2020

FIRST Quarter

PTC Newsletter

PTC Polymer Technology

UPCOMING EVENTS

Mark Your Calendars for the PTC Spring meetings!

Scratch Behavior of Polymers Consortium-SCRATCH	Polymer Technology Industrial Consortium-PTIC
Wednesday, April 1st, 2020 Noon—5pm After the ANTEC Conference-San Antonio, TX	April 16th-17th, 2020 College Station, TX Texas A&M University

Inside the Newsletter

Chi-der Steve Suh
Mechanical Engineering Department
Named American Society of Mechanical Engineers Fellow (ASME)

Dr. Steve Suh, Associate Professor, has been named a fellow of the American Society of Mechanical Engineers (ASME).

An ASME fellow grade is conferred upon worthy candidates to recognize their outstanding engineering achievements. Fewer than 3% of all ASME members are fellows.

Full story: **https://bit.ly/34Y4MEy**

Texas A&M Ranked No. 1—Four Years in a Row for Number of Students Abroad Among Public Universities

Education abroad opportunities are available to all students – freshmen through doctoral candidates. International programs can be as short as one week or as long as a full year. Students may choose to be part of a group or pursue an individual program. The most popular countries in 2017-18 were the United Kingdom, Germany, Italy, Spain, France and Mexico.

Numerous funding opportunities are available for students interested in education abroad programs. Texas A&M University provides more than $1 million annually in scholarships to students participating in international programs.

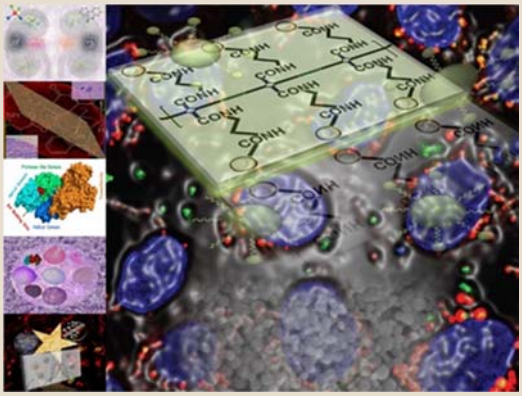
Full story: **https://bit.ly/2Lf9aHq**

Professor M. N. V. Ravi Kumar
Department of Pharmaceutical Sciences
Irma Lerma Rangel College of Pharmacy

Precision-polyesters enabling targeted delivery of pharmaceutical drugs

The targeted delivery of drugs to specific tissues and across biological barriers can, in principle, improve therapeutic efficacy while diminishing side effects. However, controlling where drugs go *in vivo* remains a major challenge in modern medicine. A widely sought-after solution to this problem, encapsulating drugs into functional nanoparticles, is predicted to have an enormous impact on next-generation health care technologies such as point-of-care diagnostics and ligand-receptor-mediated drug delivery. These nanoparticles can, for instance, facilitate the transport of drugs through the gastrointestinal tract (GIT), the blood-retinal barrier (BRB), and the blood-brain barrier (BBB). Such transport typically requires the decoration of nanoparticles with a ligand that can bind to cell surface receptors: the interaction between ligand and receptor facilitates the accumulation of the drug encapsulated nanoparticles on the cell surface, inside cells (following endocytic uptake), and in or through the tissue after cell-to-cell transport. While promising, this drug-delivery approach is currently limited in its efficacy (therapeutic windows remain suboptimal) by two major problems, ***a)*** polymer structures are not versatile enough to optimize ligand-receptor stoichiometry to maximize transport efficiencies, and ***b)*** all ligands used to date are out-competed by physiological ligands present endogenously at high concentrations. Moreover, there is no mechanistic insight available in regard to how polymer nanoparticles are transported through biological barriers. Consequently, it is not possible to rationally design targeted nanoparticles with better biological outcomes.

To address these problems, we have developed simple, yet elegant, "game changing" polymer nanoparticles that can encapsulate diverse pharmaceutical drugs with distinct physicochemical attributes. This approach is a deviation from the current literature, in which we can fine-tune the particles to increase or reduce the uptake across the intestinal barriers via transferrin receptor mediated transport without having to compete with the endogenous transferrin *(J. Am. Chem. Soc. 139: 7203-7216, 2017, cover article; ACS Appl. Bio Mater. 2: 3532-3539, 2019, cover article).* Very recently, we have applied such delivery strategy to Urolithin A (UA), a gut metabolite of the dietary tannin ellagic acid. Nanoparticle encapsulation of UA led to a 7-fold enhancement in oral bioavailability compared to native UA. The improved bioavailability led to enhanced clinical outcomes in a mouse model of acute kidney injury [AKI] *(Am J Physiol Renal Physiol. 317: F1255-F1264, 2019)*, a life-threatening condition where we don't have an FDA approved therapy. Work continues on AKI with an end goal of translation to clinic.



The overall focus of our lab is to customize the delivery strategies around the drug and the disease in question, enabled by flexible polymer structures combined with non-competitive active targeting strategies, leading to effective treatments.

More information can be found at
https://research.tamhsc.edu/drugdeliverylab

Associate Professor Terry Creasy
Materials Science & Engineering

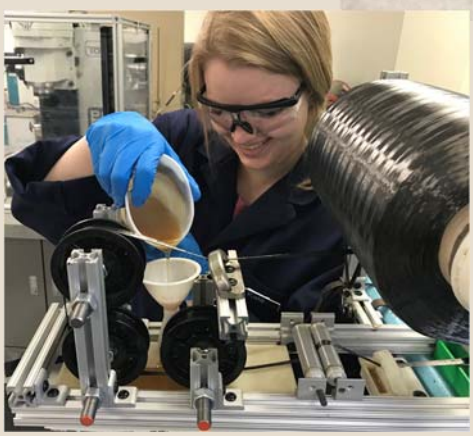
Advanced Composites Can Improve Transportation through Energy Storage Flywheels and Lightweight Structures

Current plans include more electric automobiles, buses, and trains; but many are not aware that electric aircraft—including hybrid commercial jets and self-flying air taxis—are vital for future transportation. Advanced composites that blend micro and nano materials can support this electric future. Transportation vehicles—automobiles, trains, buses, and aircraft—need lightweight structures and concentrated energy storage for efficiency and electric operation.

You might be familiar with composite structures—they are increasingly present in our cars, sports equipment, and aircraft—but composites can provide energy storage that competes with Li-ion batteries both in energy density, which is the energy stored per kilogram system weight, and in recharging time. Composite flywheels can recharge in minutes rather than hours because they do not need the slow charging that batteries require for long service life. A flywheel can spin up in less time than it takes a driver to step into a convenience shop and buy a coffee. Commercial jets could charge their flywheels as arriving passengers deplane and departing passengers board. With each stop, personal air taxis could top off their flywheels before taking the next passenger.

There are technical challenges that Professors Palazzolo, Naraghi, and Creasy are working to address through materials improvement and systems research. Composite flywheels spin at tens of thousands of RPM. Filament wound flywheels have the greatest stress in the weakest direction—transverse to the carbon fibers. If Dr. Naraghi's carbon nanofibers fill that resin-rich direction so that radially oriented reinforcements take the load, the energy density could meet or exceed the density found in slow-charging lithium-ion batteries. The trial flywheels undergo high speed testing in Dr. Palazzolo's test facility that tortures them in cycling loading and to ultimate failure. Dr. Creasy's group provides fabrication and tooling needed to make the wheels with nanofibers incorporated in the high stress regions. With continued work in improving the nanofibers and the process, this team is well placed to advance the state of the art in transportation energy storage.

This flywheel is a hybrid containing convention commercial microfiber and high strength carbon nanofiber created in Dr. Mohammad Naraghi's laboratory.



Ms. Kate Eikel uses a custom, CNC prepregging machine to produce carbon microfiber tow that is optimal for flywheel construction. Nanofiber bands incorporated during the winding process produce a nanostructured composite.

On October 18th, 2019 at the PTIC meeting, the Kaneka scholarship recipients were recognized as shown below.

Left to right: Dr. Hung-Jue Su, Professor and PTC Director, MSEN; receiving Kaneka student scholarships are: Esteban Ramirez, BMEN; Rui Sun, CHEN; missing from picture Hua Wang, MSEN; and receiving the Kaneka visiting scholar scholarships are: Guan-Hui Lai, MSEN and Wan Zhang, CHEM

On October 18th, 2019 at the PTIC meeting, the Society of Plastic Engineers-SPE scholarship recipients were recognized as shown below.

Left to right: Ms. Donna Davis, SPE Liaison; Yagmur Yegin, FST receiving SPE Scholarship; Chinwendu Akuechiama, MSEN receiving the SPE Dale Walker Memorial Scholarship and Sopida Thavornpradit, CHEM receiving the SPE Henry Kahn Memorial Scholarship.

Polymer Technology Industrial Consortium (PTIC) Student Poster Session			
OCTOBER 17-18TH, 2019			
	Students Name	MAJOR	Student Poster Title
1	Fabian Arp	CHEM	"Synthesis and Stabilization of Peroxides via Phosphine Oxides"
2	Adrianna Kuechle	CHEM	"Use of Recyclable Brønsted Acid Catalysts in Alternative Alkane Solvents"
3	Beril Ulugun	BMEN	"Ultradurable Superhydrophobic Surface Coatings for Industrial Applications"

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The Honor of Caring for 'Miss Rev'

Since leaving private practice in Corpus Christi 10 years ago to return to Texas A&M as a clinician at the Small Animal Hospital (SAH), Dr. Stacy Eckman has provided care for Reveille VII in retirement, Reveille VIII while active and in retirement, and, now, Reveille IX.

"I see her at least twice annually, but we often see her or are in contact with her handlers more frequently to answer questions," Eckman said.

Reveille spends all of her time—24 hours a day—with the Mascot Corporal, a sophomore in Company E-2 of Texas A&M's Corps of Cadets. The Mascot Corporal (currently, Colton Ray) is chosen from the company each spring, and for the next year Reveille goes everywhere with him or her—to class, on dates, and home for the holidays.

Full story: https://bit.ly/2rgiynd

Some may see her as just a dog, but Texas A&M's first lady is so much more for Aggies – and for her Aggie veterinarian.

SPE South Texas section

The 2019-2020 SPE student chapter new officers. For information on becoming a member of the SPE student chapter at TAMU, please contact the below officers.

President	Ying-Hua Fu	yinghuafu95@tamu.edu
VP Science	Yue Song	ysong@tamu.edu
VP Engineering	Ming-Uei Hung	muhung@tamu.edu
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Liaison Officer	Chenxu Wang	Chenxu_wang@tamu.edu
Webmaster/Social Media Coordinator	Kasturi Sarang	Kasturi_0402@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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