POLYMER TECHNOLOGY CENTER

Winter 2010 Edition

PTC Newsletter

MARK YOUR CALENDAR FOR PTC'S UPCOMING CONFERENCES!

- **April 6-7th** - *Short Course*
  -Scratch and Wear of Polymers and Composites @ TAMU
- **April 8th - SCRATCH**
  @ *Texas A&M University*
- **April 8th-9th - PTIC**
  @ *Texas A & M University*

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PTC Short Course Rescheduled

The short course on the **Scratch and Wear of Polymer Composites** has been rescheduled to **April 6-7th, 2010**. The course will cover various topics relevant to those with an interest in polymer surface issues. Fields pertaining to this topic include final-form polymer manufacturing, solid lubrication, coatings, filler and reinforcement suppliers, product designers, and many more. The course will present key theories behind scratch and wear as well as illustrative examples.

Register now as space is limited!
http://engrevent.tamu.edu/event/100493

Scratch Behavior of Polymers Consortium

The SBPC was held in Sterling Heights, Michigan on October 7th, 2009 in hopes of attracting involvement of the automotive industry. The following companies attended:

Advanced Composites, ExxonMobil, Ford, GM, Honda, Kaneka, International Automotive Components, Japan Polypropylene Corporation, MyTex Polymers, Phillips Sumika, Rio Tinto Minerals, Visteon

Polymer Technology Industrial Consortium

The Oct. 29-30th, 2009 PTIC meeting was held at TAMU. The companies in attendance are listed below.

Baker Oil Tools, Boeing, Dow Chemical Company, Hoerbiger Corporation of America, Inc., International Polymers Consultant Group, Kaneka Texas Corp., Macon, MyTex Polymers, Pipestream, Society of Plastics Engineers, The Research Valley Partnership, Inc., Tokai Rubber Industries, Ltd., Toyo Ink Mfg. America LLC

Certificate Program Expanded Due to Popular Demand

The amendments for the Polymer Specialty Certificate Program are on their way in the approval process. This process includes approval from the Undergraduate Advisor's Committee, the University Curriculum Committee (UCC), the Executive Committee, the Full Faculty Senate, and the President. See the amended courses on page 5.

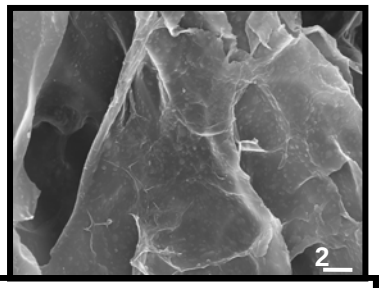
Biomedical Engineering's Dr. Melissa Grunlan Combats Clinging Cells

Dr. Melissa Grunlan (left) is developing novel thermoresponsive hydrogels

Immune cells love to cling. The moment these cells chance upon something foreign in the body, they pounce on it. This clingy behavior can lead to sticky situations-such as the sealing off of a medical implant. To counter clinging cells, **Texas A&M University's Dr. Melissa Grunlan is developing novel hydrogels to be used as membranes for implanted glucose sensors to extend their lifetime and efficacy.**

Hydrogels—gels that are up to 99 % water—have been around for some time now. Soft contact lenses, for example, are hydrogels. Grunlan has tailored hydrogels to change shape in response to heat, kicking off cells in the process. Grunlan's thermoresponsive hydrogels are nanocomposites: a hydrogel matrix with embedded polysiloxane nanoparticles. The nanoparticles make the weak hydrogel stronger, which is helpful when implanting a device such as a glucose biosensor. Her thermoresponsive hydrogels swell as they absorb water and then lose water and shrink when heated, a process which is reversible. Grunlan's hydrogels are able to remove sheets of cells in laboratory experiments but she believes that these hydrogels could also work well inside the body. If used as a membrane for an implanted biosensor, repeated heating and cooling would cause the cells covering the biosensor to be kicked off by the cyclic swelling and shrinking of the membrane.

Such hydrogel membranes could make long-term implanted glucose sensors a clinical reality for diabetics. **An implanted glucose biosensor would allow diabetics to continuously monitor their blood sugar levels without finger prick tests.** With current materials, immune cells cling to the glucose biosensor and the sensor stops working because the cells prevent glucose from diffusing to the sensor, thus hampering blood sugar measurement. If the sensor was coated with Grunlan's thermoresponsive hydrogel membrane, the sensor's surface could be continuously "cleaned" by the cyclic shrinking-swelling of the membrane with heating and cooling. For instance, if the glucose biosensor was implanted in the wrist, the patient could wear a watch-like device with a heating element that could be used to heat the membrane through the skin at regular intervals. Grunlan and her collaborator Dr. Gerard Coté are working to develop a long-term implanted glucose biosensor using this membrane.



Scanning electron microscope (SEM) image of thermoresponsive nanocomposite hydrogel.

Dr. Jaime Grunlan Receives Dow Young Faculty Award

Texas A&M Engineering's Dr. Jaime C. Grunlan has received the **2009 Young Faculty Award** from the Dow Chemical Company.

Grunlan is an assistant professor in the Department of Mechanical Engineering with a joint appointment in the Artie McFerrin Department of Chemical Engineering.

Grunlan was recognized and presented the award address, "Multifunctional Polymer Nanocomposites for Energy Conversion, Gas Barrier and Anti-Flammability," July 23rd, 2009 in Spring House, Penn.

The award was established by Rohm and Haas Co. (now a subsidiary of Dow) and "recognizes a non-tenured faculty member at an accredited university for his/her outstanding research achievement or potential in chemistry, polymers or materials science."

Grunlan's award plaque read, "Professor Grunlan's research on polymer nanocomposites has inspired the imagination of the technologists of The Dow Chemical Company."

Dr. Zoubeida Ounaies Named Inaugural Holder of Aldridge Career Development Professorship I

Dr. G. Kemble Bennett, vice chancellor and dean of engineering, has appointed Dr. Zoubeida Ounaies the inaugural holder of the **Edward C. "Pete" Aldridge Jr. '60 Career Development Professorship I in Aerospace Engineering.**

Ounaies is an associate professor in the Department of Aerospace Engineering at Texas A&M University. She is also a faculty member in the Materials Science and Engineering Program and a researcher in the Polymer Technology Center of the Texas Engineering Experiment Station. She joined the faculty in 2005 and shortly after established the *Electroactive Materials Characterization Laboratory (EMCL)*, an experimental research facility dedicated to the processing and characterization of materials that combine structural integrity with the ability to sense or actuate in response to an electric field.

Ounaies earned her bachelor's and master's degrees in mechanical engineering, and her Ph.D. in engineering science and mechanics, all from Pennsylvania State University.

WORLD NEWS UPDATE
- highlighting hallmark activities of PTC member companies-

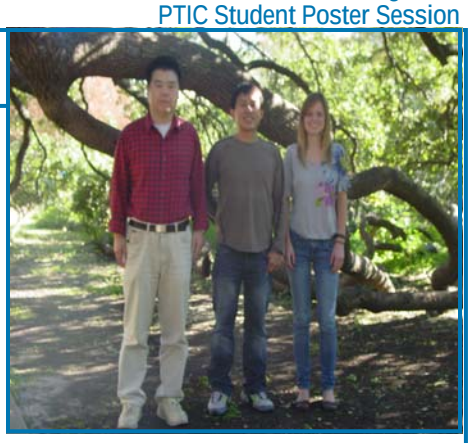
- **January 4th, 2009 - BASF products help build the world's tallest building in Dubai, United Arab Emirates. The Burj Dubai is 828 m tall and boasts 162 floors. The skyscraper that trumps all other skyscrapers cost $1.5 billion to build.**

During the five year construction period of this structural giant, BASF's **Glenium SKY**, a high performance structural plasticizer, made it possible to continuously pump concrete up to a vertical height of 600 m. About 180,000 m^3 of Glenium SKY was used to construct the Burj Dubai.

Glenium SKY's plasticizers, which are based on polycarboxylate ether polymers, not only help increase concrete stability but ensure its viscosity during the pumping process and prevents segregation in high pressure environments. The Burj Dubai is indeed a constructional marvel and one of the first notable accomplishments of this new decade.

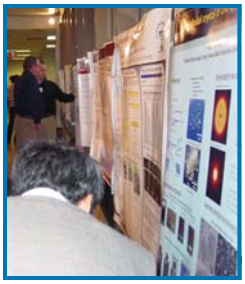
By: Adrienne O'Reilly

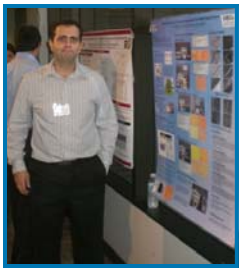
PTIC Fall 2009 Student Poster Session

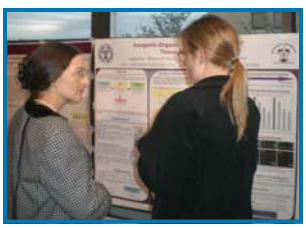


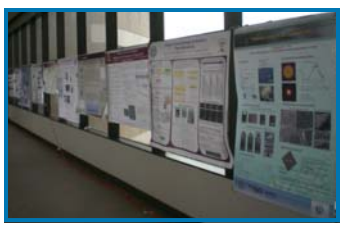
The PTIC held its Student Poster Session on October 29-30th, 2009. Below are the students that participated in this event and their poster titles. This was the **first time the student poster session was held as a contest**, with monetary awards for the top three students with the best posters. PTIC members served as judges. The posters were evaluated upon technical content, presentation, and relevance to the industry. The award winners of this event are: first place = Ke (Kevin) Wang; second place = Minhao Wong; third place = Brennan Margaret Bailey. PTC will continue this event in the fall and spring each year, be encouraged to enter for a chance to win a cash prize!

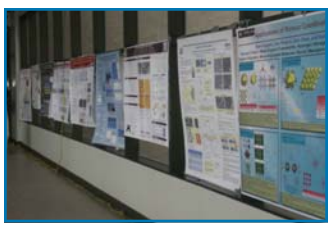
	Student's Name	Major	POSTERS
1	Brennan Margaret Bailey	bmen	*"Inorganic-Organic Hydrogel Scaffolds for Tissue Engineering"*
2	Bobby Browning	MSEN	*"Damage Catergorization and Evolution Map of Polymer Scratch"*
3	Jennifer A Carvajal	CHEN	*"Mechanical Properties of Peptide based Biomaterials from Molecular Dynamics Simulations"*
4	Ruochong Fei	bmen	*"Self-Cleaning Thermoresponsive Nanocomposite Hydrogel Membranes"*
5	Johannes Guenther	CHEM	*"HRMAS Spectroscopy as a Powerful Analytical Method for Silica Modified by Immobilized Catalysts and Polymer Coatings"*
6	Peng He	chen	*"Polymer Nanocomposites with Anisotropic Particles"*
7	Sanjay Kalidindi	MSEN	*"Ultrasonically dispersed single walled carbon nanotube reinforced semicrystalline polymer composite by solution casting"*
8	Ryan Kuppler	CHEM	*"Applications of Porous Coordination Polymers"*
9	Tao-Hua Lee	MEEN	*"Solid-State Dye-Sensitized Solar Cell Based on Semiconducting Nanomaterials"*
10	Yi-Ling (Ivan) Liang	MEEN	*"Alpha-Zirconium Phosphate-Based Polymer Nanocomposites"*
11	Yi-Ling (Ivan) Liang	MEEN	*"Evaluation of Oxygen Absorber Containing (ABSO2RB) Active Packages for Military Operational Rations"*
12	Yi-Ling (Ivan) Liang	MEEN	*"Fracture Behavior of Self-Assembled Amphiphilic Block Copolymer-Modified Epoxy:A Study of Nanocavitation Phenomenon, Strain-Rate Dependence and Matrix Crosslink Density Effect"*
13	Ehsan Moghbelli	aero	*"Electrospinning of Cellulose Nanofibers"*
14	Jean Njoroge	MSEN	*"Molecular Dynamic Simulation of Therm-Mechanical Properties of Polyurea"*
15	Nirmal Shankar Sigamani	aero	*"Study of mechanism of solid particle erosion on Polyurethane thin films and its relation with its micro-structure"*
16	Ke (Kevin) Wang	MSEN	*"Switchable Molecular Conductivity"*
17	James Winkler	CHEN	*"Production of Poly(3-hydroxybutyrate) from Sweet Potato Starch"*
18	Minhao Wong	MEEN	*"Facile Synthesis of Melt-processable ZnO QD/PMMA Hybrid Materials with Tunable Refractive Index"*
19	Dawei Zhang	MSEN	*"Shape memory polymers with silicon-containing segments"*
20	Xi Zhang	MEEN	*"Colloidal Crystal of ZnO Quantum Dots"*

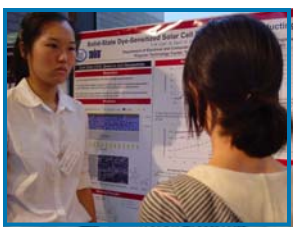












Polymer Specialty Certificate Program Expanded Due to Popular Demand

Below are the amended courses to the Polymer Specialty Certificate Program. PTC eagerly anticipates the final approval of this amendment. The highlighted courses and requirements below are amendments to this certificate.

To earn the Polymer Specialty Certificate, a student must complete a minimum of 12 semester credit hours selected from the lists below:

Core Courses (select 6 credit hours)

AERO 406	Polymer Nanocomposites and Their Applications
AERO 606	Multifunctional Materials
BMEN 482	Polymeric Biomaterials
CHEN 451	Intro to Polymer Engineering
CHEN 641	Polymer Engineering
MEEN 455	Engineering with Plastics
MEEN 458	Processing & Characterization of Polymers
MEEN 607	Polymer Physical Properties
MEEN 635	Flow and Fracture of Polymeric Solids
CHEM 466	Polymer Chemistry

Approved Technical Electives (select 6 credit hours)

MEEN 451	Viscoelastic Solids
MEEN 471	Elements of Composite Materials
*AERO 485 or 491	Individual Research
*BAEN 485 or 491	Individual Research
*BMEN 485 or 491	Individual Research
*CHEM 485 or 491	Individual Research
*CHEN 485 or 491	Individual Research
*ECEN 485 OR 491	Individual Research
*MEEN 485 or 491	Individual Research
*AERO 685	Polymer related research
*BAEN 685	Polymer related research
*BMEN 685	Polymer related research
*CHEM. 685	Polymer related research
*CHEN 685	Polymer related research
*ECEN 685	Polymer related research
*MEEN 685	Polymer related research
*MEEN 606	Polymer Laboratories
*BMEN 683	Polymeric Biomaterial Synthesis
*MEEN 657	Viscoelasticity of Solids and Structure
CHEN 642	Colloidal & Interfacial

*Up to 3 hours of credit can be substituted with research emphasizing polymers. Research must be approved by the Director of the Polymer Technology Center.

Note:

1. **Students should take at least 2 courses outside of their department to receive the Polymer Certificate**
2. **Substitutions of 489/689 courses may be allowed by approval of the Program Coordinator.**
3. **This form will be verified by the Polymer Technology Center and approval given upon verification of requirements by the Program Coordinator to earn the certificate.**

PTC SEMINARS

Nanoparticles for the Improvement of Wear Resistant Polymer Composites
Klaus Friedrich
Monday, October 26, 2009

The use of polymers and polymer composites in various tribological situations has become state of the art. Nevertheless, further developments are still under way to explore new fields of application for these materials and to tailor their properties for more extreme loading conditions.

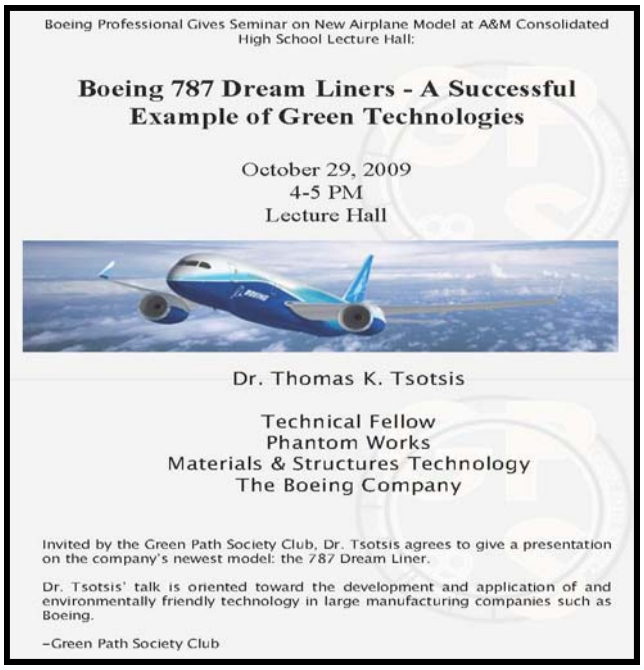
This overview describes how to design polymeric composites in order to operate under low friction and low wear against steel counterparts. Particular emphasis is focused on the incorporation of spherical nanoparticles, often in combination with classical tribo-fillers, for the tribological improvement of thermoplastics and thermosets.

The principle effects are demonstrated by describing practical examples of various fields of application. These include (a) high temperature polymer composite coatings for hybrid bushings used in automotive components under the hood, (b) friction torque limiters for damped flywheel clutches in modern automotives, (c) epoxy based particulate composites for thick covers of calendar rollers in the paper making industry, and (d) thersetting nanocomposite coatings for automotive engine pistons, to mention only a few.

Green Path Society Club

A&M Consolidated High School

PTC is working closely with the Green Path Society Club at A&M Consolidated High School. The Green Path Society Club is a group of enthusiastic students wanting to learn more about ecologically-friendly technology. Dr. Thomas Tsotsis agrees to give a presentation on the company's newest model: Boeing 787 Dream Liner—A Successful Example of Green Technologies.



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SPE Student Chapter Seminars

How to Build a Successful Career in the Polymer Industry
By: Dr. Donald Witenhafer
Oct. 20,2009

Dr. Donald Witenhafer recieved his PhD. in Polymer Science from Case Western Reserve University in 1968. He worked at B.F. Goodrich for 20 years in all aspects of PVC technology, eventually becoming R&D Manager. He worked for five years at SC Johnson Wax as manger of Polymer Research before becoming a consultant in 1992. He is a fellow grade member of SPE (Society of Plastics Engineers) and has served for 14 years on the SPE Council including 4 years as Vice president of SPE. In 2009, Dr Witenhafer was elected to the **Plastics Hall of Fame** for his key inventions that saved the PVC industry when it was discovered that vinyl chloride causes cancer in humans.

Opportunities with the Polymer Technology Center at Texas A&M
Dr. Hung-Jue Sue
Nov. 23rd, 2009

The Polymer Technology Center (PTC) at TAMU has recruited 15+ new faculty members who have brought along with them cutting edge polymer knowledge and experiences. In this presentation, an update on the expansion of the PTC faculty members, facility, and research field was issued. A highlight regarding the contribution made by the South Texas Section of SPE over the years was also presented. Close ties between SPE and PTC are expected for many years to come. The PTC manages the Polymer Specialty Certificate which gives students the opportunity to acquire an interdisciplinary education with an emphasis in polymers.

"Review on Development of a New Polyolefin Elastic Fiber for Stretch Apparel Applications"
Dr. Thoi Ho
December 7th, 2009

Abstract

Polyolefin fibers have been utilized in textiles for many years. However, penetration into apparel markets has been limited due to the polymer's inherent low service temperature. In addition, traditional polyolefins lack elastomeric properties required for the fastest growing apparel applications – stretch garments. With the advent of INSITE technology and its capabilities of producing elastomeric material, there is an opportunity to bring a new class of elastic fiber into the market. This fiber, enhanced with cross linking, overcomes the gaps of traditional polyolefins and the deficiencies of segmented polyurethane, the predominant fiber of the stretch apparel industry. The new fiber's improved service temperature, combined with good chemical resistance to chlorine and industrial bleach, enables new concepts in stretch garment care and offers textile mills broader processing windows. This innovation provides opportunities to expand the concept of stretch to new apparel markets. Because of its innovative properties, this fiber has been awarded the new, generic classification of lastol by the Federal Trade Commission.

Biography

Dr. Thoi Ho is a technical consultant in the area of polymer additives for plastics. He obtained a PhD in Polymer Chemistry from Tohoku University, Sendai, Japan, and completed post doctoral work at Columbia University, New York. He served as a technical leader in Polycarbonate and Polyolefin R&D departments for Dow Chemical Co. Dr. Ho has over 26 years of experience in process chemistry, new product development, and polymer additives (antioxidants, light stabilizers, flame retardants, processing aids, and slip agent) for polycarbonates and polyolefins. He is an inventor and a co-inventor of 90 U.S. and world patents. He is currently chairman elect of the Polymer Modifier and Additive Division (PMAD) of SPE, and section chair of the polymer additives sections of the 2010 International Polyolefin Conference.

Polymer Specialty Certificate Updates

Students that have applied for Certificate	**15**
Students that have received the Polymer Specialty Certificate	**11**

For more information:
http://essap.tamu.edu/polymer.htm

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