2017

Second Quarter

PTC Newsletter

Polymer Technology Center

UPCOMING EVENTS

Mark Your Calendars!

Scratch Behavior of Polymers Consortium-SCRATCH	Polymer Technology Industrial Consortium-PTIC/Fall Meeting
May 10th, 2017 Anaheim, CA After the ANTEC Conference	October 19th - 20th, 2017 College Station, TX Texas A&M University

Inside the Newsletter

MATERIALS SCIENCE & ENGINEERING
TEXAS A&M UNIVERSITY

Minor in Materials Science & Engineering

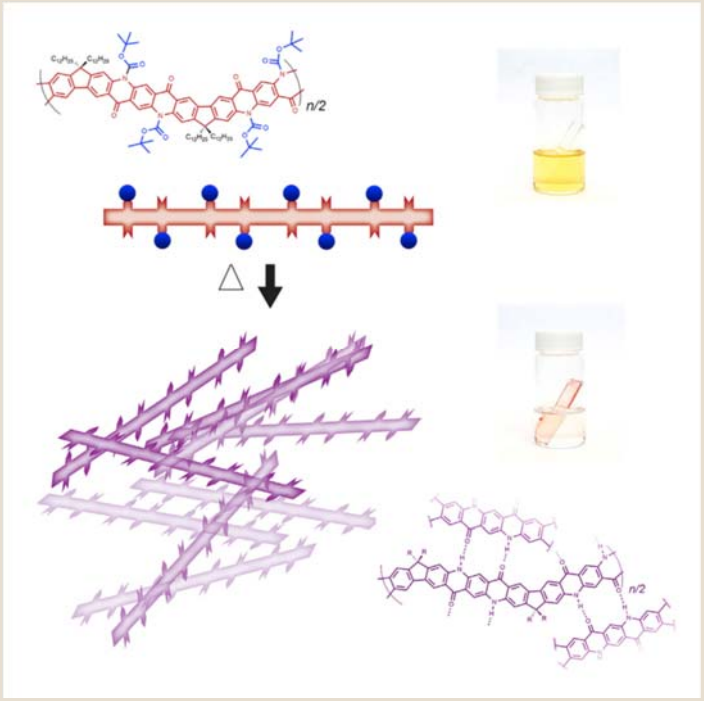
The Department of Materials Science & Engineering minor degree program is designed to provide a strong materials science educational program for undergraduate science and engineering majors and to integrate a materials focus into their undergraduate training. It is intended for students who are interested in broadening their undergraduate major program of study to incorporate a fundamental understanding of materials processing and structure–property relationships to complement their major degree. Students will have the flexibility to select relevant coursework in order to customize this program of study to best suit the particular student's intended area of focus through consultation with a MSEN faculty advisor. The minor program in materials science and engineering consists of a minimum of five three-hour courses for a total of 15 credit hours, with up to six credit hours in materials courses within their major. All students are required to have completed a prerequisite, such as MSEN 201—Engineering Materials: From Structure to Properties (or an equivalent course)—prior to applying for the minor. Two three-hour courses (six credit hours) are selected from a list of core MSEN undergraduate courses. The remaining three courses (nine credit hours) are selected from upper-level materials focused technical electives. With the permission of the MSEN faculty advisor, students may substitute up to two technical electives with courses from their major department with a primary focus on materials science and engineering. Completion of the minor will be recorded on the student's university transcript.

For application, guidelines and more information about this program, please visit: goo.gl/CaEqQg

Dr. Lei Fang
Chemistry Department
Synthesis and Solution Processing of a Hydrogen-Bonded Ladder Polymer

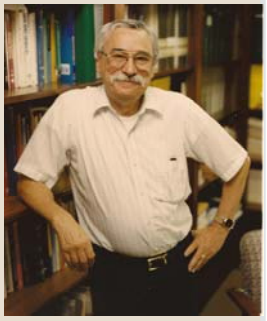
Rigid coplanar ladder polymers equipped with regulated intermolecular interactions promise unique solid-state properties. Efficient synthesis and solution processing of these materials, however, are challenging because of their extremely poor solubility. Herein, we describe a highly efficient, gram-scale synthesis of a hydrogen-bond-containing ladder polymer through an approach free of metal catalyst. The quinacridone-derived repeating unit features multiple self-complementary intermolecular hydrogen bonds along the rigid backbone. Using a reversible hydrogen-bond protection strategy, we were able to fully characterize this insoluble polymer in solution and process it into smooth thin films. In the solid state, the material demonstrated excellent resistance to organic solvents, aqueous acids, and thermal treatments, rendering a solution-processed, solvent-resistant thin film. This unique property allows for solution manipulation of robust polymer materials for applications associated with extreme operating or processing conditions. This scalable fused-ring polymer also demonstrated promising potential as a precursor for graphitic carbon materials.

Full story: **goo.gl/OJ6GWo**



Fang and coworkers report a conjugated ladder polymer featuring a rigid coplanar backbone and self-complementary intermolecular hydrogen bonds. The gram-scale synthesis was achieved in three steps with overall 66% yield. Reversible hydrogen-bond protection and cleavage enabled solution-phase characterization of this highly insoluble polymer. Solution-processed thin films demonstrated robust resistance to aggressive solvents after simple thermal annealing. Carbonization of this fused-ring polymer leads to carbon materials with high graphitic content.

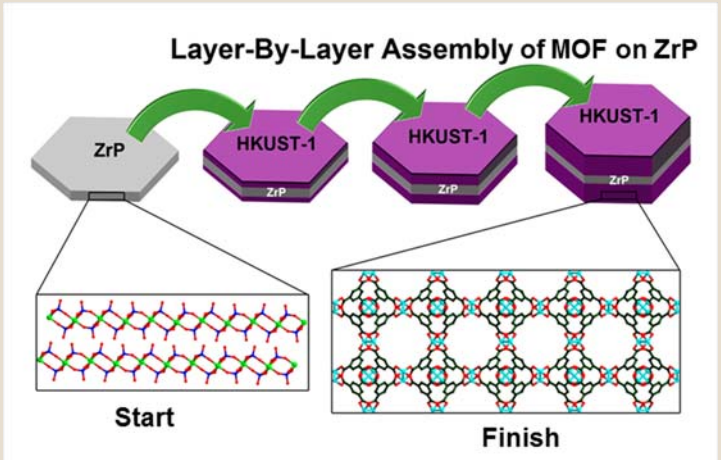
Dr. Abraham Clearfield
Chemistry Department
Research Interests of Clearfield Research Group



While Dr. Clearfield's research group is small, he still operates in three research areas. The most active area is functionalization of layered materials through treating the layer surface, intercalation between the layers, and combination with polymers. His latest work was to put a Metal Organic Framework (MOF) on the surface of zirconium phosphate. As a catalyst it was far superior to the results obtained by having the same MOF made in solution.

A second area of research is to capture certain lanthanides from electronic scrap. They have prepared metal phosphonates that favor 3+ atoms to those of lower charge. Since all lanthanides and yttrium are taken preferentially, they also pick up aluminum and separate it from the lanthanides. This program should be considered by engineers.

The third area of research is the synthesis and characterization of discrete molecular compounds which show interesting magnetic properties like magnetic refrigeration. Magnetic refrigeration is based on the magnetocaloric effect (MCE) that in turn relies on the entropy change of a material in a magnetic field. Magnetic refrigerants have been proposed to replace the rare and expensive helium-3 in some ultra-low temperature cooling applications.



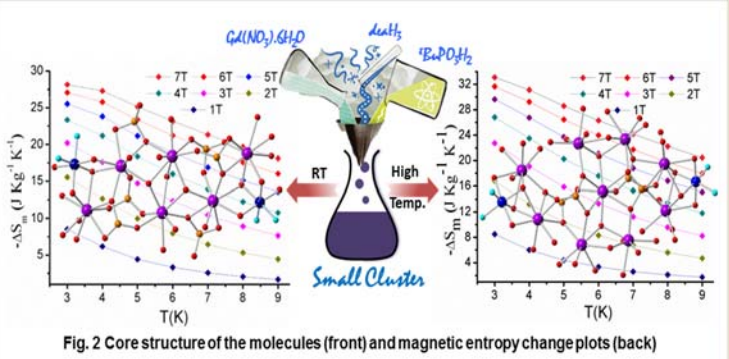


Fig. 2 Core structure of the molecules (front) and magnetic entropy change plots (back)

TEES | PTC
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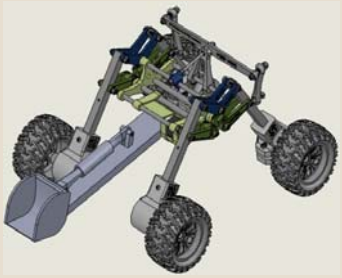
Students Hold the Future of Lunar Exploration in Their Hands

"The Internet of Things (IOT) is a developing area of technical interest," said Greco. "This is also one of the technologies that NASA is interested in pursuing for space exploration in the future. NASA requires an IOT capability of sending and receiving data via the internet integrated into a robot vehicle.

"We are partnering with another capstone design team of mechanical engineering students in Qatar to modify the robot's mechanical aspects and make it moon ready, giving NASA even more of an incentive to pick our project."

The Digital Systems Teaching and Research (DSTR) robot (disaster), will be demonstrated to NASA as a prototype for a proposed future lunar exploration.

"A user of this internet of things (IOT) system will be able to collect sensor data remotely via the internet and send movement command to the DSTR robot from the user interface," Sharpe said. "Our system, the Wireless IOT for SensorTag (W.I.T.S.) Platform will demonstrate the cloud control movements, send terrains similar to lunar landscapes for testing, function as a prototype for future IOT projects and utilize mechanical expansions for the DSTR."



Full story: goo.gl/wXDYhI

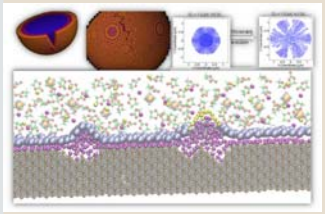
Some Paws For Celebration: World's First Cloned Cat Turns 15 at Texas A&M

Dr. Duane Kraemer, senior professor in the Reproduction Sciences Lab at Texas A&M's College of Veterinary Medicine & Biomedical Sciences, says CC – short for Copy Cat – made the record books in several categories. She became the first cloned cat following 87 attempts 15 years ago, and she also became the first cloned cat to become a mother – she has three offspring that were born 11 years ago, all of them still alive and doing well.

Full story: goo.gl/7yaaS6

Research Team Led by Dr. Perla Balbuena Awarded $1.2 Million DOE Grant to Study and Model Battery Reactions

Dr. Perla Balbuena's team will conduct research that falls under Advanced Battery Materials Modeling. This will be a key area if the DOE is to reach the goals of EV Everywhere. As the industry stands today, the largest limiting factors in the adoption of plug-in electric vehicles (EVs) is the cost and efficiency of the battery. There have been significant advances in lowering the cost and increasing the efficiency of EV batteries, but there is still a gap between the EV Everywhere goals and current technological capabilities.



Full story: goo.gl/aupO45

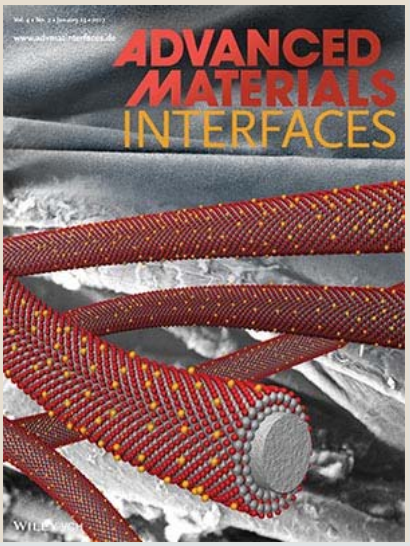
Dr. Jodie Lutkenhaus, CHEN, Receives Van Ness Award

The Van Ness Award is the latest in what is growing to be a large number of awards for Lutkenhaus. In 2011, Lutkenhaus received a Faculty Early Career Development (CAREER) Award sponsored by the National Science Foundation (NSF); in 2013, Lutkenhaus received a U.S. Air Force Office of Scientific Research Young Investigator Award; in 2014, she was awarded a KANEKA Junior Faculty Scholarship, and named an ACS PMSE Young Investigator (The Polymeric Materials Division of the American Chemical Society); in 2015, Lutkenhaus was named a finalist in the energy category of the 2015 World Technology Network Awards, and became one of the first members of a new NSF Research Traineeship program, "Data-Enabled Discovery and Design of Energy Materials (D3EM)."

Full story: goo.gl/Rf373e

Lutkenhaus and Collaborators Featured on Cover of Advanced Materials Interfaces

Lutkenhaus and her collaborators were able to solve the temperature and toxic material problem by developing a new layer-by-layer method, bonding positively charged MOFs and negatively charged polymers in a water suspension. The new coating has been successfully applied to silicon, glass, flexible plastic and cotton, confirming that MOFs can be applied to a wide variety of surfaces. The research team has filed a provisional patent for the new process, and the article is on the journal's "most accessed" list.



Full story: goo.gl/AzsAJS

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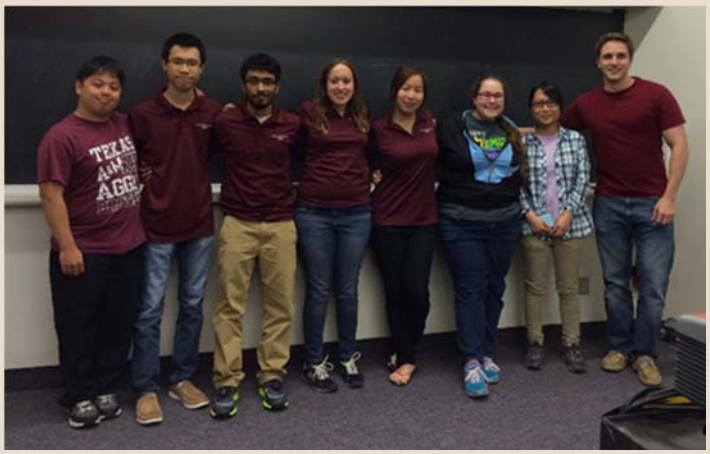
SPE Student Poster and Scholarship Recipient

The 2017 SPE International Polyolefin Conference was held on Feb. 26th—March 1, 2017 at Hilton Houston North in Houston Texas. Joseph Baker, Chemistry graduate student, won first place in the student poster competition and was also recognized for his 2017 Polymer Modifiers and Additives Division (PMAD) Scholarship.

Society of Plastics Engineers Student Chapter at TAMU



SPE officer photo for 2016-2017 (pictured from left): Tim Tsao, Social Media Coordinator; Xun He, VP Engineering; Mohammed Haque, Publicity Coordinator; Mary Layne Harrell, President; Shin Hye Ahn, VP Science; Simcha Felder, Secretary; Yanyan Wang, Activities Coordinator; and Kevin Wacker, Treasurer

Polymer Specialty Certificate Updates

Students that have applied for the Polymer Specialty Certificate	64
Students that have received the Polymer Specialty Certificate	41

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

Have Questions?

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