2020

THIRD Quarter

PTC Newsletter

Polymer Technology Central

UPCOMING EVENTS

Mark Your Calendars for the PTC Spring meetings!

Scratch Behavior of Polymers Consortium-SCRATCH	Polymer Technology Industrial Consortium-PTIC
Fall-Wednesday, October 7th, 2020 Noon—5pm to be determined	Fall-October 16th, 2020 9-3pm to be determined

Inside the Newsletter

Development of Non-Toxic Flame Retardant Plastics via Low-Cost and One-Step Scalable Process

Qingsheng Wang
Associate Professor
Artie McFerrin Department of Chemical Engineering

Polymeric materials provide numerous advantages to society in everyday life, like being versatile, lightweight, corrosion-resistant, and electrically insulating. However, there is a continuous demand for improved properties of polymeric materials, especially their low propensity of ignition and/or improved flame retardancy, given the fact that polymeric materials are taking a large portion of fire load in houses, commercial environments, and transportation. Traditionally, the incorporation of halogen-based fillers in polymeric materials has been an economical method for improving their flame retardancy. However, halogen-based chemicals have been under regulatory scrutiny for the past 40 years, and certain halogen-based compounds have been banned for commercial use in recent years, because of the concern from the public about their persistence, bioaccumulation, and toxicity (PBT). Now, the market trend is moving to halogen-free flame retardants. Even though they are environmentally sound, halogen-free chemicals also present disadvantages. Inorganic substances, for example, which currently comprise the most used flame retardants, require high levels of loading, leading to additional costs, processing difficulties, and deterioration of polymer mechanical properties.

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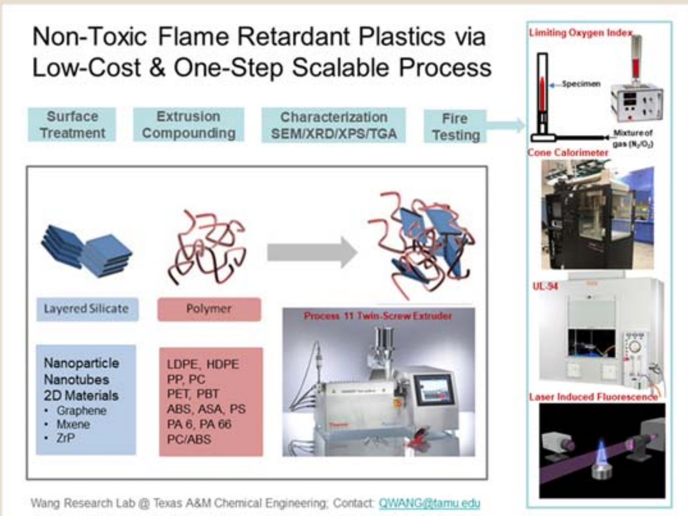
Development of Non-Toxic Flame Retardant Plastics via Low-Cost and One-Step Scalable Process

Qingsheng Wang
Associate Professor, Department of Chemical Engineering



As a relatively new, safe, and environmentally friendly strategy, polymer nanocomposites have attracted great attention in this filed, because they can improve flame retardant performance, while still maintaining or enhancing mechanical properties, even with very low loading. In our laboratory, we have a long-standing interest to improve the flame retardancy of engineering plastics using polymer nanocomposite technology, particularly those nanofillers of high aspect ratio. The commonly used nanoscale fillers include spherical silica, carbon nanotube, layered silicate, graphite, and layered double hydroxide. Recently, after proper surface treatment, we have implemented the melt blending process to embed nanofillers into engineering plastics to form polymer nanocomposites using a twin-screw extruder, because of its ability for use in industrial applications and good compatibility with other current industrial processes. After this one-step synthesis process, various characterization methods, including SEM-EDS, XRD, and XPS, are used to examine the dispersions of nanofillers, their structure, and elemental compositions within the composites to ensure the formation of polymer nanocomposites. The thermal stability of polymer nanocomposites manufactured from this process is evaluated using TGA. Their ignitability, ease of self-extinguishment, and flammability are evaluated comprehensively using various fire testing techniques available in our lab, including LOI, UL-94, and cone calorimeter. This study will directly contribute to reducing the cost and advancing the application of nanocomposites into everyday use for flame retardant polymeric materials.

Polymer/MXene Functional Coatings

Jodie Lutkenhaus
Professor, Department of Chemical Engineering

Polymer composites containing "MXenes", a new type of filler material, are gaining interest for applications in barriers, sensing, energy storage, and mechanical reinforcement. MXenes are two-dimensional nanomaterials derived from ceramic "MAX" phases, with the most common type of MXene being $Ti_3C_2T_x$, where T_x indicates the terminal groups. Typical MXenes are 1-10 um in diameter and ~ 1 nm in thickness, depending on the degree of exfoliation. They are conductive and can be used in place of graphene or carbon nanotubes for composite applications. MXenes tend to bear hydrophilic surface terminal groups so the nanosheets are easily dispersible in water.

In our work, we have created polymer/MXene functional coatings for energy storage applications. Specifically, we created layer-by-layer coatings of polyaniline nanofibers (PNFs) and $Ti_3C_2T_x$ MXene electrodes for the first time. In this processing technique, the PNFs and the MXenes are alternately deposited onto a substrate of choice to form numerous layer pairs. The coating thickness increased at a rate of 49 nm/layer pair (LP) with a composition of 77 wt % PNFs and 23 wt % MXenes. We evaluated their energy storage performance, hypothesizing that both redox active PNFs and MXenes would store energy. The coatings were evaluated in a two-electrode non-aqueous configuration, demonstrating energy storage from both components. Our current work is examining this platform for conformal batteries and capacitors, in which the energy storage device could be integrated into woven fabric or thread. In the future, this approach may be leveraged to assemble conformal batteries for small-scale electronic devices that will lead the fourth industrial revolution.

This work appears in ACS Appl. Mater. Interfaces 2019, 11, 47929; http://doi.org/10.1021/acsami.9b16692

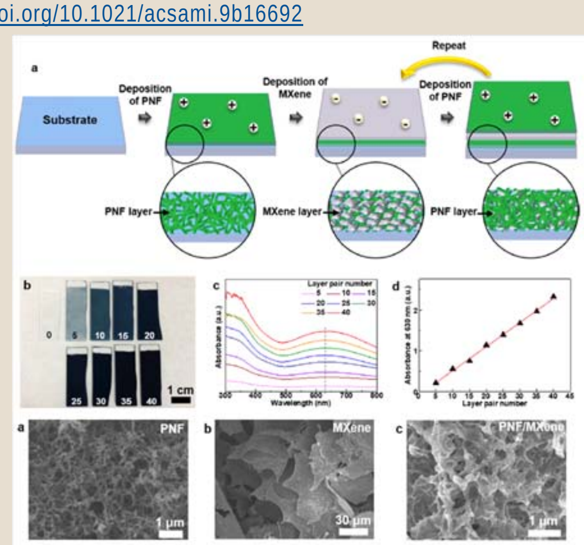


Figure. Characteristics of polyaniline nanofiber (PNF) / MXene layer-by-layer coatings. Top row, layer-by-layer schematic. Middle row, appearance and UV-Vis spectra of PNF/MXene coatings with varying thicknesses and number of layer pairs. Bottom row, scanning electron microscope images of PNFs, MXenes, and PNF/MXene coatings

2020 SPRING Society of Plastics Engineers Scholarship Recipients


Dr. David Hansen
SPE Liaison


Nicole Reynolds, CHEN
Undergraduate Scholarship Recipient


Mei Dong, CHEM
Graduate Scholarship Recipient

These students were recognized at the PTIC videoconference meeting held on April 17th, 2020 for being the 2020 Spring SPE scholarship recipients.

2020 SPRING KANEKA Scholarship Recipients


Glendimar Molero, MSEN
Graduate Scholarship Recipient


Guiler Bengusu Tezel, CHEN
Kaneka Visiting Scholar Scholarship Recipient


Dr. Masaya Kotaki
Kaneka Liaison

These students were recognized at the PTIC videoconference meeting held on April 17th, 2020 for being the 2020 Spring Kaneka scholarship recipients.

Qihui Chen
Visiting Scholar—North University of China

Qihui Chen finished his visiting scholar project in Professor Hung-Jue Sue's lab summer of 2020. He has been studying high-toughness structural polymer composites with engineering application prospects. Under the guidance of Dr. Hung-Jue Sue. In recent years, he has focused on the synergy of external-internal multi-component toughening systems to develop high-toughness epoxy composites without sacrificing mechanical properties and thermal stability. Qihui Chen will return to his alma mater and continue to complete PhD degree.

Qihui Chen

Guan-Hui Lai
Visiting Scholar—National Chin-Yi University of Technology in Taiwan

Howdy!

My name is Guan-Hui Lai and I am a visiting scholar from the National Chin-Yi University of Technology in Taiwan. I joined Dr. Sue's group in July 2019 and worked here for almost one year. My previous research focused on composites material for its application in anticorrosion coating and catalyst. My research experience at Texas A&M University was focused on the fundamental understanding of self-assembly phenomena of 2D nanoparticles in polymer matrices. It's a nice experience for me and I learned and enjoyed a lot this year. I would like to thank Dr. Sue for giving me this opportunity to work in an excellent research environment, and I appreciate all the help and support from our group. Furthermore, I would like to thanks the financial support of the Ministry of Science and Technology, Taiwan for providing the necessary funds for this opportunity.

Guan-Hui Lai

Does A Cloth Mask Protect Me From COVID-19?

As leaders at the local, state and national levels implement the mandatory use of face coverings in public areas as a direct response to increased cases of COVID-19, understanding the what, how and why behind the use of a cloth face mask can help each of us reduce the spread of the novel coronavirus.

Although you may question why you should wear a cloth face covering even when you're not sick, remember that many COVID-19 patients didn't realize they were ill and inadvertently exposed others to the virus.

"One of the problematic realities of COVID-19 is the fact that those who are asymptomatic — meaning, carriers of the virus not showing any signs or symptoms of sickness — are contagious, unknowingly spreading the virus," said Matthew Sorenson, assistant dean for graduate nursing education and professor at Texas A&M University College of Nursing. "When someone who is sick with COVID-19 wears a cloth face covering properly, they significantly reduce the odds of transmitting the disease to those around them."

Full story: **http://bitly.ws/8Vzo**

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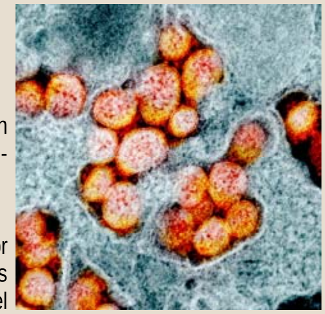
Texas A&M Testing COVID-19 Vaccine Candidates For iBio, Inc.



A team of scientists at Texas A&M University is working on two COVID-19 vaccine candidates that could be mass produced quickly in modified tobacco plants.

The team is led by Dr. James Samuel, a regents' professor and the head of the Department of Microbial Pathogenesis and Immunology at the College of Medicine. Samuel discusses the experiments with John Sharp, chancellor of The Texas A&M University System, in the final episode of "COVID-19: The Texas A&M University System Responds."

"This is an important collaboration," Sharp said. "It's an example of how our scientists, engineers and other experts collaborate with the private sector on the world's most pressing problems."

Samuel is leading the group at his lab at the Texas A&M Health Science Center. The team is testing the vaccine candidates for the international biotechnology company iBio Inc., which operates a manufacturing facility in nearby Bryan, Texas. The scientists expect to see preliminary results before Oct. 1 from pre-clinical trials in mice.

Full story: https://bit.ly/31v9ta2

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
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VP Engineering	Ming-Uei Hung	muhung@tamu.edu
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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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PTC
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MATERIALS SCIENCE & ENGINEERING

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