POLYMER TECHNOLOGY CENTER

Summer 2004 Edition

MARK YOUR CALENDAR!

September 2004

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12	13	14	15	16	17	18
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September 30 - SCRATCH Fall Conference

October 2004

S	M	T	W	T	F	S
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31						

October 1 - PTIC Fall Conference
October 2 - PTC Football Outing
TAMU vs Kansas State
(**reserve tickets soon** - Contact Kelly Strickland)

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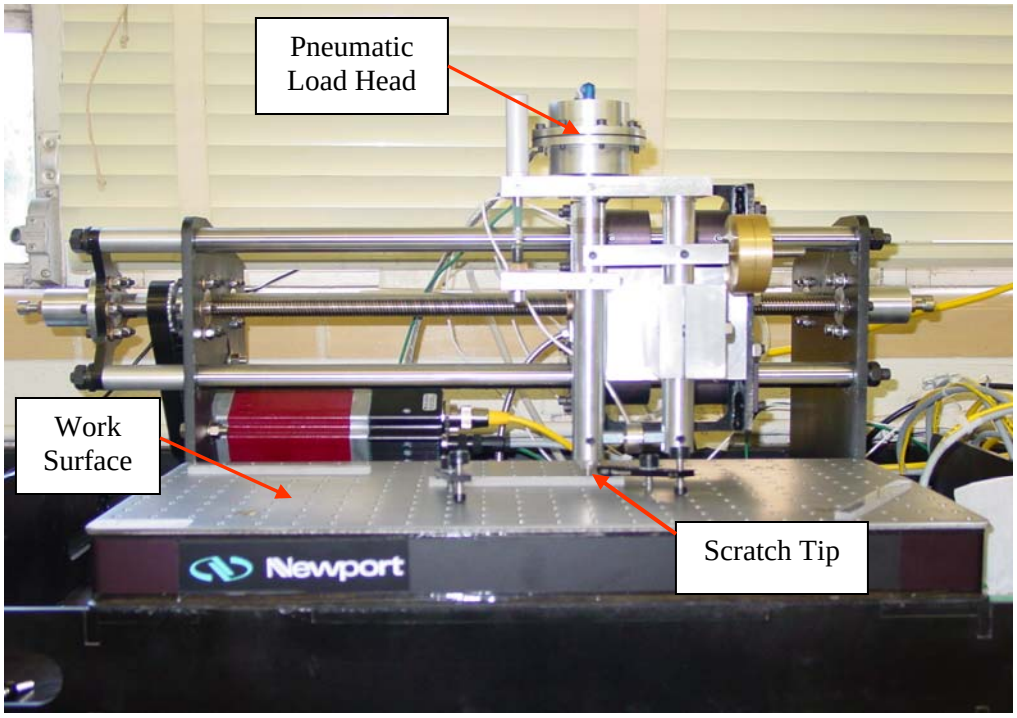
SCRATCHER UPDATE

After great anticipation, the third generation of the PTC Scratch Machine has been completed. The new machine comes with several new features while improving many of the same functionalities as the previous designs. The important features of the PTC Scratch Machine III include:

- Pneumatic Normal Load Control (0.05 – 200 *N*)
- Single scratch head assembly to execute various test modes:
  - Constant or Increasing Load (0.05 – 200 *N*)
  - Constant or Increasing Velocity (0 – 400 *mm/s*)
- Maximum Sample Thickness of 125 *mm*
- Maximum Scratch Length of 400 *mm*
- Digital load sensors to capture normal and tangential load data
- Displacement sensors for scratch distance and scratch depth
- Larger work surface for better workability

The PTC Scratch Machine III can be operated easily by a single user, and a scratch test using any of the testing modes requires only two minutes, approximately. A fully documented manual for calibrating, operating and maintaining the machine has been prepared together with a set of in-house programs to analyze scratch data.

The PTC Scratch Machine III



The load and displacement sensors are new add-on features of the machine and can be excluded if one chooses to perform scratch tests with no need for data acquisition.

For more information on the new machine contact the PTC or come to the SCRATCH Consortium Fall Conference on September 30th.

Contributed by Bobby Browning

PTC WELCOMES OUR NEWEST SCRATCH CONSORTIUM MEMBER

Casper Chiang has been an active and valued supporter of the PTC. We are pleased to welcome him and The Clorox Company to the Scratch Consortium.

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OUR FUTURE POLYMER LEADERS

Congratulations to the 2004 SPE Scholarship Recipients!

Megan Singer, a senior majoring in Chemical Engineering, aspires to work in research and development creating new applications for polymers in the medical field. She currently works as a laboratory assistant performing analyses and experiments associated with marine chemistry.

Brentley James Smith, a senior majoring in Chemistry and Philosophy, is planning future graduate studies in the area of polymers chemistry and engineering. He is currently taking part in a research program under Dr. Abraham Clearfield and Dr. Hung-Jue Sue. This research includes studying the dispersion of chemical composites in polymers. He has also worked under Dr. David Ford on chemically treated polymer membranes.

Congratulations to the 2004 Henry Kahn Memorial Scholarship Recipient -

Yeon Seok Kim is a graduate student in Mechanical Engineering performing research under Dr. Terry Creasy. He completed his master's at Purdue University with emphasis on CAD and manufacturing. During his studies, he focused on time, cost reduction and quality improvement for product design and production. He realized that the raw material, especially polymer, has the best potential to achieve these goals. He chose to pursue his Ph.D. at TAMU because of the accomplished material division in the mechanical engineering department.

THE BEST PAPER AWARD GOES TO...

PTC Ph.D. Student - Goy Teck Lim!

ANTEC May 16-20, 2004 Chicago, IL Plastics Innovation in the Windy City

The participation of PTC in the 2004t Annual Technical Conference held in Chicago has earned the Center another distinctive accolade.

The paper "*Assessment of Plastic Failure of Polymers Due to Surface Scratches*", by G.T. Lim, H.-J. Sue and J.N. Reddy, is chosen to receive the ANTEC 2004 Best Paper Award from the Failure Analysis Special Interest Group. The award is acceded based on the merits of the paper technical content and presentation excellence. The winning paper was selected out of 9 finalist entries from a total of 33 peer-reviewed and accepted conference manuscripts.

GRADUATE STUDENT RESEARCH on ZnO

Preparation and Characterization of Ultraviolet Light Emitting ZnO Nanoparticles

A new, versatile and simple approach is utilized to obtain highly concentrated ZnO nanoparticles with narrow size distribution in the size range from 2 to 5 nm. Various hydroxide and alcohol mixtures, such as KOH, NaOH, LiOH, methanol, ethanol and isopropanol, can also be utilized to form ZnO nanoparticles successfully by this method. The particle growth is found to be pH, reaction time and temperature dependent. Furthermore, the dry powders of ZnO nanoparticles prepared show a strong blue-shifted near-band-edge ultraviolet emission, and the size and size distribution of the particles did not change much during solvent evaporation. Raman spectra show ZnO $E_2^{(2)}$ (TO) phonon mode and other vibration modes are attributed to the acetate group. The CO stretching mode in the Raman spectra is red-shifted to 1401 cm^{-1}, indicating a strong adsorption of the ligand onto ZnO surfaces. The adsorption removes oxygen vacancies from the surface and eliminates the impurity-induced green luminescence from the nanoparticles.

A patent based on this research was filed in May.

SCRATCH & PTIC SEMI-ANNUAL FALL CONFERENCE!

September 30 & October 1

The Fall Conferences for Scratch and PTIC are approaching quickly! Don't miss these most informative meetings and networking opportunities. You will learn about the exciting advances in polymer research that are taking place at Texas A&M University, and meet PTC Faculty, Students and fellow PTC Members.

The **Scratch Consortium Conference** will be held Thursday, September 30th at the Holiday Inn College Station. The meeting will be from 8:30am until approximately 2:00pm. Lunch will be provided. There will be a shuttle to take attendees to campus for a lab tour from 2:00pm until 3:30pm.

The **PTIC Consortium Conference** will be held Friday, October 1st at Texas A&M University in the Engineering Physic Building. The meeting will be from 9:00am until approximately 2:00pm. Lunch will be provided. Lab tours will be offered from 2:00pm until 3:30pm.

Saturday, October 2 will be a **PTC Football Outing** and pre-game Presidential Buffet. The official game start time has not been posted. The starting time may change if it is televised. We will advise as soon as the official time is posted. A "guesstimate" of event times is 10:30am for the Buffet with a football game kickoff time of 1:00pm. See Texas A&M beat Kansas State!

Hotel Guest Rooms: If you are planning on staying in College Station, you need to make a hotel reservation as soon as possible. Guest rooms are on an individual pay bases. We have A block of rooms that will be held until **August 15th** . You may make your reservations directly, or forward the pertinent information to me (including credit card information).

HOLIDAY INN 1503 S. Texas Ave., College Station, TX 77840
Tel: 1-979-693-1736

Guest Room Rate:September 29 & 30 - $65.00 plus tax – Reservation Group Code: PTC
October 1 - $115 plus tax – Reservation Group Code: PT1

Football Game: Please advise me as soon as possible if you are planning on attending the Presidential Buffet and Football game on Saturday, October 2.

Airport Information:

(a) Easterwood Field Airport (CLL) in College Station is 3 miles from TAMU.
This airport is serviced by Continental (IAH) and American Airlines (DFW)
(b) George Bush Houston Intercontinental Airport (IAH) in Houston is 102 miles from TAMU. Information on shuttle service can be found at: www.GroundShuttle.com
(c) William P. Hobby Airport (HOU) in Houston is 108 miles from TAMU.
(d) Austin-Bergstrom Intl Airport (AUS) in Austin is 100 miles from TAMU.

More Information Is Forthcoming!

PTC *EXTREME MAKE-OVER*

The PTC is getting a marketing make-over! To reflect all the new developments and direction of the PTC – including new leadership, faculty, university support, research focus, members, and more – we are getting a new look. With the assistance of Rob Robideau, John Daugherity and staff of the Texas Engineering Experiment Station (TEES) Communications Division, we have a new logo and the website is currently under construction and will be revealed in September. Because of our newest PTC advocate, Dr. Theresa Maldonado - the Associate Dean of Dwight Look College of Engineering and the Associate Director of TEES, there will be more exciting changes and improvements in the future. Keep an eye on the PTC!

PTC POLYMER TECHNOLOGY CENTER

Pictures from the Spring PTIC Conference

THE PTC FACULTY WELCOMES JAIME GRUNLAN:

Football Player -to- Polymer Coach!

Although Jaime always wanted to study chemistry, it was not until he arrived at North Dakota State University that he discovered polymer science. Having come to NDSU on a football scholarship, he had the opportunity to take courses and do undergraduate research in the Polymers & Coatings Department. His undergraduate research focused on powder coatings and polymer emulsions. Upon graduating from NDSU in May of 1997, he began his graduate studies in behavior of polymer nanocomposites at University of Minnesota, where there is a strong interdisciplinary polymer group. He was particularly interested in creating composites with very low percolation thresholds. The percolation threshold is the minimum concentration of filler required to achieve a given transport property (e.g., electrical conductivity). Using polymer emulsions, he was able to create electrically conductive carbon black-filled polymers with less than 1wt% filler. He also studied the use of nano-sized metal oxides (e.g., ATO) to create optically transparent systems. These materials are useful for electromagnetic interference shielding, chemical sensors, resettable fuses and a variety of other organic electronic applications.

Since leaving Minnesota in June of 2001, he has been synthesizing/studying various types of polymers and polymer matrix composites for a variety of medical and electronics-related applications at the Avery Research Center in Pasadena, CA. His position as a Senior Research Engineer exposed him to a variety of new chemistries and film formation processes (e.g., electrostatic self-assembly of polymer multilayers, intrinsically conductive polymer synthesis, solution processing of ceramic-organic hybrids, carbon nanotube – filled polymers, etc.). A significant portion of 2002 was spent working on a NIST Advanced Technology Program (ATP) aimed at developing gas and moisture barriers, for electronics packaging, using combinatorial methodology. Furthermore, he had the opportunity to teach Biola University's first ever Introduction to Materials Science course as an adjunct faculty. More recently he was the group leader for Avery Dennison's initiative in electrostatically self-assembled thin films and just finished teaching Introduction to Materials Science at Azusa Pacific University. Electrostatic or layer-by-layer assembly of polyelectrolytes creates thin films (< 1mm) that often have very unique properties relative to bulk polymer or composite materials. He's very interested in the use of these films for electrochromic, drug delivery, and flame retardant applications.

His background in the development of novel polymeric materials with unique transport, biological, and/or opto-electronic behavior will complement and enhance the PTC. Having worked on interdisciplinary projects focused on electronics packaging, organic electronics, self-assembled films, and biologically active materials, Jaime is able to immediately assist current projects and begin new initiatives at the same time. He has a strong aptitude for recruiting/developing productive students (most of his publications contain student co-authors that he has mentored) and has had a continual stream of refereed publications and patents in a variety of key areas. Furthermore, he invites collaborations from the PTC industrial members.

"This is an exciting opportunity for me and I'm looking forward to contributing to the future success of the PTC."

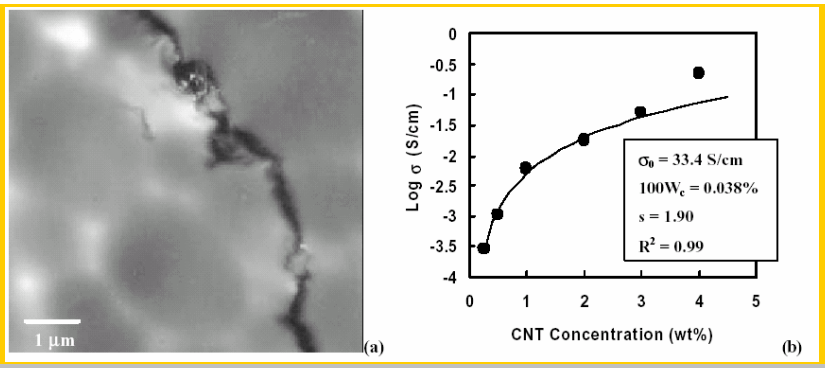

Figure 1. TEM image of a poly(vinyl acetate) emulsion film containing 3wt% nanotubes (a) and the effect of increasing nanotube concentration on the electrical conductivity of this system (from Ref. 12). Oval-shaped polymer particles can still be discerned in (a), although coalescence has obscured their boundaries. The solid curve in (b) is the fit of the percolation power law [$\sigma = \sigma 0(W - Wc)s$]; where $\sigma 0$ is a scaling factor, W is weight fraction of conductive filler, Wc is the percolation threshold expressed as a weight fraction, and s is the power law exponent. The films used to generate the data in (b) were approximately 150µm thick.