materials will be exposed. In particular, supramolecular materials that exhibit unique autonomous-mending properties upon application of ultrasonic waves will be discussed. We will also discuss the incorporation of radical-generating species into polymeric backbones as well as additional (mechano)luminescent materials.

Notes

Poster Presentation Titles

1. **Polymerization control through varied reaction parameters in the ATRP of NaPSS**
   Paul Balding

2. **Solvent effects on modulus of poly(propylene oxide)-based organogels as measured by cavitation rheology**
   Kyle Bentz

3. **Silica Polypeptide Composite Particles as Responsive Materials for Jamming Transition Studies**
   Alyssa Blake

4. **Effects of Inert Fillers of Frontal Polymerization Temperature and Velocity in Acrylate Composites**
   Sam Bynum

5. **Investigation of the Dynamic Aminal Bond Exchange towards the Design and Synthesis of Polyaminal Polymers**
   Albert Chao

6. **Nanoparticles of Unsubstituted Polythiophenes by Chain-Growth Dispersion Polymerization**
   Chunwa (Peter) Kei

7. **Reinforcing 3D printing PLA filaments with PLA grafted cellulose nanofibers**
   Ju Dong

8. **Free-Radical Frontal Polymerization Properties of Vinylic Monomers in Deep Eutectic Monomer Mixtures**
   Kylee Fazende

9. **Fluid Encapsulations by Hydrophobin Cerato Ulmin**
   Andrew Gorman

10. **Determining the Origins of Impurities during Azide-Alkyne Click Cyclization of Polystyrene**
    Farihah Haque

11. **Phosphole Containing Conjugated Polymer**
    Hongda Cao

12. **Thermoresponsive hydrogel poly(N-vinylcaprolactam) grafted cellulose nanocrystals: synthesis, structure, and liquid-to-gel transition behavior**
Jinlong Zhang

13. **Ultrathin film crystallization of poly(ε-caprolactone) in blends containing styrene-isoprene block copolymers: the nano-rose morphology**
Giovanni Kelly

14. **Elucidation of unconventional poly(2-oxazoline) termination phenomena via targeted end group modification and MALDI-TOF MS characterization**
Karolina Kosakowska

15. **Water processable dioxythiophene copolymer blended with carbon nanotubes for flexible electrochemical supercapacitors**
Augustus Lang

16. **Effect of polymer architecture on nano-structured polymeric materials and development of nanoporous membrane for separation of oil-water mixtures**
Baraja Lwoya

17. **Anionic polymerization of Aziridines**
Pierre Canisius Mbarushimana

18. **Cure-On Demand Bone Restoration using Frontal Polymerization**
Catherine Morejon-Garcia

19. **Surface-initiated short chain ATRP of substituted styrenes on SiO2 - A step towards Engineered Soil Surrogates (ESS)**
Arjun Pandey

20. **The synthesis and characterization of linear poly(ethylene glycol)s bearing supramolecular hosts and guests–toward hydrophilic supramolecular polymer assembled via the hydrophobic effect**
Molly Payne

21. **The Role of Cosolvent in the Processing of a Highly Aggregated Polymer for Organic Photovoltaics**
Ian Pelse

22. **Chemical Oxidation of Soluble Electroactive Polymers: A Route Towards Scalable Device Construction**
Sandra Pittelli

23. **Buckling Instabilities in Polymer Brush Surfaces via Postpolymerization Modification**
Cassandra Reese

24. **Cellulose Nanocrystal Supported Superparamagnetic Nanorods with Aminated Silica Shell: Synthesis and Properties**
Suxia Ren

25. **Micellation and Micellar Structure of Sequence-defined Ionic Peptoid Amphiphiles**
Garrett Sternhagen

26. **Thiol-Acrylate Materials for Microfluidic Applications**
Michael Tullier

27. **Thin film phase behavior and domain spacing of binary and ternary homopolymer/block copolymer blends**
Md Fakar Uddin

28. **Luminescent nanoparticles for high-throughput microfluidic droplet barcoding**
Manibarathi Vaithiyanathan

29. **Self-assembling linear-dendritic hybrids as next generation drug delivery systems**
Dal Williams

30. **Synthesis and characterization of thermoreversible ABC triblock copolypeptoid hydrogels**
Sunting Xuan

31. **Differential dynamic microscopy of thermoreversible microgel particles**
Xujun Zhang

32. **Pattern Generation via Block Copolymer Self-assembly**
Le Zhang

Panel Speakers

Robert J. Brown, JD, MBA
- Assistant Director, LSU Office of Innovation & Technology Commercialization

H. N. Cheng, PhD
- Research Scientist, USDA

Joshua Hanna, PhD
- Coatings, Construction, and Wind Product Manager, Huntsman

Samuel Lahasky, PhD
- Product Manager, SciGenesis

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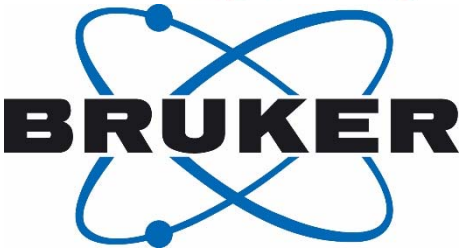
Keynote Speaker

Dr. Erick Soto-Cantu

Dr. Erick Soto-Cantu is a research chemist at the 3M Company in St. Paul, Minnesota. He works in the Corporate Research Analytical Laboratory of 3M; Erick interacts with nearly all business units of the company. Prior to coming to the United States, Erick earned a bachelor's degree in chemistry from UANL in Mexico. Erick earned his Ph. D. in chemistry from LSU directed by Prof. Paul Russo. Upon completion of his studies, he started post-doctoral research at the University of Tennessee and Oak Ridge National Laboratory. Erick has been working at 3M since 2011.

Thank you to the generous sponsors that made this meeting possible!



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