2017
First Quarter
PTC Newsletter

Polymer Technology Center

UPCOMING EVENTS

Mark Your Calendars!

Polymer Technology Industrial Consortium-PTIC	Scratch Behavior of Polymers Consortium-SCRATCH
April 6th - 7th, 2017 College Station, TX Texas A&M University	May 10th, 2017 Anaheim, CA After the ANTEC Conference

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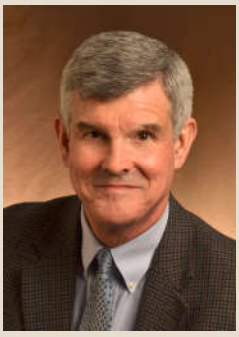
Pharr to join MSEN thanks to the Governor's University Research Initiative



Texas A&M University is the top beneficiary in a major new initiative announced recently by Gov. Greg Abbott that has resulted in attracting 10 distinguished researchers to the state. Five of the renowned faculty members recruited through the Governor's University Research Initiative (GURI) will join Texas A&M. The grant awarded to Texas A&M total more than $20 million.

One of the five researchers heading to Texas A&M will join MSEN – Dr. George M. Pharr IV. "I look forward to joining the esteemed Texas A&M University engineering program in January as a result of this initiative, and to working with colleagues and students to advance research in nanomaterials," said Pharr.

"Texas is the home of innovation, and with the addition of these world-class scholars to our university faculties, we will continue to lead the nation in cutting edge research," said Gov. Abbott. "This strategic investment in higher education will further elevate future generations of students and faculty at Texas universities while spearheading new breakthroughs in the fields of science, technology, engineering, mathematics and medicine, all of which are crucial to the long-term success of the Texas economy."

Full story-page 6: goo.gl/iu0a4N

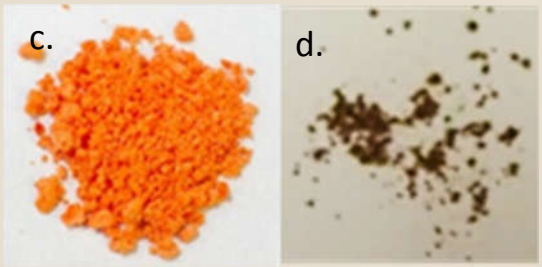
Using Hydrocarbon Oligomers as Phase Anchors, Solvents, and Reagents for Polymer Modification

Dr. Dave Bergbreiter, Chemistry Dept.

Research in the Bergbreiter group focuses on using polymers as tools in chemistry. One way we do this is by using polymers as phase anchors for catalysts, reagents, or products. For example, we use an oligomeric polyisobutylene (PIB) to make a catalyst heptane soluble. Such a PIB group might keep a catalyst soluble in heptane while a product precipitates. Then a simple filtration separates the product and catalyst. This approach is also greener in that we can recover the heptane solvent. However, heptane is still volatile and toxic. Recently, we have begun studies to replace conventional solvents with greener nontoxic, nonvolatile, and recyclable polyolefin oligomers as alternatives. We did this first with low melting Polywax oligomers. These PE oligomers could be used with other solvents but were separable as solids after a reaction. More recent work has used polyolefin oligomers obtained from Baker Hughes and Exxon-Mobil as nontoxic, nonvolatile "polymeric solvents" that are easily recycled. They have an additional feature in that they more efficiently sequester hydrocarbon soluble catalysts – something we call an 'anti-leaching" effect.

PIB oligomers that make catalysts phase selectively soluble make everything they couple to into highly soluble viscous oils. This is seen with PIB-metallophthalocyanines that readily dissolve in heptane and in molten PE. PIB groups also make nanoparticles highly soluble. In recent work, we prepared modified nanoparticles that are orders of magnitude more soluble, nanoparticles with PIB coatings that not only solubilize and encapsulate a nanoparticle but appear to protect it from some reagents.

a. Polywax; b. Polywax + recyclable Ru catalyst



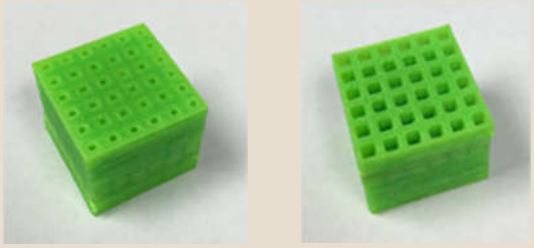
c. PE dyed by melting and mixing; d. ferromagnetic PE

Fabrication and Modeling of Functionally Graded Porous Polymer Materials

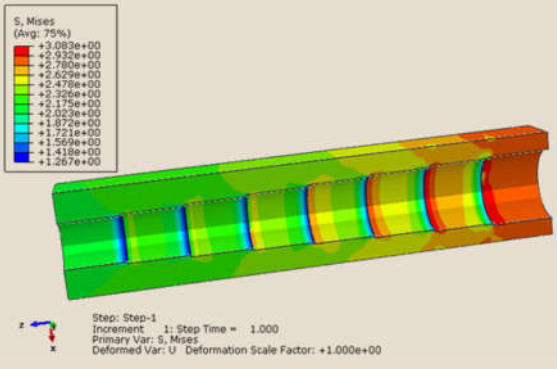
Dr. Jyhwen Wang

Engineering Technology and Industrial Distribution

Functionally graded porous materials (FGPMs) are porous structures with porosity gradient distributed over volume. They have potential applications in aerospace, biomedical, and other industries. Despite the significant efforts to fabricate FGPMs, the existing manufacturing techniques such as gas foaming and phase separation techniques are either complex, expensive, unable to control exact porosity distribution, or unable to create closed cell structures. Dr. Jyhwen Wang, a professor in the Department of Engineering Technology and Industrial Distribution and his graduate student Ms. Ying Zhang from the Department of Mechanical Engineering have developed a new method to fabricate FGPMs. Based on an additive manufacturing approach, thin polymer sheets are manufactured and assembled to create porous 3D structures using lamination and thermal-bonding techniques. To demonstrate the feasibility of this process, thin polymer layers were fabricated by 3-D printing for increased effectiveness and flexibility, and polylactic acid (PLA) was selected as the base printing material due to its low glass transition and melting temperatures as well as its low shrinkage rate after cooling. The single-layers were printed with pores in various shapes and sizes. Under applied compressive load, controlled heating, and appropriate holding time, FGPMs with different porosity gradients can be assembled layer-by-layer or in a stack through polymer self-adhesion. In this research, the effects of applied pressure, heating temperature, and holding time on the shear strength at the bonding interface were investigated. The fabricated FGPMs were characterized and both analytical and numerical models were developed to predict the effective properties of the materials. Dr. Wang is currently exploring potential applications of the developed process.



Open cell FGPMs fabricated through lamination and thermal bonding process (top and bottom views)



Stress contour of σ_{33} for a graded, open cell structure with cylindrical voids (section view of a unit cell)

TEES | PTC
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'Aggies United' Event Brings Campus And Community Together To Denounce Hate

Thousands of Texas A&M University students, faculty, staff and community supporters assembled on Kyle Field on Tuesday, December 6th for the "Aggies United" event, a gathering to demonstrate unity as a direct response to a non-university invited speaker who has white supremacist views.

The event featured a diverse lineup of speakers and performers, and was co-hosted by television and film actor Hill Harper and Texas A&M Student Body President Hannah Wimberly.

Full story: **goo.gl/axkkpA**

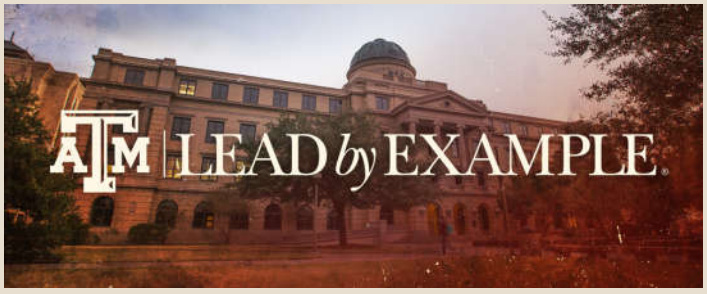
Texas A&M University System Chancellor John Sharp (left) and Texas A&M University President Michael K. Young write messages on a unity wall with students outside of Kyle Field.

"Lead by Example" Campaign Surpasses Halfway Mark, Foundation Provides University Record Amount

Just one year after the official launch of the "Lead by Example" campaign, a comprehensive effort to raise $4 billion by the year 2020, Texas A&M University has surpassed the halfway point of its fundraising goal. In its 2016 annual report, the Texas A&M Foundation announced that "Lead by Example" has raised $2.3 billion as of Aug. 31 and that the Foundation will make a record $103.9 million available to Texas A&M University. Funds made available are a combination of gifts from the 2016 fiscal year that were intended for immediate use as well as endowment earnings from previous years.

The "Lead by Example" campaign is a joint effort between Texas A&M and its affiliate organizations: the Texas A&M Foundation, The Association of Former Students, the 12th Man Foundation and the George Bush Presidential Library Foundation. It is the largest higher education campaign in Texas history and the second largest conducted nationally by a public university.

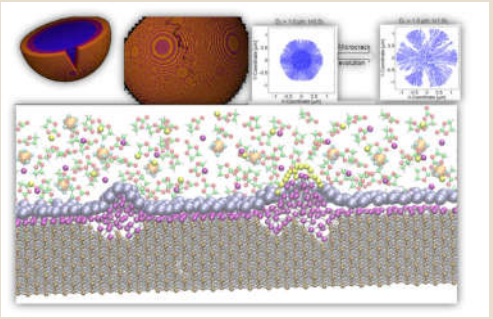
Full story: **goo.gl/zTMuTk**



Research Team Led by Balbuena Awarded $1.2 Million DOE Grant to Study and Model Battery Reactions

The Vehicle Technology Office (VTO) within the Department of Energy (DOE) recently awarded a $1.2 million grant to a team led by Dr. Perla Balbuena, professor and holder of the GPSA Professorship in the Artie McFerrin Department of Chemical Engineering at Texas A&M University.

Balbuena's team will conduct research that falls under Advanced Battery Materials Modeling. This will be a key area if the DOE is to reach the goals of EV everywhere. As the industry stands today, the largest limiting factors in the adoption of plug-in electric vehicles (EVs) are the cost and efficiency of the battery. There have been significant advances in lowering the cost and increasing the efficiency of EV batteries, but there is still a gap between the EV everywhere goals and current technological capabilities.



Full story: **goo.gl/oagT0a**

Texas A&M Chemist Lei Fang Earns NSF CAREER Award

Lei Fang, assistant professor of chemistry at Texas A&M University, has been selected to receive a 2017 National Science Foundation (NSF) Faculty Early Career Development (CAREER) Award in support of his research on polymer properties and dynamic bond-promoted coplanarity.

Fang, a faculty member since 2013 in the Texas A&M Department of Chemistry who also holds a joint appointment in the Department of Materials Science and Engineering, says his project aims to investigate the fundamental correlation between the geometry of electrically semiconducting polymer molecules and their corresponding materials properties. Most polymeric molecules possess structural flexibility at the nanometer and subnanometer scales, which leads to various 3D shapes that they can adopt. Such geometric variability impacts a wide range of polymer properties that are important for their applications, especially those related to electronic and optical properties.

Full story: **goo.gl/X5N9QF**

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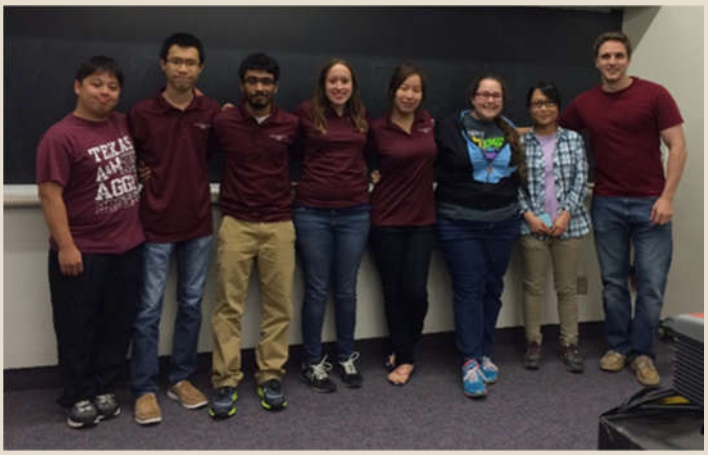
Dr. Yossef Elabd elected Fellow of the American Physical Society

Dr. Yossef Elabd, professor in the Artie McFerrin Department of Chemical Engineering at Texas A&M University, has been elected a Fellow of the American Physical Society (APS). The Fellow designation is an honor signifying recognition by a professional peer group for exceptional contributions to the study and application of physics. APS is one of the oldest organizations of physicists, and the world's second largest. APS, which formed in 1899, has more than 51,000 members.

According to the official citation, Elabd was elected to APS, "for fundamental contributions to transport phenomena in ion-containing polymers." The bulk of these contributions are a result of Elabd's work and research on the development of new polymers for clean energy including fuel cells, batteries and capacitors. There are many different areas and industries Elabd's research impacts, but the largest potential impact is in the electric vehicle industry.

This is just the latest milestone in a long line of achievements for Elabd. In 2013, Elabd's research led to two patents around the structure of fuel cells which both improve the efficiency of cells and reduce the production cost. In May 2015, Elabd was invited to become a visiting fellow at the University of Bologna, the world's oldest university. In June 2015, Elabd was awarded a Department of Defense grant to conduct further polymer research.

Society of Plastics Engineers Student Chapter at TAMU



SPE officer photo for 2016-2017 (pictured from left): Tim Tsao, Social Media Coordinator; Xun He, VP Engineering; Mohammed Haque, Publicity Coordinator; Mary Layne Harrell, President; Shin Hye Ahn, VP Science; Simcha Felder, Secretary; Yanyan Wang, Activities Coordinator; and Kevin Wacker, Treasurer

Polymer Specialty Certificate Updates

Students that have applied for the Polymer Specialty Certificate	60
Students that have received the Polymer Specialty Certificate	41

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

Have Questions?

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