2017

Third Quarter

PTC Newsletter

Polymer Technology Center

UPCOMING EVENTS

Mark Your Calendars!

Scratch Behavior of Polymers Consortium-SCRATCH

Wednesday, October 4th, 2017
Noon—4:30pm
After the TPO Conference FT

Polymer Technology Industrial Consortium-PTIC/Fall Meeting

October 19th - 20th, 2017
College Station, TX
Texas A&M University

Inside the Newsletter

Zachry Engineering Education Complex

Currently under construction on the corner of University Drive and Bizzell Street, the Zachry Engineering Education Complex (ZEEC) will be a modern, technology-integrated facility dedicated to undergraduate engineering education.

This facility will be the largest academic building on campus and unlike any other facility in the nation. The 525,000 sq. ft. education complex completely modernizes the original Zachry Engineering Center and expands the facility to include a state-of-the-art Engineering Design Center.

This facility will revolutionize the way we deliver education to our undergraduate students. This complex will be a departure from the traditional classroom and lecture hall, and will focus on student centered design to optimize modern learning techniques and technology.

More info can be found at: **goo.gl/3qssO3**

Dr. Anastasia Muliana
Department of Mechanical Engineering
Modeling Response of Polymers Undergoing Diffusion of Fluid

Polymers have been widely used in many engineering applications where they are often subjected to various environmental conditions in addition to complex mechanical loadings. Our group has studied changes in the physical and mechanical behavior of polymers due to the presence of a diffusing fluid/solvent. The diffusion of fluid induces swelling/deformation and changes the mechanical properties of the polymers, leading to coupled diffusion-deformation behavior. For some polymers, diffusion of fluid causes hydrolytic degradation from chain scission, forming monomers and other byproducts, which can lead to erosion (monomers and byproducts leaving the polymers) and/or further crystallization. Chain-scission alters the mechanical properties of polymers, which at the macroscopic scale is observed in the form of stress relaxation. In order to incorporate the above aspects in predicting the overall macroscopic response of polymers we formulated a coupled time-dependent model that described diffusion -induced deformation, solvent consumption in the scission reaction, kinetics of scission and formation of monomers/byproducts, and diffusion of the monomers out of the polymers. We also considered that the deformation in the polymer can accelerate the process of scission. The above coupled time-dependent model was solved using finite difference method and a level set method was also used to tract the evolving boundary due to the erosion process. As an example, we studied the response of biodegradable polymer, PLGA, undergoing hydrolytic process due to diffusion of water. Figure 1 depicts response of PLGA thin plate, where one-dimensional diffusion through the thickness was considered. Due to symmetry, only half of the model was simulated. The model can capture the diffusion process, reduction in molecular weight, and formation and concentration of monomers, while the boundary changes due to the erosion process. Figure 2 illustrates the concentration of water and evolving boundary in case of a multi-axial deformation. Due to symmetry, only a quarter model was considered. The complex deformation in the multi-axial case leads to non-smooth boundaries as erosion takes place.

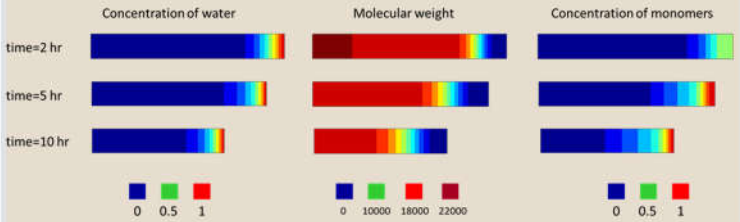


Figure 1 Time-dependent response of PLGA thin plate due to hydrolytic degradation

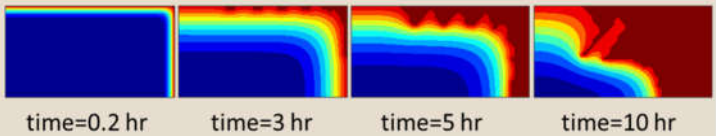
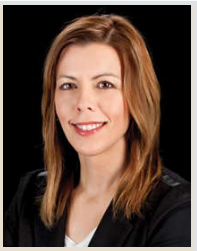


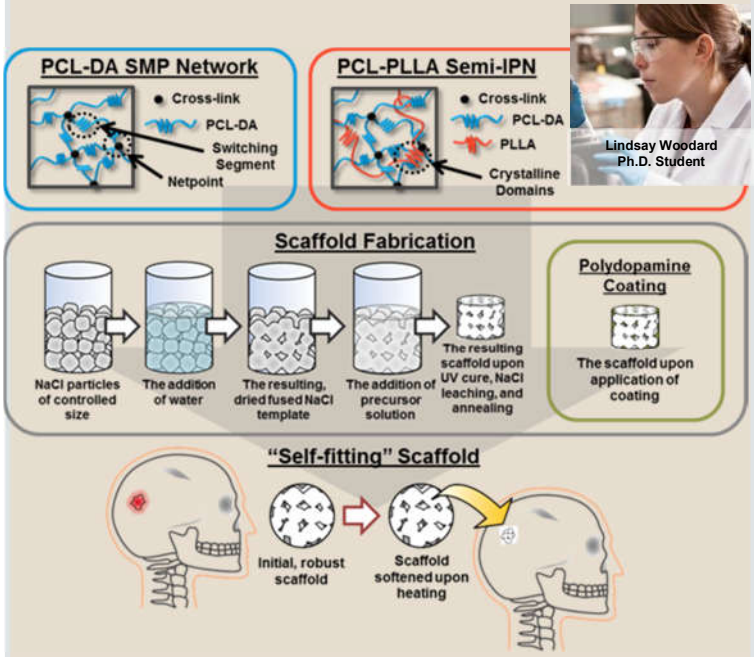
Figure 2 Multi-axial response of PLGA plate due to hydrolytic degradation

Dr. Melissa Grunlan
Biomedical Engineering Department
"Self-fitting" Scaffolds to Treat Craniomaxillofacial (CMF) Bone Defects



Dr. Grunlan's research group has developed a scaffold for tissue regeneration that is able to "self-fit" into irregular CMF bone defects. Given the failures of current treatments, it is known that precisely matching the irregular boundaries of bone defects is essential to defect healing. A scaffold, therefore, must achieve defect geometry as well as exhibit an interconnected pore morphology, robust mechanical properties and controlled rates of degradation.

The Grunlan Research Group developed a porous, poly(ε-caprolactone) (PCL) diacrylate scaffold that meets the general requirements for tissue healing. Utilizing shape memory polymer (SMP) technology, when the scaffold is exposed to warm saline ($T > T_{trans}$), it becomes malleable and can be pressed into an irregular bone defect. Upon subsequent cooling, the scaffold locks into the defect geometry. Through the application of a polydopamine coating, bioactivity (i.e. formation of hydroxyapatite in vitro), osteoblast adhesion, proliferation, osteogenic gene expression and ECM deposition are also achieved. The group is now seeking to expand upon the current material properties of (e.g. via PCL-DA/poly(L-lactic acid) semi-interpenetrating networks [semi-IPNs]), particularly to improve rigidity and to achieve degradation rates precisely controlled to match tissue healing.



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Astronomers Discover Planet Hotter Than Most Stars Where a 'Year' Lasts 1.5 Days

Artist's rendering of KELT-9b (red), illustrated along with the star it orbits, KELT-9, which is more than twice as large and nearly twice as hot as our Sun. (Credit: Robert Hurt, NASA/JPL-Caltech.)

Prior to coming to Texas A&M University in 2008, Darren DePoy spent 18 years at Ohio State University, building both the astronomy program along with an international reputation for excellence in astronomical instrumentation. Together, with fellow Texas A&M astronomer Jennifer Marshall, he built the first KELT system used in the set of measurements involved in new research out of Ohio State detailed below — a system that was later duplicated and installed in the Southern Hemisphere to complement the original one observing the Northern Hemisphere skies. DePoy and Marshall, both members of the George P. and Cynthia Woods Mitchell Institute for Fundamental Physics and Astronomy and astronomical instrument builders in the Charles R. '62 and Judith G. Munnerlyn Astronomical Laboratory, are cited in the team's paper as among those "essential for the initiation and successful operation of the KELT-North and KELT-South surveys."

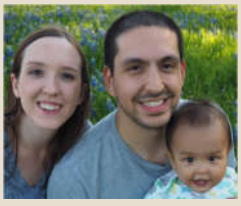
Full story: **goo.gl/ImP4PK**

Engineering, Design Collaboration Could Change The Way Concrete Structures Are Made

A team of design and engineering faculty and students are attempting to create a low-cost method to quickly cast complex, concrete forms.

Envisioning cityscapes renewed with stylish, custom-designed, concrete structures, a group of Texas A&M design and engineering faculty and students will collaborate during the 2017-18 academic year to develop a low-cost method for quickly casting complex concrete forms.

Full story: **goo.gl/9FCIQN**



Dr. Spencer Hawkins
Former PTC Student

Congratulations to Dr. Spencer Hawkins, who successfully defended his dissertation on June 16, 2017 in Materials Science and Engineering. He is currently looking for a research position in the aerospace, automotive, sports, and polymer industries. He was the recipient of two prestigious fellowships, the National Science Foundation Louis Stokes Alliance for Minority Participation Bridge to the Doctorate Fellowship in 2011, and the NASA Harriet G. Jenkins Graduate Fellowship in 2013. He was also the recipient of two scholarships, the International Polyolefins Conference Polymer Modifiers and Additives Scholarship in 2016, and the Polymer Technology Industrial Consortium KANEKA Scholarship in 2017. He was also awarded the Polymer Specialty Certificate in 2012, which requires a student to take four polymer courses.

After joining Dr. Sue's group in 2011, he worked as part of a multidisciplinary and multicultural team and published 1 first-author (1 to be submitted) and 5 co-authored publications and presented his research at a number of local (6), national (3), and international conferences (2). He also mentored undergraduate (5) and graduate (6) students throughout his graduate career. Furthermore, he was an officer in a number of professional organizations such as: The Society of Plastics Engineers, The Society for the Advancement of Material and Process Engineering, The American Chemical Society, and The Electrochemical Society. He also formed the student chapter of SAMPE at Texas A&M University and served as its President from 2013-2017. His doctoral research focused on fabricating multifunctional epoxy films containing well-exfoliated multi-walled carbon nanotubes for aerospace applications. These hybrid films exhibited exceptional tensile properties, fracture toughness, and electrical conductivity compared to neat epoxy films and can be used as composite matrices for structural applications, conductive adhesives, and interleaves for carbon fiber-reinforced composites.

THE KANEKA FOUNDATION
kaneka

At the PTIC meeting on April 7th, 2017, Mr. Toshihiko Kanda, Kaneka representative, presented and recognized Dr. Matthew Sheldon, Chemistry Department for being the award recipient of the Kaneka Junior Faculty Award.

Polymer Technology Industrial Consortium (PTIC)
Student Poster Session

APRIL 6TH-7TH, 2017

MAJOR		Students Name	Students Poster Title
CHEN	1	Shaoyang Wang	"In-situ Mechanistic Investigation of an Organic Radical Polymer Cathode on Interfacial Charge and Mass Transfer"
CHEM	2	Mary Layne Harrell	"Nontoxic and Nonvolatile Alternatives for Heptane and Hexane and Their Use in Catalysis"
CHEM	3	Tianyu (Kelvin) Yuan	"Versatile Thermochromic Supramolecular Materials Based on Charge Transfer Interactions"

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Meet the TAMU SPE student chapter officers for 2017-18 and their contact information, should questions arise.

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On April 7th, 2017 the 2017 SPE SPRING scholarship recipients were recognized.

Left to right: Yi-Yun (Timothy) Tsao, CHEM; Ms. Donna Davis, SPE Liason; and Pilar Suarez-Martinez, CHEN

On April 7th, 2017 the 2017 KANEKA SPRING scholarship recipients were recognized.

Left to right: Mr. Toshihiko Kanda, Kaneka representative, Ying-Hua Fu, CHEM; Xiaozhou Ji, CHEM; and Spencer Hawkins, MSEN; missing from picture were: Congzhi Zhu, CHEM and Ahmet Tigli, MSEN

Polymer Specialty Certificate Updates

Students that have applied for the Polymer Specialty Certificate	64
Students that have received the Polymer Specialty Certificate	48

For more information, please visit: http://ptc.tamu.edu/polymer-specialty-certificate/

Have Questions?

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