Steve Sauerbrunn, Technical Manager with METTLER TOLEDO

CCM Acquires Mettler Toledo Flash DSC

Late in 2010, Mettler Toledo introduced a new instrument that significantly expands the boundaries of thermal analysis—the flash differential scanning calorimeter (flash DSC).

University of Delaware
Center for Composite Materials

COMPOSITES UPDATE
NOVEMBER 2011

Thanks to a cooperative agreement with the company, the Center for Composite Materials at the University of Delaware is among just six academic institutions to have one of the revolutionary new devices.

According to Dr. Steve Sauerbrunn, Technical Manager with MT, the flash DSC has extremely high cooling (-4,000ºC/sec) and heating (40,000ºC/sec) rates and offers a wide temperature range, from -95ºC to 450ºC, in one measurement.

"These features enable us to uncover information that was previously hidden about materials and gain new insights into crystallization and reorganization processes," says Sauerbrunn, who is in residence full-time at CCM to provide training and professional consultation on an entire suite of thermal analysis equipment.

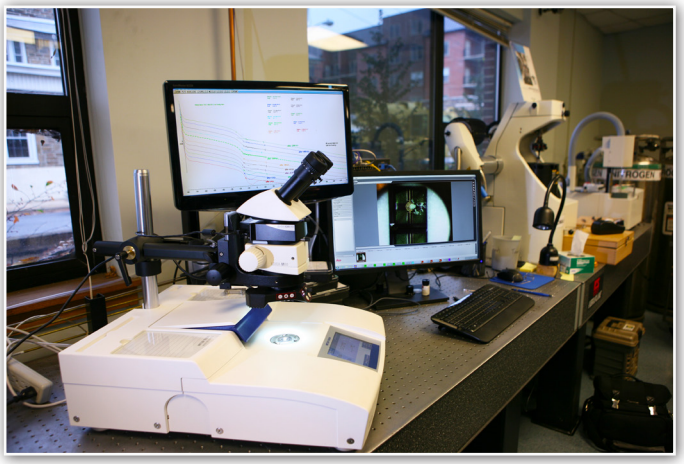
The equipment is enabling researchers to answer questions about the behavior of materials during rapid cooling in modern high-speed production processes.

TOP STORY
(Continued)

"We can now gain insight into how thermal history shapes a polymer material's crystalline microstructure, which ultimately determines the mechanical properties," says CCM scientist Joe Dietzel.

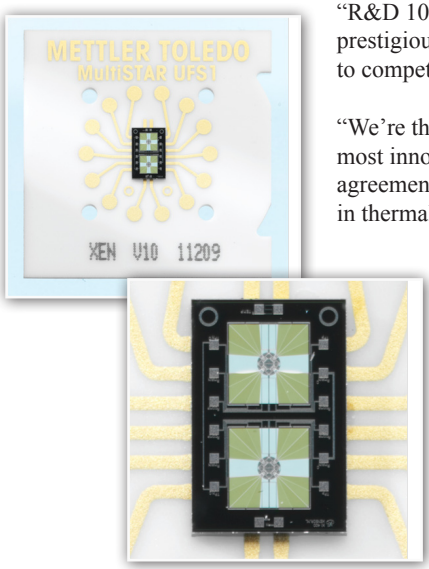
He explains that traditional DSC experiments are unable to isolate metastable phases that form in a polymer under non-equilibrium conditions because polymer molecules reorganize into a more stable state much more rapidly than the material can be heated in a traditional DSC experiment.

"The flash DSC is capable of heating rates on the order of thousands of degrees per second for properly prepared samples," Dietzel says. "With this instrumentation, it's possible to heat a sample up faster than molecules can melt and recrystallize, isolating transitions of metastable phases that have formed due to a specific processing history."



This equipment is located in CCM's Chemical Characterization Lab

DSC sensors



In June, Mettler Toledo received the coveted "R&D 100 Award" for the flash DSC. These prestigious awards help companies provide the important initial push new products need to compete successfully in the marketplace.

"We're thrilled to have an in-house capability that has been recognized as one of the most innovative ideas of the year," says CCM director Jack Gillespie. "Our cooperative agreement with Mettler is providing us with access to the most cutting-edge technology in thermal analysis for advanced materials."

Sauerbrunn is confident that the technology will offer researchers a new window into what is actually happening.

"As we use this equipment, I think we're going to find that a lot of what we've considered fact over the past 25 years in thermal analysis is not truth at all," he says.

For more information about the Mettler Toledo flash DSC facility at CCM, contact Steve Sauerbrunn at sauerbru@udel.edu or 302-545-5895.

Article by Diane Kukich

OTHER NEWS

[home] Professional Education News

UD's Center for Composite Materials: making partnerships work

UD's Center for Composite Materials (CCM) has been designated a national Center of Excellence since 1985

When Jack Gillespie first heard University of Delaware President Patrick Harker talk about knowledge-based partnerships as an essential part of the Path to Prominence, he felt right at home.

Gillespie is director of UD's Center for Composite Materials (CCM), where researchers have been partnering with industry for more than three decades. In this position, he has had a front row seat to the benefits that are reaped when universities leverage their knowledge-based assets in partnership with industry, government and other academic institutions through innovation and entrepreneurship.

CCM was founded at UD in 1974, and just four years later the center's consortium, "Application of Composite Materials to Industrial Products," was established. Gillespie notes that this was an innovative approach at a time when most universities were conducting only government-funded research.

"Interest in composites was heating up at the time," Gillespie says, "but companies were frustrated with academic researchers' lack of understanding about what was important in the 'real' world."

The Center's current leadership. which includes associate director Suresh Advani and three assistant directors has ensured the sustainability of this pioneering idea by continuously identifying new markets and mechanisms for collaboration. In the 33 years since the consortium was started, more than 200 companies have provided over $20 million in gift support to the Center.

"We have used these funds to establish state-of-the-art facilities as well as to support the work of our talented faculty, staff and students," says Gillespie, who is also Donald C. Phillips Professor. "However, industry has always been far more to us than just a source of funding to augment government grants."

Click here to read the entire article in the **Fall 2011 Professional Education News.**

Other News

UDaily Story

Recycled cooking oil powers UD bus fleet

8:42 a.m., Oct. 25, 2011--Transportation at the University of Delaware became more environmentally friendly recently, when the campus bus fleet began using biodiesel produced by undergraduate engineering students to, in part, fuel its travel.

The project is a collaborative effort between transportation and engineering, inspired by the donation of a biodiesel processor last spring by UD chemical engineering alumnus James Seferis, who received a doctorate in 1977.

Photo by courtesy of UDaily

UD alumnus James Seferis

UD chemical engineering alumnus James Seferis, who received his doctorate in chemical engineering in 1977 at CCM, recently donated a biodiesel processor to the University of Delaware. The equipment is enabling undergraduate engineering students to produce biodiesel to partially fuel the campus bus fleet. Seferis is founder, chairman and CEO of GloCal Network Corporation. He was previously a professor at the University of Washington. Seferis received an Outstanding Alumni Award from UD in 1999.

Biodiesel is a clean burning alternative fuel, produced from renewable resources such as vegetable oil or soy oil. Biodegradable and less toxic than table salt, it has lower emissions compared to petroleum diesel and it can be used in compression-ignition (diesel) engines with little or no modification.

The homegrown biodiesel is made by recycling used cooking oil. Housed in Colburn Laboratory, the donated biodiesel processor is capable of recycling 130-150 gallons of cooking oil per batch to produce 100 gallons of biodiesel fuel, as well as glycerin, a syrupy byproduct with many uses in agriculture, pharmaceuticals and beauty products.

Undergraduates in the Department of Chemical Engineering provide the sweat equity to render the oil into fuel through a method called transesterification, the process of separating the glycerin from the fat or vegetable oil. The project is part of the senior design experience led by Antony Beris, Arthur Metzner Professor of Chemical Engineering

Click here to read the full story in UDaily.

OTHER NEWS

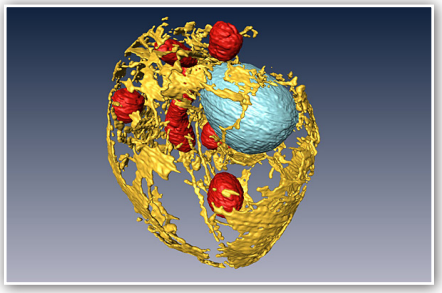


Image courtesy of UDaily

Udaily Story

Sophisticated microscope elevates UD research capability

5:33 p.m., Oct. 27, 2011--University of Delaware Prof. John Xiao is researching ways to make tiny electronics devices – such as those found in computer hard disks and memories, environmental sensors; even iPods – perform faster and consume less energy.

His work involves using spin electronics, or "spintronics," an emerging science that focuses on harnessing the "spin," or magnetic properties of electrons, to encode and process data. This high-tech work requires fabricating devices and looking at the atomic structure of materials at the nanoscale in order to determine how they are organized, and then investigating how materials can be improved or enhanced to impact performance (speed) and energy use (consumption).

Xiao, a professor of physics and astronomy in the College of Arts and Sciences, is one of several UD researchers who are excited about the arrival of a new, sophisticated microscope to campus Thursday, Oct. 27.

The instrument, called the Zeiss AURIGA CrossBeam microscope, is a dual beam focused ion beam and scanning electron microscope (FIB-SEM) capable of both nanoscale deposition and machining. It will provide high-resolution imaging and a wide variety of analytical capabilities, enabling research for both soft and hard materials including polymers, biomaterials, ceramics, metals, semiconductors, composites and more.

"Much of my research uses transmission electron microscopy (TEM), where we take pictures of atoms within a multilayer structure to view how atoms in each layer are arranged in order to understand the structural-property relationship of the materials," explained Xiao.

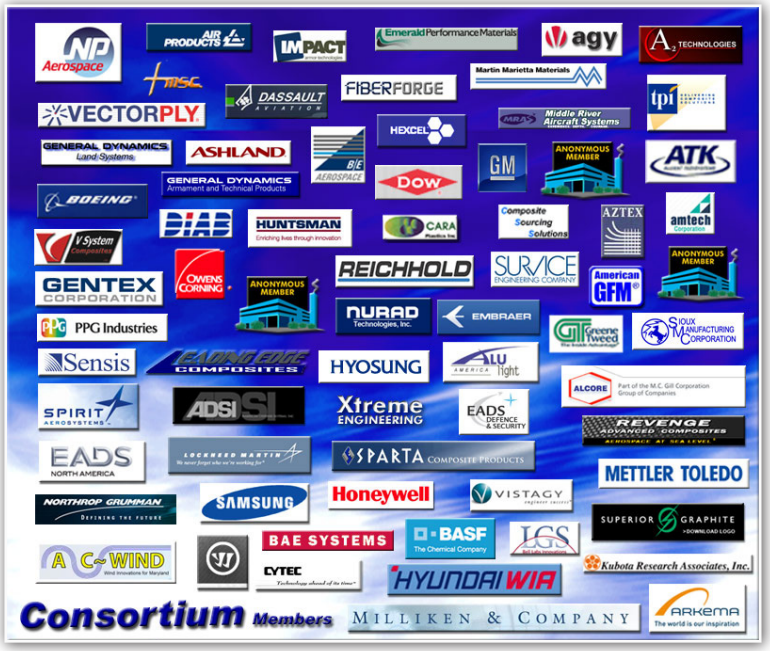
"In order to use TEM to see our specimen, the materials we put under the microscope must be very thin, on the order of a nanometer or one billionth of a meter. The Zeiss microscope allows for ion beam etching, which is a faster way to expose the vertical wall, or cross section, and view the structure's multiple layers."

Click here to read the full story in UDaily.

CONSORTIUM NEWS

We wish to thank **Milliken and Company**, Spartanburg, SC, for the recent renewal of their membership, as well as our many other members for continuing to participate in CCM's research and development activities.

To learn more about the benefits of becoming a member, please visit us on the web at **www.ccm.udel.edu/Consortium/benefits.html**



Celebrating 35+ years of significant contributions to composites science and technology, the education of students, and the creation and transfer of technology to industry.

This is a newsletter publication of the University of Delaware Center for Composite Materials
Please visit us on the web at **http://www.ccm.udel.edu**

201 Composites Manufacturing Science Laboratory • phone 302.831.8149
University of Delaware, Newark, Delaware 19716-3144 • fax 302.831.8525