



Mark Your Calendars for the PTC Fall meetings!

Scratch Behavior of Polymers Consortium-SCRATCH

Wednesday, October 9th, 2019
Noon—5pm
After the TPO Conference-Troy, MI

Polymer Technology Industrial Consortium-PTIC

October 17th-18th, 2019
College Station, TX
Texas A&M University

UPCOMING EVENTS



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PTC News &
SPE Student Chapter

“Scratch Machine Beats Pencil Hardness for Testing Coatings”

Professor Hung-Jue Sue

Materials Science & Engineering



Pencil hardness has long been an industry-standard test for coating hardness. The Sue group is working on an instrumented scratch test that measures hardness using a more scientific and reproducible process. This scratch test generates data such as modulus, strength, and adhesion, that can be used to more efficiently improve the quality of polymeric coatings. This work was presented at ANTEC 2019 by Glendimar Molero.



PTC

POLYMER TECHNOLOGY CENTER

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Degradation and Recycling of PAEK Polymers

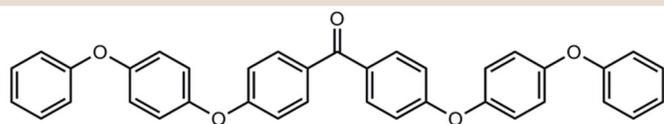
Professor Janet Bluemel
Department of Chemistry

The Bluemel group, in collaboration with Dr. Sue, explores options for degrading and recycling polyaryletherketones (PAEK). These high-performance polymers are of growing interest in a wide range of applications that demand superior

mechanical strength, corrosion resistance and retention of dimensional and physical properties in harsh environments. They are used as durable medical implants, e.g. artificial vertebrae, for 3D-printing of large objects, even car chassis and houses, and as light-weight downhole materials in oil and gas drilling and fracking processes. While the different commercially available PAEK grades are of growing importance, from an environmental perspective the quest for improved recyclability of plastics becomes more urgent.

Therefore, we investigate hitherto unexplored chemical decomposition pathways of PAEK. Ideally, the PAEK is broken down to its molecular building blocks, for example, phenol and hydroquinone, which can be funneled back into the chemical feedstock stream. In this way, the pollution with a large fraction of plastics materials could be reduced, while regaining important chemicals.

To enable a deeper understanding of the chemical reaction mechanisms on the molecular level we employ soluble molecular model compounds, for example the model for PEEK (polyetheretherketone) that is shown here.



Preliminary experiments on polymer samples show that the physical properties, e. g. the amorphous versus crystalline nature of PAEK and the chemicals used to break down the polymers, as well as the characterization of the fragments are of essence. In our interdisciplinary approach the right composition of degradation conditions and reagents leads to a quantitative break-down of PAEK to the molecular level. As analytical methods we employ mostly solid-state NMR, quantitative solution NMR spectroscopy and mass spectrometry.

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

High-performance computing to investigate physics of suspensions with irregular-shaped particles.

Associate Professor, Iman Borazjani
Department of Mechanical Engineering



The research at scientific computing and biofluids lab is mainly on developing advanced computational tools for different fluid-structure interaction problems. In a suspension, many solid particles interact with the fluid. The fluid flow affects the motion of the particles while the particles, in return, change the flow of the fluid, i.e., fluid-structure interaction. Therefore, the presence of particles changes the behavior of the fluid and its rheological properties. We have developed and validated computational tools that are capable of simulating fluid-structure interaction, by resolving the flow around the particles and calculating their motion based on the fluid forces exerted on them, and calculating the rheological properties of the suspension (see Fig. 1) [1]. The method is general and can handle any arbitrary shape of the particles (see Fig. 2) [2]. The method has been extended to handle the collision of many particles, which are important in dense suspension. Note that identifying and modeling the collision for irregular-shaped particles is not as straightforward as spherical ones whose collision can be determined just by the distance between their centers. The method will be used to investigate the role of shape, polydispersity, and inertia on the rheology of a suspension. The ultimate goal is to help design particle geometries that are beneficial in performing specific tasks, e.g., reducing viscosity, or drug delivery.

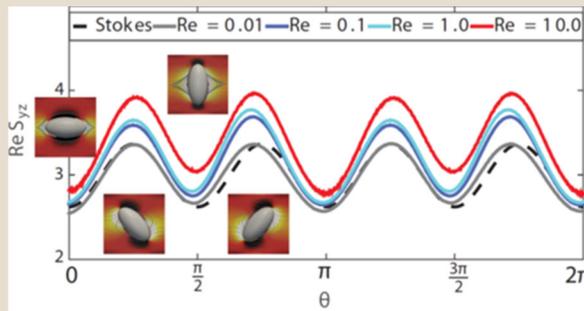


Figure 1 Stresslet of an ellipsoidal particle at different particle Reynolds numbers compared with the analytical solution. The insets show the vorticity and streamlines around the particle. Adopted from [1]

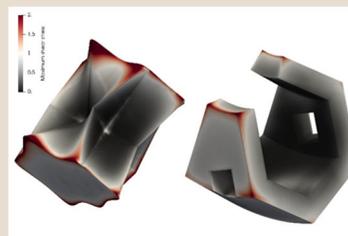


Figure 2 Maximum shear stress on irregular-shaped particles. Taken from [2].

References:

[1] Daghooghi, M. and Borazjani, I. (2015). The influence of inertia on the rheology of a periodic suspension of neutrally buoyant rigid ellipsoids. *Journal of Fluid Mechanics* 781, 506-549.
[2] Daghooghi, M. and Borazjani, I. (2018). The effects of irregular shape on the particle stress of dilute suspensions. *Journal of Fluid Mechanics* 839, 663-592 DOI: [10.1017/jfm.2018.65](https://doi.org/10.1017/jfm.2018.65)

Texas A&M teaches industry how to deal with corrosion in new course

Associate Professor Homero Castaneda
Materials Science & Engineering

Corrosion is the natural deterioration that occurs with all materials and it affects nearly every industrial sector and government agency, along with having a direct impact on the economy, health, safety, infrastructure, environment and national security.



So it's not surprising that industry professionals from Toyota Motor North America, Inc. and PinnacleART traveled to College Station to learn more about the degradation process and how to deal with its destructiveness in their own fields.

"TEES EDGE collaborates with TEES researchers to meet current industry needs by developing opportunities for professionals to explore, in a hands-on environment, applications resulting from our cutting-edge, engineering research," said Melissa Walden, TEES EDGE director. "Dr. Homero Castaneda-Lopez and the Center for Infrastructure Renewal worked closely with leaders at Toyota and TEES EDGE to launch this high-quality short course with immediate benefits across the automotive and energy industries—benefits we hope extend beyond those enrolled in the course."

On Dec. 11-13, the center presented the short course "Basic Corrosion: An Introduction to Thermodynamics and Kinetic Fundamentals" at the Center for Infrastructure Renewal. The course was led by Castaneda-Lopez, interim director of the Lab and associate professor in the Department of Materials Science and Engineering at Texas A&M.

Full story: goo.gl/JFNuR5



PTC is pleased to announce the newest member to the SCRATCH Behavior of Polymers Consortium.

CRODA

CRODA is the name behind the high performance ingredients and technologies in some of the biggest, most successful brands in the world: creating, making and selling specialty chemicals that are relied on by industries and consumers everywhere.

CRODA believes in turning challenges into opportunities, embracing their responsibility to pursue sustainable growth, and ensuring that the ingredients they make and the products they are used in have ever more benefit, with ever less impact. As they continue to evolve, their focus will remain the same; a team of passionate experts dedicated to working alongside their customers, delivering to them sustainable and innovative ingredients that they can build on.

WELCOME CRODA

Honored by the American Society
of Mechanical Engineers

Professor George Pharr
Materials Science & Engineering



Dr. George M. Pharr receives Nadai Medal for achievements in materials science

Dr. George M. Pharr, professor in the Department of Materials Science and Engineering at Texas A&M University, has been recognized by the American Society of Mechanical Engineers (ASME) for his work in the development of nano-indentation and fundamental contributions in the field of contact mechanics. Dr. Pharr has made significant contributions in materials science during a distinguished academic career at Texas A&M, Rice University and the University of Tennessee.

Full story: goo.gl/sgtM5r

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Celebrating 100 years of Family Weekend at Texas A&M University

What began after World War I as a campus Mother's Day celebration has grown into a weekend dedicated to Aggie families. This year's Family Weekend is set for April 12-14.

After 1965, when membership in the Corps became voluntary, new activities were continually added over the years to include a wider variety of students. Some of these new activities included the Bevo Burn Barbecue competition, Memorial Student Center (MSC) Variety Show, and Residential Housing Association (RHA) Casino.

"This weekend is the best way for families to experience the Aggie Spirit, and I am ecstatic to be able to engage with and welcome those families to our campus this April," she said. "This year we will be hosting a Centennial Celebration to commemorate this long standing tradition, as well as events such as a tailgate before the Maroon and White Game,"

The Centennial Celebration will be held April 13 from 7-10 p.m. and will feature a curated display of artifacts and memories, special guest speakers, live music, dessert and a photo booth.

Full story: <https://today.tamu.edu/2019/03/20/celebrating-100-years-of-family-weekend-at-texas-am/>



Texas A&M Parents Day in 1960. Photo courtesy of Texas A&M Cushing Memorial Library & Archives



Texas A&M Parents Day in 1960. Photo courtesy of James E. Hudson III.



For information on becoming a member of the SPE student chapter at TAMU, please contact the below officers.

President	Fabian Arp	arpfabian@gmail.com
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Treasurer	Andy Abbas	aabbas101@tamu.edu

Polymer Specialty Certificate Updates

Students that have applied for the Polymer Specialty Certificate	77
Students that have received the Polymer Specialty Certificate	57

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

Have Questions?

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