



PTC

POLYMER TECHNOLOGY CENTER

TEXAS A&M ENGINEERING EXPERIMENT STATION

Phone: (979) 458-0918

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First Quarter 2015

NEWSLETTER



TEXAS A&M
UNIVERSITY

Mark Your Calendars for PTC'S upcoming events:

- * SCRATCH Consortium = March 25th, at ANTEC in Orlando, Florida
- * APPEAL Consortium = April 9th, 2015 at Texas A&M University, College Station, TX
- * PTIC Consortium = April 9th-10th, 2015 at Texas A&M University, College Station, TX

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PTC has moved

Please Note: The Polymer Technology Center has moved to the Reed-McDonald Building, a four story building at the corner of Ireland and Ross.

The Physical Address is: 575 Ross Street

For a better map view, please visit:

<http://fcor.tamu.edu/downloads/0436.RMcD.complete.2011.0405.pdf>



APPEAL Consortium

Dr. Tim Bremner led off the APPEAL meeting on November 5th, 2014 with an update on the status of our Texas Emerging Technology Fund grant. We then had several presentations related to our research on high performance polymers, especially PEEK and PBI, for oil & gas. A description of our plans to apply for an Industry / University Cooperative Research Center was presented. Our ultimate goal is to successfully apply for an Engineering Research Center grant, which would significantly enhance our capabilities.



Members in attendance

- ⇒ Baker Hughes
- ⇒ Ensinger
- ⇒ Hoerbiger
- ⇒ RTP Company
- ⇒ Schlumberger

SCRATCH Behavior of Polymers Consortium

The 28th Scratch Behavior of Polymers consortium meeting was held on November 6th, 2014 at Texas A&M University. Recent findings on scratch and mar behavior of polymers were presented and discussed with the industrial partners. An updated scratch testing methodology by modifying the tip geometry was proposed in the meeting which would overcome the limitation of current scratch testing procedure on soft polymers. Effects of different physical and mechanical aspects of polymer on mar resistance, influence of rubber particles size and type on scratch resistance, development of a physics-based model on polymer scratch behavior and design of scratch resistant polymers were also presented and discussed in the meeting. Research priorities were set for the next consortium meeting to be held on March 25th, 2015 in Orlando, FL.



Members in attendance

- ⇒ Advance Composites Ltd.
- ⇒ Avery Dennison
- ⇒ ExxonMobil
- ⇒ Kaneka
- ⇒ Mytex Polymers
- ⇒ National Center for Packaging Material Quality Supervision and Inspection from China
- ⇒ SABIC Innovative Plastics

Polymer Technology Industrial Consortium (PTIC)

PTIC met on November 7th, 2014 to discuss cutting-edge research related to polymer science. Presentations were given by Lei Fang ("Tailoring the Properties of π -Conjugated Polymers by Conformational Control"), Yossef Elabd ("Polymerized Ionic Liquid Block Copolymers: Highly Versatile Polymers"), Mustafa Akbulut ("pH-Responsive Supramolecular Gels for Enhanced Oil Recover"), Perla Balbuena ("An Artificial "Solid-Electrolyte Interphase" Layer for Lithium-ion Batteries"), Melissa Grunlan ("An Effective Strategy to Reduce Fouling on Silicones"), and Anastasia Muliiana ("Viscoelastic Response of Polymers and Polymeric Composites"). Lauren Link, the president of the TAMU Student Chapter of the Society of Plastics Engineers introduced Rita Silbernagel (graduate student) who gave a short presentation on "Unconventional Metal -Organic Frameworks for the Separation of Lanthanides from Actinides".



Members in attendance

- ⇒ Asahi Kasei, Japan
- ⇒ Baker Hughes
- ⇒ The Dow Chemical Company
- ⇒ ExxonMobil
- ⇒ Heritage Bag Company
- ⇒ Hoerbiger
- ⇒ Malvern Instruments, Inc.
- ⇒ National Center for Packaging Material Quality Supervision and Inspection from China
- ⇒ SABIC
- ⇒ Southwest Petroleum University-Chengdu, China
- ⇒ SPE, Society of Plastics Engineers



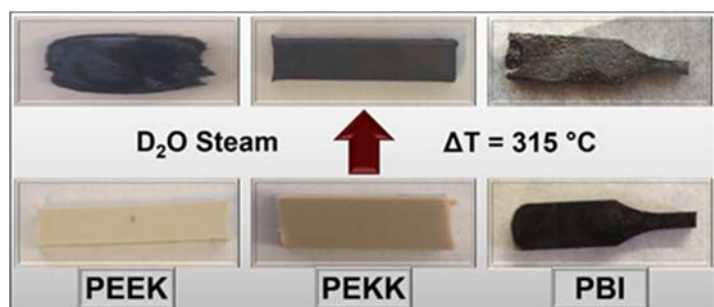
Characterization of PAEK (Polyaryletherketone) Polymers by Solid- State NMR Spectroscopy

Dr. Janet Bluemel

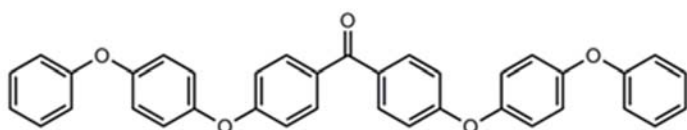
Professor

Department of Chemistry

PAEK polymers, such as PEEK (*polyetheretherketone*) and PEKK (*polyetherketoneketone*), are of growing interest for extreme service environments in the oil and gas industry. Blended with PBI (*polybenzimidazole*) they are used in environments of high pressures and temperatures, being exposed to steam, water-based drilling fluids, and other corrosive chemical cocktails that are highly acidic, caustic, or oxidizing. The longevity of PAEK-based devices or components used in such environments is of paramount importance from both a cost/benefit and a safety perspective when such materials are used in critical service devices.



The pictures above show samples that have been subjected to steam-treatment in a pressure vessel for 48 hours to simulate such real-life conditions. Within the *APPEAL* (*Advancing Performance Polymers for Energy Applications*) Consortium (Co-directors Dr. Tim Bremner, Hoerbiger, and Dr. Hung-Jue Sue, MSEN) my graduate student Jacqueline Pope studied the mechanism of degradation in these samples with multinuclear solid-state NMR spectroscopy to support the development of more robust and longer lived polymers. Jacqueline could identify water within the polymer network as one of the key factors in the degradation mechanism. She could quantify the water content of the samples and prove that water is present in liquid domains, but also hydrogen-bonded to the O and N atoms in the strands of the polymers.



To enable a deeper understanding, molecular level chemical reaction mechanisms are investigated. Therefore, my graduate student Joseph Baker synthesized and characterized molecular model compounds, for example the model for PEEK shown here.

Continued with Dr. Bluemel's Characterization of PAEK (*Polyaryletherketone*) Polymers by Solid-State NMR Spectroscopy

Joseph exposed the model compounds to liquids of various salt content and pH at different temperatures. Then he identified and quantified the fragments of the original molecule using one- and two-dimensional ^1H and ^{13}C NMR at a high-resolution spectrometer equipped with a kryo probe-head for optimal signal to noise ratios. In parallel, Joseph investigates the decomposition products of the PAEK polymers both in solution and in the solid state.

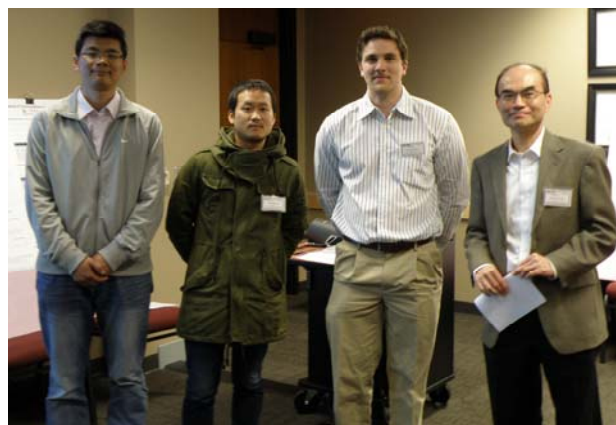
Besides polymer chemistry the Bluemel group pursues research with catalysts immobilized on oxide supports, and metallocenes and other small molecules adsorbed on solid surfaces.

More detailed information about all projects can be found at:
<http://www.chem.tamu.edu/rgroup/bluemel/publications.html>

PTIC Student Poster Session Recipients

PTC would like to take this opportunity to congratulate the 1st, 2nd and 3rd place recipients of the PTIC Student Poster Session.

Polymer Technology Industrial Consortium (PTIC) Student Poster Session			
November 6th - 7th, 2014			
MAJOR		Student Name	Poster Title
CHEM	1	Kevin Wacker	"Synthesis and Characterization of a Novel Polycarbonate Derived from the Neolignan Honokiol"
MSEN	2	Peng Li	"Large-scale Colloidal Dispersion and Self-assembly of Two-dimensional Nanoplatelets for Structural and Functional Applications"
CHEM	3	Jongbok Lee	"The Synthesis of Fully Conjugated Ladder polymer by Dynamic Covalent Bond"



Left to right: Mr. Peng Li, MSEN; Mr. Jongbok Lee, CHEM; Mr. Kevin Wacker, CHEM; and Dr. Hung-Jue Sue, PTC Director

Congratulations



Texas A&M's Liberty Bowl win over West Virginia encourages Aggie fans going into off-season

Texas A&M quarterback Kyle Allen (10) plays against West Virginia in the second half of the Liberty Bowl NCAA college football game Monday, Dec. 29, 2014, in Memphis, Tenn. Texas A&M won 45-37.



WHOO!

FYI-Aggies have won 4 bowls in a row



Aggies in Memphis enjoy Liberty Bowl Parade in lead-up to big game against West Virginia

MEMPHIS -- The AutoZone Liberty Bowl may not have been the postseason destination Aggie fans dreamed of in September, but now that the faithful are here, they're making the most of it.

Texas A&M and West Virginia fans alike -- many of whom chose to utilize Beale Street's exemption from the state's ban on open containers -- lined both sides of the famous avenue on a chilly Sunday afternoon to catch the annual Liberty Bowl Parade.

The Mountaineer Marching Band started the hour-long festivities that featured hundreds of participants, including beauty queens, several high school marching bands and an organization known as the Secret Order of Boll Weevils, which was created in the 1960s to mock high-society in Memphis.

The final group was one familiar to the Aggies who waited a few hours for the experience: The Fightin' Texas Aggie Band brought up the rear of the parade.

Full story: http://www.theeagle.com/news/local/aggies-in-memphis-enjoy-liberty-bowl-parade-in-lead-up/article_4138a53f-898b-5dba-bb89-f64d4dff9972.html

Kyle Field: West side comes down, fundraising rises by another \$35 million

The west side of Kyle Field was imploded early Sunday to make way for a new facade and facilities as part of what's become a \$485 million renovation. An estimated 7,000 people were on campus to watch the 735 pounds of gelatin-based dynamite bring down the 75,000-ton structure.



Full story: http://www.theeagle.com/news/a_m/kyle-field-west-side-comes-down-fundraising-rises-by-another/article_838f8bce-8923-11e4-94fd-37d263f1679a.html



Material developed at Texas A&M could enable new facial reconstruction treatment



A newly developed material that molds itself to fill gaps in bone while promoting bone growth could more effectively treat defects in the facial region, says a Texas A&M University researcher who is creating the shape-shifting material.

The research by Melissa Grunlan, associate professor in the university's Department of Biomedical Engineering, is detailed in the scientific journal "Acta Biomaterialia." Working with colleagues at Texas A&M and Rensselaer Polytechnic Institute, Grunlan has created a polymer foam that is malleable after treating with warm saline, allowing it to precisely fill a bone defect before hardening into a porous, sponge-like scaffold that promotes new bone formation.



Full story: <http://engineering.tamu.edu/news/2014/09/30/grunlan-scaffold>



Thermal interface materials: Akbulut refines soft materials, copper

In the microelectronics world, the military and private sectors alike need solutions to technologic challenges. Dr. Mustafa Akbulut, assistant professor in the Artie McFerrin Department of Chemical Engineering, and two students are leading a project funded by DARPA to create thermal interface materials (TIMs) that have a superior ability to transfer heat and a strong capacity to keep cool.

Full story: <http://engineering.tamu.edu/news/2014/10/22/thermal-interface-materials-akbulut-refines-soft-materials-copper>



Materials Science & Engineering Minor Degree Program

The MSEN minor degree program is designed to provide a strong materials science educational program for undergraduate engineering majors and to integrate a materials focus into their undergraduate training. It is intended for students who are interested in broadening their undergraduate major program of study to incorporate a fundamental understanding of materials processing and structure—property relationships to complement their major degree. Student will have the flexibility to select relevant coursework in order to customize this program of study to best suit the particular student's intended area of focus through consultation with a MSEN faculty advisor.

For more information please visit: <http://engineering.tamu.edu/materials/academics/degrees/undergraduate/minor>



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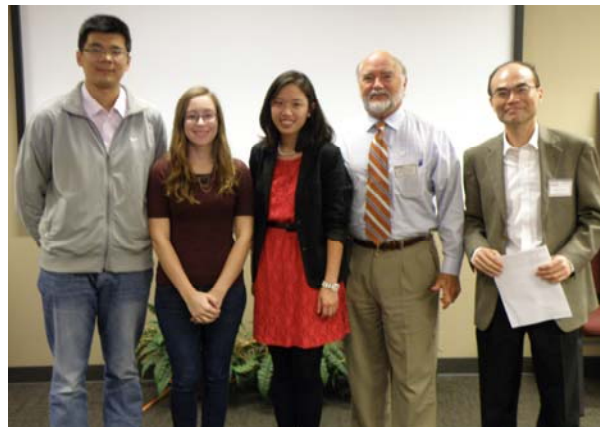
Scholarship recipients for SPE and KANEKA



SPE 2014 Fall Scholarships recipients

SPE Scholarship recipients

1. Peng Li, MSEN—SPE/Dale Walker Scholarship
2. Megan Nicholson, BIMS—SPE/Dale Walker Scholarship
3. Melissa Cruz Santos, CHEN—SPE/Henry Kahn Scholarship



Left to right: Peng Li, Graduate Student; Megan Nicholson, Undergraduate Student; Melissa Cruz Santos, Graduate Student; Dr. David Hansen, SPE Liason; and Dr. Hung-Jue Sue, PTC Director

KANEKA Fall 2014 Scholarship recipients



KANEKA Visiting Scholar/Exchange Student Scholarship

1. Chunxia Zhao, Visiting Scholar from Chengdu P.R. China

KANEKA Graduate Scholarships

1. Shuang Xiao, MSEN
2. Hyosung An, CHEN
3. Jakkrit Suriboot, CHEM
4. Hanna Glidewell, BMEN



Left to right: Dr. Masaya Kotaki, KANEKA Representative; Chunxia Zhao, Chengdu China; Shuang Xiao, MSEN; Hyosung An, CHEN; Jakkrit Suriboot, CHEM; Hanna Glidewell, BMEN not present; and Dr. Hung-Jue Sue, PTC Director

Congratulations to all the SPE and KANEKA Scholarship recipients.

Polymer Specialty Certificate Updates

Students that have applied for the Polymer Specialty Certificate 33

Students that have received the Polymer Specialty Certificate 30

For more information, please visit: <http://ptc.tamu.edu/certificate.html>

TAMU/SPE Student Chapter

To find out more about the TAMU/SPE Student Chapter, please contact Lauren Link at:

lalink87@gmail.com

Visit the SPE Student Chapter website at:

<http://plastics.tamu.edu>

