



POLYMER TECHNOLOGY CENTER

Winter 2009 Edition



PTC Newsletter

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New PTIC Member

PTC is pleased to introduce Toyo Ing. Mfg. America, LLC as its newest member. Please help us in welcoming Toyo Ink Mfg. America LLC as a new PTIC member.



The PTC Semi-annual Scratch Behavior of Polymers Consortium was held on October 30th, 2009 and the Polymer Technology Industrial Consortium was held on October 30-31, 2009. The companies in attendance are as follows:

Scratch Behavior of Polymers Consortium

- Advanced Composites, Inc.
- AXEL Plastics
- Japan Polypropylene Corp.
- Kaneka Texas Corporation
- MyTexPolymers
- Phillips-Sumika
- Rio Tinto Minerals
- SBC Global
- Solvay Engineered Polymers
- Sumitomo Chemical
- Sunoco

Polymer Technology Industrial Consortium

- AXEL Plastics
- BASF-The Chemical Co.
- Cytec Industries Inc.
- INEOS Olefins & Polymers
- Japan Polypropylene Corp.
- MyTexPolymers
- Phillips-Sumika
- The Research Valley Partnership, Inc.
- SBC Global
- Solvay Engineered Polymers
- South Texas Society of Plastics (SPE)
- Sumitomo Chemical
- Sunoco
- Tokai Rubber
- Total Petrochemical
- Toyo Ink Mfg. America LLC



Polymer Specialty Certificate Program

TAMU students can apply for this program. Please visit:

<http://essap.tamu.edu/polymer.htm>

MARK YOUR CALENDAR FOR PTC's NEXT CONFERENCES!

April 16 - SCRATCH

@ Texas A&M University

April 16-17 - PTIC

@ Texas A & M University

Polymer Technology Center

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PTC Faculty Member Dr. Anastasia Muliana Receives AFOSR Award for Young Investigators



For the AFOSR YIP project, Dr. Anastasia Muliana proposed to develop a multi-scale framework that integrates coupled thermal, electrical, and mechanical responses, including loading rate effects, of the constituents to the overall multi-field responses of smart composites, with application to morphing structures. She also plan to investigate long-term responses of these smart composites. The proposed framework will enhance understanding of the multifunctional performance of smart structures under extreme environments and can support design optimization of intelligent aerospace vehicles, thus, significantly reducing development cost and time.



PTC Faculty Research: Temperature-Sensitive Polymers and Chemical Reaction Induced Mechanical Oscillations

Dr. Zhengdong Cheng - Department of Chemical Engineering

Dr. Zhengdong Cheng is currently an Assistant Professor in the Department of Chemical Engineering at Texas A&M, where he joined as faculty in 2004. Among his interests are the study of the dynamics of the temperature-sensitive polymer, poly(*N*-isopropylacrylamide) (PNIPAM) and its applications in colloidal suspensions and crystallization.

Using emulsion crystallization method, the accurate nucleation rate measurements of colloidal PNIPAM spheres is carried out in Dr. Cheng's lab. The colloidal PNIPAM suspensions are dispersed into w/o emulsions in a microfluidic device. The nucleation volume and the volume fraction of the PNIPAM particles are finely tuned by the microfluidic flow rate and the temperature, respectively. Using independent droplets, the nucleation events are isolated to eliminate the interactions among crystallites that exist in bulk or large droplet systems. This emulsion crystallization method is promising for bridging the gap among theories, simulations, and experiments for nucleation kinetics studies. (*Langmuir*, 23 (2007), 2919)

A nonlinear chemical reaction, the Belousov-Zhabotinsky (BZ) reaction has been used to induce mechanical oscillation in the polymeric systems. A self-oscillating nano gel particle composed of stimuli-responsive PNIPAM polymer with grafted tris(bipyridine)ruthenium (Ru(bipy)₃) moiety as the BZ catalyst is prepared to induce a periodic volume oscillation in the PNIPAM gel. In the suspensions of environment-sensitive PNIPAM gel particles, the correlation between the dynamic behavior of the particle system and the BZ reaction substrate concentrations are presented into a ternary phase diagram (*J. Phys. Chem. A*, 111 (2007), 12081). It is also found that the immobilized catalysts on the polymer network cause a prolonged induction time while have little effect on the oscillation behavior. This tunability using a polymer matrix should provide a new dimension to control the self-assembly of in colloidal systems.

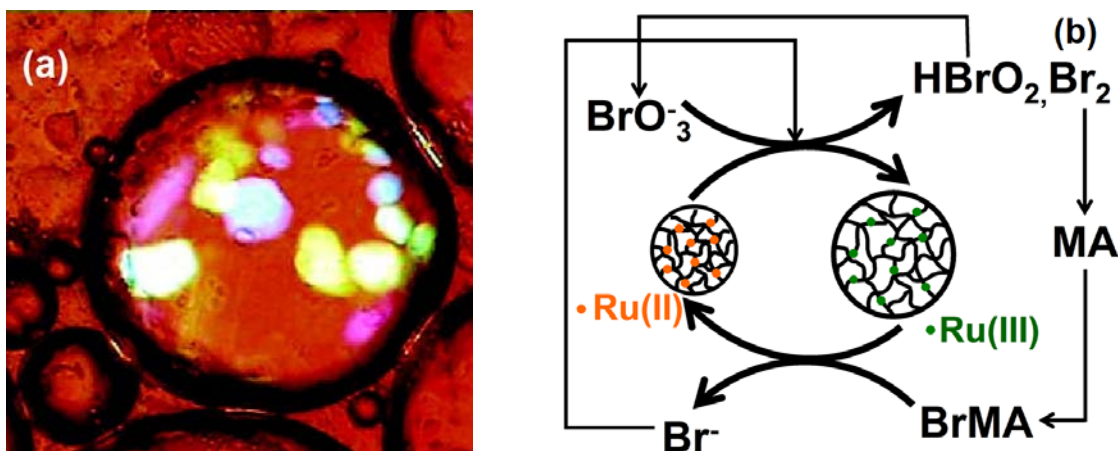


Figure 1. Temperature-sensitive polymers. (a) The emulsion crystallization of PNIPAM colloidal particles observed via crossed polarizers; (b) Schematics of the mechanical oscillation of PNIPAM particles loaded with Ru(bipy)₃.

PTC Faculty Member brings seminar to local High School

A group of enthused students at the A&M Consolidated High School have organized a club called Green Path Society, GPS, sponsored by their Science Teacher, Ms. Sarah Farr. GPS is a club that provides an opportunity for ambitious students to step into the professional realm of green science and technology by focusing on issues that influence our lives today (such as economics, government, and current green technology). GPS is original in that it provides multiple purposes and uses that allow the students to take control. As members, these students serve to increase the availability to participate and have a hand and feel of how to take advantage of technology in society.

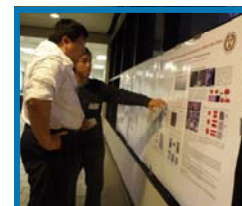
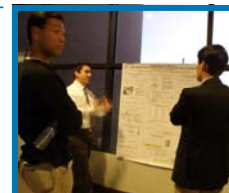
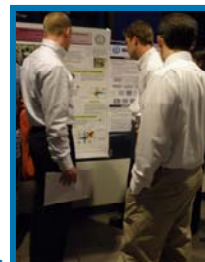
On December 10, 2008, Dr. Xing Cheng, a PTC Faculty member, presented a seminar to the GPS club entitled: "Advances in Solar Cell Technology - A Promising Alternative Energy Source". The students were very receptive and had several interesting questions. PTC is pleased to help out the local high school students with bringing more topics of interest to these eager students that are willing to learn more about science and technology.



Student Poster Session for PTIC

The student poster session which was held on October 30-31 was a great success. This event gives an opportunity for students/faculty and industry to share ideas, research, etc. PTC would like to thank all the students/faculty and industry that took part in this event. Posters are listed below:

- HRMAS Solid-State NMR Spectroscopy of Modified and Polymer-Coated Silica
T. Posset, J. Guenther, M. Perera, C. Hilliard, B. Beele, and **J. Bluemel**
- Colloidal Disk Particle Sedimentation by Analytical Centrifugation
Peng He, Dazhi Sun, H.-J. Sue, and **Zhengdong Cheng**
- Fabrication, Characterication and Shape Transformation of Micro Wax Disks
Andres F. Mejia, Peng He, Mark Netemeyer, Dawei Luo, Manuel Marquez and **Zhengdong Cheng**
- Mechanical Oscillations and Traveling Chemical Waves in PNIPAM Gels
Srinivas Pullela, Guanqum Wang, Jingyi Shen, Manuel Marquez, and **Zhengdong Cheng**
- Making Plastics from CO₂: CoPolymerization of CO₂ and Epoxides or Oxetanes to Polycarbonates
Donald J. Darensbourg
- Characterization of Light Weight Composite Proppants
Mandar C. Kulkarni, **Ozden O. Ochoa**
- Toughening Mechanisms in Polymeric Materials
J. (Daniel) Liu, J.-I. Weon, W.-J. Boo and **H.-J. Sue**
- Influence of Additives on the Scratch Behavior of Polymers
B. Browning, G.T. Lim, A. Moyse, L.Y. Sun and **H.-J. Sue**
- Objective Evaluation of Coating Scratch Resistance: Effect of Coating Thickness
R.L. Browning, G.-T. Lim, A. Moyse, **H.-J. Sue**
- Monodisperse ZnO Quantum Dots and Their Optical Properties in Polymers
Dazhi Sun, Nobuo Miyatake and **H.-J. Sue**

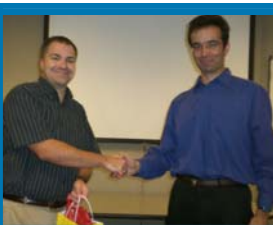


PTC Seminars

Dr. Volker Schaedler
Polymer Research at BASF
ENPH Room 301, October 9, 2008

Abstract:

In my talk I will give an overview of BASF Polymer Research and indicate some technology and market driven trends. As The Chemical Company has a strong global presence in all its business areas the R&D activities also become more global than it used to be in the past. The trend to emphasize on research internationalization is illustrated by the exploratory research group dealing with supramolecular and nanomaterials at ISIS/University of Strasbourg, France and the new group located at Wyandotte, Michigan.



Dr. Cris Schwartz, TAMU on left and
Dr. Volker Schaedler, BASF on right

Dr. Thomas K Tsotsis
Composite Materials Development at Boeing
ENPH Room 301, October 28, 2008

Abstract:

An overview of composite-materials development and usage at Boeing will be given with an emphasis on liquid-molding processes. Discussion will focus on the implementation of out-of-autoclave materials and processes for aerospace structures. Additionally, nanotechnology will be discussed in the context of potential applications to advanced aerospace materials and systems.



Dr. Hung-Jue Sue,
TAMU on left and Dr.
Thomas Tsotsis,
Boeing on right

PTC Faculty



SPE Student Chapter Elects New Officers for 2009

The SPE Student Chapter at TAMU has appointed new officers for 2009, they are:

Ravi Vasiraju—President
Morgan Priolo—Treasurer
Yishu Song—Secretary

Please contact anyone of these students to learn more about the SPE Student Chapter.

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SPE Seminars

Dr. Gerry Fusco

Lean & 6 Sigma Methodologies in the Polymeric Processing Industry

Wednesday, October 8th, 2008

Dr. Fusco will be discussing a real-world application of Lean & 6 Sigma methodologies in the polymeric processing industry used here in Houston, as applied to fluoro-elastomers.

Dr. Fusco is currently President of Gerry Fusco Consulting, which focuses on Lean and 6-Sigma applications as well as leadership development. Dr. Fusco has over 30 years of experience leading manufacturing companies through "People Driven Change" as a Division President, VP Operations and Supply Chain and other top leadership positions. He is currently working with several Oil & Gas & Wind Energy companies both here in the Houston area as well as the rest of the state of Texas.

Dr. Fusco has a Chemical Engineering degree, a US Patent and is on the Board of Directors of the Society of Plastics Engineers and is also on the Entrepreneurial Advisory Board. He also leads C-level executives who are *In Transition* at the Between Jobs Ministry at NorthWest Bible Church in Spring, TX.



Dr. Gerry Fusco, President of Gerry Fusco Consulting



Dr. Neil J. O'Reilly, BASF

Dr. Neil J. O'Reilly (BASF)

The Role of Catalysis in the Polyolefins Industry

Thursday, Oct. 30th, 2008

Dr. O'Reilly received his BS in Chemistry and Ph.D. in organofluorine Chemistry from the University of Manchester in the UK. He then spent one year at the Tokyo Institute of Technology and two years at the University of Minnesota before joining Occidental Chemical to work on pharmaceutical intermediates.

He worked there for 12 years on specialty organic chemicals and ethylene oxide, and became increasingly involvement in polyolefins, global R&D partnerships, and technology licensing, joining Lyondell and then Equistar through acquisitions.

In 1999 Neil joined Engelhard to lead the polyolefins catalyst R&D in Pasadena Texas, a role he continues in BASF.

Dr. David Morrison

Unique Applications of Thermoplastic Elastomers in Commercial Products

Wednesday, Nov. 19th, 2008

Abstract

Thermoplastic elastomers (TPEs) are well-known polymers that are widely used in many different industries. Even though six generic types of TPEs are used on a large scale commercially, they are used in thousands of products ranging from adhesives to electrical & telephone cable fillers to catheters and shoe soles. An area of unusual applications is in consumer products for household and personal care use. This presentation will describe how the physical properties of TPEs enabled the invention and development of new products in industries where these polymers had never been used previously.

Biography

David S. Morrison, Ph.D. received his BS in Chemistry from The University of North Carolina, and his Ph.D. in Organic Chemistry from Pennsylvania State University. He has over 20 years experience in Product Development, Technical Customer Support, and R&D Management, having worked at Pennzoil Products Co. and Penreco, a joint venture that manufactured and marketed highly refined specialty petroleum products. He currently is consulting for a Houston-based petroleum marketer, and a manufacturer of oil & gas well treatment chemicals.



Bobby Browning, TAMU graduate student on left and Dr. David Morrison on right

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