2020
FOURTH Quarter
PTC Newsletter

Polymer Technology Consortia

UPCOMING EVENTS

Mark Your Calendars for the PTC Spring meetings!

Scratch Behavior of Polymers Consortium-SCRATCH	Polymer Technology Industrial Consortium-PTIC
Spring-Wednesday-March 24th, 2021 Noon—5pm After the ANTEC Conference-Denver, CO	Spring-April 8th-9th, 2021 College Station, TX Texas A&M University

Inside the Newsletter

Carbon-based Nanomaterials Synthesized via Pyrolysis: Finding the Happy Marriage between the World of Polymers and "Nano-Carbon"

Mohammad Naraghi, Associate Professor
Department of Aerospace Engineering,
Affiliated with Materials Science and Engineering

One dimensional carbon nanomaterials, such as carbon nanotubes (CNT) and carbon nanofibers (CNF), have captured the imagination of material scientists and engineers for two decades as a basis for developing multifunctional materials with unprecedented combinations of highly desirable properties. The synthesis of these materials often fall into two broad categories: chemical vapor deposition (CVD) methods and pyrolysis. In the latter, a polymer precursor is converted into carbon by extracting non-carbonaceous atoms from it. Processing parameters of pyrolysis are highly controllable in large scales, as practiced in industrial scale production of carbon fibers.

In Naraghi's lab, "Nanostructured Materials Lab", we have invested our time and energy in realizing the processing-microstructure-property relationships in carbon nanofibers which are obtained via pyrolysis of electrospun polymeric nanofibers such as polyacrylonitrile (PAN). Our target applications include classical load bearing nanomaterials, in which the strength and resilience of CNFs has to be extended. Another direction of research considers CNFs for multifunctional materials, such as CNFs as electrodes for load bearing supercapacitors, for weight/volume sensitive applications which require onboard energy sources.

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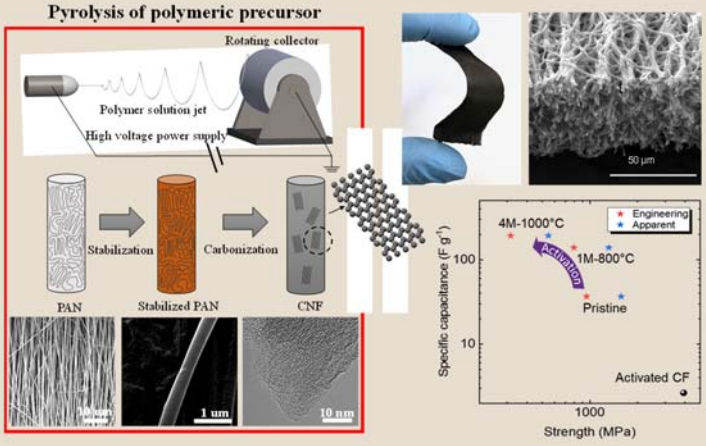
Mohammad Naraghi, AERO

What makes our approach unique in "Nanostructured Materials Lab" is the specific attention we pay to the polymeric nature of the CNFs precursors. Among various classes of materials (Polymers, Metals, Ceramics), polymers are by far the most "malleable". This means that the form (shape), characteristic dimensions (e.g., diameter of fibers), and morphology (e.g., crystallinity, chain alignment, etc), can be adjusted with great ease, unparalleled among metals and ceramics. This has brought a happy marriage between the worlds of polymers and carbon, in which we constantly seek approaches to fine-tune the morphology, form and characteristic length scales of the former to enhance performance metrics of the latter. A research direction we have taken along these lines is benefitting from our control over the crystalline domain alignment in precursors to develop strongest CNFs ever, with strength of over 10 GPa. Another research direction has been focused on introducing sacrificial islands inside the PAN precursor as a means to develop porous CNFs which can act as mutltifunctional materials for structural energy storage applications. The pores there are intended to increase the surface area for enhanced electrochemical energy storage (supercapacitor) while the pore shape and size is to be adjusted by controlling the precursor microstructure to minimize reduction in load bearing caused by the presence of pores.

The current and near future directions of the research is aimed at accelerated material discovery by means of advanced engineering and high throughput models (via emerging machine learning) towards multifunctional nanofibers. The work has benefitted over the years from collaborations with TAMU PIs (Drs. Lutkenhaus and Boyd) and outside scientists (Dr. Keneddy, AFRL). The majority of the work has been supported by Air Force Office of Scientific Research and Air Force Research Lab.

The work has appeared in various articles including Advanced Functional Materials 29 (33), 1901425 , ACS applied materials & interfaces 10 (44), 38310-38318, Carbon 117, 208-219, Acta Materialia 162, 46-54, Carbon 137, 242-251



Homero Castaneda, MSEN

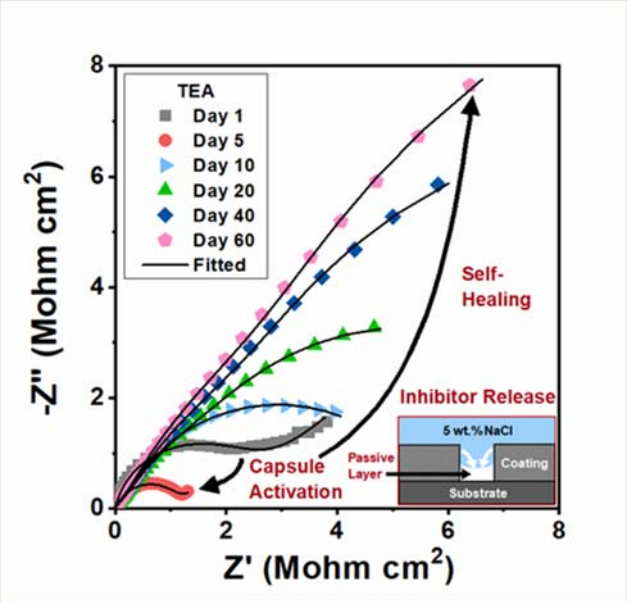
A Smart Coating Embedded with pH-Responsive Microcapsules Containing a Corrosion Inhibiting Agent-a Self-Healing Effect

Homero Castaneda, Associate Professor
Department of Materials Science
and Engineering

Dr. Castaneda's group searches for several pathways and strategies in research for corrosion control. One novel approach was recently published in the ACS Applied Materials and Interfaces Journal. Triethanolamine (TEA), was encapsulated and then embedded into an epoxy coating to achieve long-term corrosion protection of aluminum alloy. Electrochemical techniques were able to characterize and quantify the corrosion performance of the "microcapsules". Self-healing effects included in this system showed when the metal experienced mild corrosion in its early performance stages following water uptake within the coating. The inhibiting layer was formed by local pH level change which occurred release of TEA. Figure shows the electrochemical response when the microcapsules are released with time [1].

Based on the local high resolution electrochemical technique, the current density of the metal surface in the presence of a microencapsulated TEA coating was significantly lower than that of a control coating with no microcapsule. The results revealed that the sample surface that had microencapsulated TEA nearby was considerably less stained after 60 days of testing compared to that of the control sample (with no microcapsules), which indicated that the metal substrate was protected by an inhibiting layer.

[1] ***ACS Appl. Mater. Interfaces* 2020, 12, 5, 6451–6459.**



Dr. Matt Pharr receives award for excellence in teaching

Dr. Matt Pharr, assistant professor in the J. Mike Walker '66 Department of Mechanical Engineering at Texas A&M University, takes his place among less than 300 faculty members in 30 years as a Montague-CTE (Center for Teaching Excellence) Scholars Award recipient for his achievements in teaching undergraduate students.

According to Pharr, his dedication to teaching stems from his enjoyment of working in the classroom.

"I enjoy interacting with students, particularly with the energy they bring to class," Pharr said. "It is fun to hear students ask questions and come up with new solutions from perspectives that I have not considered before. It's also very rewarding when students come to that "aha moment" through lectures and discussion."

Full story: **http://bitly.ws/a8tb**

Homero Castaneda to serve on National Academies of Sciences, Engineering and Medicine committee

Dr. Homero Castaneda-Lopez, associate professor in the Department of Materials Science and Engineering at Texas A&M University, has been selected as one of 12 experts to serve on the Corrosion of Buried Steel at New and In-Service Infrastructure committee that is a part of the National Academies of Sciences, Engineering and Medicine. This committee will focus on technical issues related to steel corrosion in ground stabilization, pipelines and infrastructure foundations in unconsolidated rock, among other settings.

The committee brings together experts from academia and industry to conduct a study aiming to improve the performance of steel over the long term for a number of infrastructure applications. Due to limitations caused by the COVID-19 pandemic, they will hold virtual meetings to discuss their findings, including a workshop on the prediction and monitoring of corrosion in buried steel.

Full story: **http://bitly.ws/9Nvh**

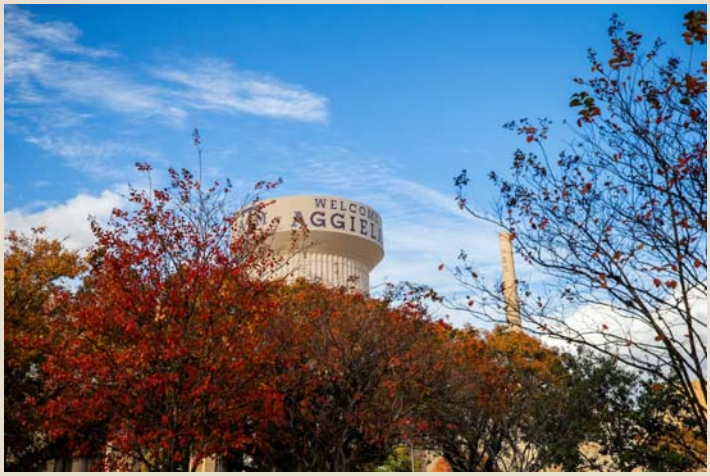
Texas A&M Moves Up 4 Spots In U.S. News Rankings

Texas A&M University is ranked No. 26 among public universities and has improved four spots to No. 66 overall among over 1,800 schools in U.S. News & World Report's 2021 college rankings.

U.S. News also ranks Texas A&M No. 13 in the country for best engineering programs and No. 24 for best business programs.

"Our improvement in the rankings is a testament to the fact that we are one of the most productive and influential research universities in the nation, as well as to our longstanding commitment to ensuring that our students graduate on time so that they can become leaders who excel in their careers and serve their communities, our nation and the world," said Texas A&M President Michael K. Young.

Full story: **http://bitly.ws/9Lbt**



MONEY Magazine Ranks Texas A&M Best in Texas

Texas A&M University is ranked the top university in Texas in MONEY magazine's new best value rankings.

Full story: **http://bitly.ws/9LbN**

Washington Monthly Ranks Texas A&M Among Nation's Best Colleges

Texas A&M University is ranked No. 12 overall and No. 4 among public universities in the United States by Washington Monthly magazine in its annual college rankings.

Full story: **http://bitly.ws/9LbY**

Fiske Guide Ranks Texas A&M Among Top 20 In U.S.

Texas A&M University remains the only public college in Texas to make the "Best Buys" list in the 2021 Fiske Guide to Colleges, a listing which cites the best colleges that offer a superior education for the most affordable cost.

Full story: **http://bitly.ws/9Lcj**

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Texas A&M Fall Enrollment Increases 2.4 Percent

Fall enrollment totals 71,109 students.

Enrollment for fall 2020 at Texas A&M University totaled 71,109, which is a 2.4 percent increase from last year's figure of 69,465 students.

The fall numbers include students at the undergraduate, master's and doctoral level enrolled at the College Station campus, the Health Science Center and branch campuses in Galveston and Doha, Qatar. This year's total represents 243 of 254 Texas counties, all 50 states and 131 countries. The College Station campus saw the greatest increase of 1,501 students, with its enrollment reaching 65,684 this year.

Texas A&M University President Michael K. Young added that the enrollment success has been a collective effort.

"With the economic uncertainty created by COVID-19, we were all concerned about how that might impact our overall enrollment," Young said. "We were delighted to see that our numbers increased for both the summer session and the fall semester. This is a testament to the students and families who rely on the quality of a Texas A&M education, and a tribute to the extraordinary efforts of our faculty and staff who helped us continue our educational mission during such a challenging time."

Full story: **http://bitly.ws/9QBu**

SPE South Texas section

The 2020-2021 SPE student chapter new officers. For information on becoming a member of the SPE student chapter at TAMU, please contact the below officers.

President	Mohammed Haque	myhaque123@tamu.edu
VP Science	Ching Pang	chingpang@tamu.edu
VP Engineering	Chia-Ying Tsai	tsaicying@tamu.edu
Treasurer	Hengxi Chen	hengxichen@tamu.edu
Secretary	Chenxuan Li	chenxuanli@tamu.edu
Activity Coordinator	Ting-Wei (Timothy) Hsu	timothy791210@tamu.edu
Webmaster	Bo-Ji Peng	bojipeng@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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