



# POLYMER TECHNOLOGY CENTER

Spring 2006 Edition



## PTC Newsletter

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## MARK YOUR CALENDAR FOR PTC's NEXT CONFERENCES!

April 20 - SCRATCH

@ Texas A & M University

April 21 - PTIC

@ Texas A & M University

## ADVERTISE IN THE PTC NEWSLETTER!

If you are interested in placing an ad in the PTC quarterly newsletter, please contact Isabel Cantu. Revenue will be used for PTC Student activities.

### Related links:

<http://thelook100.tamu.edu>  
<http://www.tamu.edu/vision2020>

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Website: <http://ptc.tamu.edu>

## New Scratch Member

PTC would like to welcome and introduce our newest Scratch Behavior of Polymers Member:

Ciba Specialty  
Chemical Inc.



## New PTIC Member

PTC would also like to introduce and welcome our newest Polymer Technology Industrial Consortium Member: Total Petrochemicals.



**TOTAL PETROCHEMICALS**

TOTAL PETROCHEMICALS USA, INC.



## New Faculty Member at PTC from the Department of Biological and Agricultural Engineering: Dr. Elena Castell-Perez

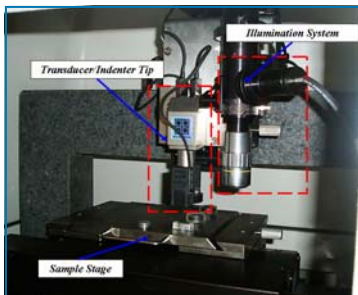
Dr. Elena Castell-Perez is a native of Caracas, Venezuela. She got her undergraduate degree in Food Engineering from the State University of Campinas in Brazil in 1980. She pursued graduate studies at Michigan State University where she obtained a Master of Science and PhD in Agricultural Engineering in 1984 and 1990, respectively. In 1991, she joined the faculty at the Department of Food and Animal Industries at Alabama A&M University as an Assistant Professor of Food Engineering. In 1996, she joined the faculty of the Department of Agricultural Engineering at Texas A&M University, was promoted to Associate Professor in 2000, and became a Full Professor in 2005.

Dr. Castell-Perez's specialties include characterization of food and biological materials, food rheology, smart packaging systems and food safety technologies such as irradiation. She has obtained funding from federal agencies (USDA), the U.S. Army and the food industry. She has over 40 publications in respected professional journals, is the author of several book chapters, a book in deep-fat frying, and is currently working on a book on applications of rheology to the food industry. She has more than 50 abstracts and proceedings and has given at least 30 invited lectures in addition to 70 technical presentations at professional meetings. Dr. Castell-Perez served as Director of the Center for Food Processing Engineering under the Institute of Food Science and Engineering at Texas A&M University from 1998-2004. She has been an active member of the Institute of Food Technologists (IFT) since 1984 with special interest in the Food Engineering and International Divisions. She is also a member of the American Society of Agricultural Engineers (ASAE) and the Society of Rheology.

Dr. Castell-Perez had the opportunity to travel to several African countries under a USAID research program, and truly enjoyed seeing the impact of technology transfer in such countries. Many of her graduate students come from all parts of the world. Dr. Castell-Perez believes that her efforts in developing new cutting-edge research in the area of irradiation technology, bioactive materials, and dosimetry provide an exciting research-intensive learning environment for undergraduates and graduates students around the world.

Dr. Castell-Perez also holds MS and ABD degrees in Spanish Literature from Michigan State University. She has always had a passion for the written word and is an enthusiastic reader. She particularly enjoys reading plays, with Samuel Beckett and Eugene Ionesco being some of her favorite playwrights.

## "Evaluating Mechanical Properties on the Nanoscale"

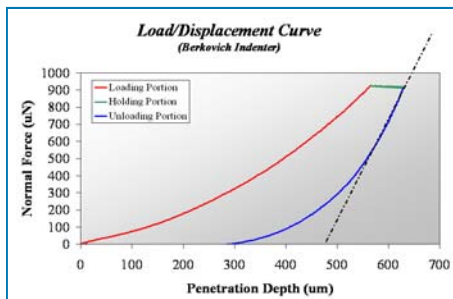
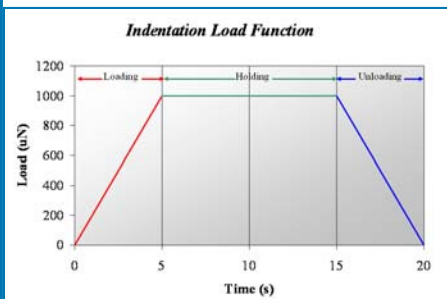


Photograph of the Hysitron TriboIndenter showing the transducer/indentation tip arrangement, the sample stage, and the sample illumination device.

Nanoindentation is a method used in material science to determine hardness. During a test, an indenter of one of many geometries (Berkovich, Rockwell, Cube Corner, Spherical) is pushed into a material under a given normal load. When the maximum load has been reached, the indenter can be immediately withdrawn or held for an amount of time. The hardness is then calculated from the withdraw portion of the load/displacement curve along with other mechanical properties (Stiffness, Reduced Modulus, Contact Area, Penetration Depth). The Materials Characterization Facility (MCF) is equipped with a Hysitron TriboIndenter that operates using TriboScan 6.0 software (Hysitron Inc.). It is equipped with depth and load sensors that allow the indentations to be analyzed without ever having to actually view them. In addition to

indentation, the TriboIndenter can perform nanoscratches that can be used to evaluate such properties as coating adhesion strength. In scan mode, meaningful *post-situ* images of the actual indentations or scratches can be produced in a manner similar to an AFM. These images can provide important information about the material's

resilience, creep behavior and the extent of plastic/elastic deformation. For more information about the nanoindenter or to inquire about the capabilities of the MCF, please contact Orla Wilson at [owilson@tamu.edu](mailto:owilson@tamu.edu).



(The two plots will be shown side by side, the Load Function on the left and the Load/Displacement curve on the right)

Example of data obtained for the nanoindentation of a sample of injection molded polypropylene with a Berkovich tip.



## Small Angle X-ray Scattering Instrument

The materials scientists and engineers of today are able to understand and regulate the properties of materials on a nanoscale level. Exciting new materials such as designer polymers and bioceramics are being made, and continuing

advances with materials such as liquid crystals, inorganic-organic nanostructured materials, and thin film coatings are made possible by investigating and altering their nanostructures. A reliable, economic and non-destructive method for analyzing nanostructured materials is Small-Angle X-ray Scattering (SAXS). SAXS yields information such as particle sizes and size distributions on a nanometer length scale (1-300 nm), shape, and orientation distributions in liquid, powders and bulk samples. Moreover, there is no requirement for crystallinity of the samples.

What is shown in the figure is a Bruker AXS NANOSTAR SAXS instrument. It features a brilliant X-ray source (Cu sealed tube fine-focus X-ray source,  $K\alpha = 1.54$ ) combined with innovative multi-layer optics, which provides an intense, point-like incident beam upon the sample. Also included is the HI-STAR detector, a virtually noise-free, real-time 2-D detector with photon counting ability. The sample chamber and X-ray paths were evacuated during the testing. In fact, the NANOSTAR analyzes pure sample properties, even if the sample particles are asymmetric or show preferred orientation.



POLYMER TECHNOLOGY CENTER

# Polymer Specialty Certificate Program

The proposed Undergraduate Polymer Certificate Program has been approved by the TEES Dean and is waiting on approval from the Board of Region, which we hope to have by September, 2006. The program will begin in Fall 2006, and the PTC is excited to get it underway.

## Benefits

The value of the certificate to the student will be to broaden his or her exposure to a diverse polymer science and engineering curriculum, thereby differentiate the student from their peers.

Industry will value graduates with the Polymer Specialty Certificate because they will have a more diverse background in polymers. Further, the graduates will have a focus that will foster entrepreneurial thinking and expand the employment horizons beyond the traditional industrial jobs.

## Description

The proposed undergraduate Polymer Specialty Certificate Program will consist of (4) three-hour courses for a total of 12 credit hours. Two of the courses will be core curriculum, which will count for 6 credits toward the student's departmental degree. Core courses will include MEEN 458 (Processing & Characterization of Polymers) and CHEM 466 Polymer Chemistry. An additional six hours will be comprised of (2) three-hour science or engineering electives. Completion of 12 semester credit hours of the following courses earn a Polymer Certificate and the specialty is recorded on the student's permanent University record.

### 1. Core Curriculum - 6 semester credit hours

Course Code	Course Title	Instructor	When Offered	Frequency Offered	Credit Hours
MEEN 458	Processing & Characterization of Polymers	Jaime Grunlan	Spring 2006	Annually/Spring	3
CHEM 466	Polymer Chemistry	Stephen A. Miller	Spring 2006	Annually/Spring	3
CHEN 451	Intro to Polymer Engineering	Michael Bevan	Fall 2006	Annually/Fall	3
MEEN 455	Engineering with Plastics	Hung-Jue Sue	Fall 2006	Annually/Fall	3
MEEN 471	Elements of Composite Materials	Terry S. Creasy	Spring 2006	TBA	3
AERO 489	Polymer and Composites	Zoubeida Ounaies	Spring 2007	TBA	3
MEEN 451	Viscoelastic Solids	Anastasia Muliana	Fall 2006	TBA	3
MEEN/CHEN/ AERO/CHEM 485	Individual Research	PTC Faculty	Spring 2006	Every Semester	3
BMEN 482 & 682	Polymeric Biomaterials	Melissa A. Grunlan	Spring 2006	TBA	3
CHEN 642	Colloidal & Interfacial Systems	Michael Bevan	Spring 2006	Even years/ Spring	3

A grade of C or above is required in all of the above courses.



# Seminar Speakers



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**PTC would like to acknowledge our seminar speakers, with our gratitude and appreciation.**



***Professor T. C. Mike Chung***  
***Department of Materials Science and Engineering***  
***The Pennsylvania State University***  
***“Functionalization of Polyolefins and***  
***Applications in the Exfoliated Clay Nanocomposites”***  
***February 3, 2006***



***Dr. Shih-Yaw Lai***  
***The Dow Chemical Company***  
***Freeport Texas***  
***“RECENT ADVANCEMENT IN DOW'S INSITE\* TECHNOLOGY***  
***POLYMERS AND SPEED BASED R&D”***  
***February 21, 2006***



***Professor Volker Altstädt***  
***Department of Polymer Engineering***  
***University of Bayreuth, Germany***  
***“Influence of nanoscale morphology on the micro- and***  
***macro-mechanical behaviour of polymers and polymer nano***  
***composites”***  
***February 24, 2006***



***Dr. Lebzy Gonzalez***  
***Ford Motor Company***  
***“The case for polymer nanocomposites in automotive***  
***applications”***  
***February 27, 2006***



## SPE SOUTH TEXAS SECTION SCHOLARSHIPS

Congratulations to the following Students, who were awarded the SPE South Texas Section Scholarships.

### Graduate Students:

1. Mr. Arnab Chakrabarty GPA: 4.0 Ph.D Major: Chemical Engineering
  - "Carbon nanotube polymer nanocomposites for electromechanical system applications"
2. Mr. Han Jiang GPA 3.7 Ph.D. Major: Mechanical Engineering
  - " Study of scratch behavior on polymer materials"
3. Mr. Lei Liu GPA: 4.0 Ph.D. Major: Material Science & Engineering
  - "Tailoring Nanoparticle Microstructure with Stimuli-Responsive Polymers"
4. Mr. Craig Justin Price GPA: 3.37 Ph.D Major: Chemistry
  - "Activity- $\lambda_{max}$  Correlation in the Activation of *ansa*-Metallocene Olefin Polymerization Catalysts"

### Undergraduate Student:

1. Ms. Dominique Galvan GPA: 3.67 Senior Major: Chemistry
2. Mr. Brentley J. Smith GPA: 3.97 Senior Major: Chemistry

### SPE Additives and Modifiers Division:

1. Mr. Bobby Browning, Graduate Student

## SPE INTERNATIONAL POLYOLEFIN CONFERENCE STUDENT POSTER CONTEST

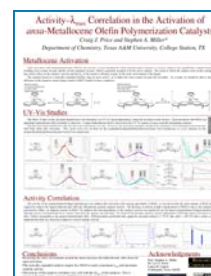
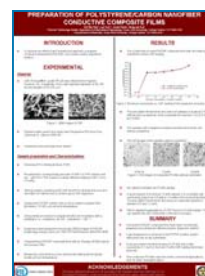
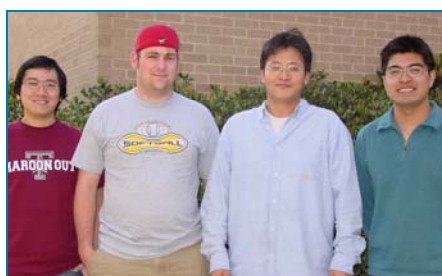
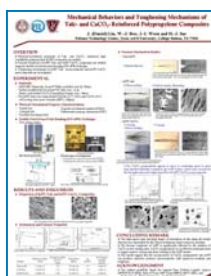
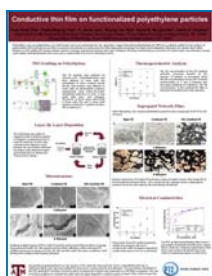


On February 28th at the SPE International Polyolefin Conference, a Student poster contest was held. These poster contest lends an excellent opportunity for the students research to be displayed to the Polymer Industry. Dr. William H. Talbott with SPE announced and presented the winners of the poster contest, Mr. W.J. Boo being present from Texas A&M University and co-author of the 1st and 2nd place poster winners, accepted the certificates. The winners are as follows:

- 1st place winner Mr. Yeon Seok Kim from Texas A & M University with poster titled **"Conductive thin film on functionalized polyethylene particles"**
- 2nd place winner Mr. Jia (Daniel) Liu from Texas A & M University with poster titled **"Mechanical Behaviors and Toughening Mechanisms of Tale- and CaCO<sub>3</sub>- Reinforced Polypropylene composites"**
- 3rd place winner Mr. Chi-Wei Tien from Texas A & M University with poster titled **"Preparation of Polystyrene/carbon nanofiber conductive films"**
- Honorable Mentioned Mr. Craig Price also from Texas A & M University with poster titled **"Activity- $\lambda_{max}$  Correlation in the Activation of *ansa*-Metallocene Olefin Polymerization Catalysts"**



### Congratulations to these students





# PTC faculty

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**Mr. Hidehito Ikeda**

## PTC Scholar from Japan

I work for a company in Japan, TOKAI RUBBER INDUSTRIES, LTD. (<http://www.tokai.co.jp/english/index.html>). Tokai Rubber Industries and Polymer Technology Center have collaborated very closely, and by instruction of Professor Hung-Jue Sue of Mechanical Engineering Department, it was decided that I spend 15 months with Polymer Technology Center as a visiting scholar to carry out joint research. Tokai Rubber, established in 1929, is involved in research, development, manufacturing and sales of various products including conveyor belts, industrial and automotive hoses, all types of anti-vibration parts, polyurethane, and various other plastics. Tokai Rubber's headquarters is located at Komaki-city, Aichi, Japan and operates four domestic plants and seven branch offices throughout Japan, as well as 15 overseas subsidiaries in Thailand, China, Korea, Poland, Belgium, and the United States. Our company employs nearly 9000 (consolidated), and its last yearly period had annual sales (consolidated) in excess of \$2 billion. 80% of that revenue was associated with automotive parts. Our Company is continuously expanding in order to supply our products to many automotive makers.

My specialty is rubber material development of hoses for automobiles, and I have so far studied many materials such as FKM, NBR, ECO, CR, IIR and EPDM in the Japan head office during the last 12 years. I am very interested in nanotechnology and polymer morphology characterization technology. I strongly think that my valuable experiences at Texas A&M University will be useful for the development of materials for automotive hoses with greatly improved performance. I look forward to getting to know the members of PTC and enjoying life in College Station. However my first goal is to adapt to life in Texas.



**PTC group welcoming Mr. Hidehito Ikeda, a visiting scholar from Tokai Rubber Industries in Japan, at a dinner on January 11, 2006.**



## SPE SOUTH TEXAS SECTION ANNOUNCEMENTS

For anyone interested in the plastics industry, the Texas A&M student chapter of the Society of Plastics Engineers is an excellent way to gain exposure to both specific engineering and chemical topics in the plastics industries as well as the overall trends in the plastics field at large. One way this is accomplished is through our monthly seminar series. Each seminar features a speaker who is an expert in their own particular area of the plastics industry. Not only do they share with us their specific research activities and technological innovations, they also give examples of product scale-up, intellectual property issues, world market trends and health and safety compliance issues. They are also very open to questions from the audience before, during and after the presentation. Attending these seminars is a great way to keep in touch with world of science, and engineering outside of academia. A world many of us will be joining soon.

Our activities also include participating in major plastics industry related conferences held around the country. This year we will be attending the International Polyolefins Conference 2006 held in Houston Texas February 26<sup>th</sup> through March 1<sup>st</sup>. Then follows Antec 2006, May 7<sup>th</sup> to the 11<sup>th</sup>, in Charlotte North Carolina. At these conferences, we participate as ushers, poster and paper presenters. They are also excellent opportunities to attend a large number of technical talks and presentations as well as a great way to make contacts both in academia and industry. More information can be found on our website at [stuact.tamu.edu/stuorgs/spe](http://stuact.tamu.edu/stuorgs/spe).

Getting involved in our student chapter is easy. Membership in the chapter is free. Just give us an email address and we will put you on our mailing list. Then you will get notices of our upcoming activities. Then attend our seminars, learn more about the plastics industry, eat free pizza, and have fun.

Feel free to email me with any questions or concerns you may have about SPE at [efrantz@mail.chem.tamu.edu](mailto:efrantz@mail.chem.tamu.edu).

Eric Frantz, President  
SPE Student Chapter