

BALTIMORE, MARYLAND, US
21-24 MAY 2012

Baltimore Convention Center | 1 W. Pratt Street | Baltimore, Maryland 21201

The Leading Advanced Materials and Processes (M&P) Event in the World



University of Delaware
Center for Composite Materials

COMPOSITES
UPDATE
MARCH 2012

**CCM AT SAMPE 2012: CENTER AFFILIATES TO
SHARE RESEARCH WITH MATERIALS COMMUNITY**

CCM will have a major presence at the upcoming **SAMPE 2012 Conference and Exhibition** in Baltimore: more than 40 affiliated faculty, student, and staff researchers are chairing 14 sessions and presenting 34 papers.

In addition, Prof. Erik Thostenson is providing a tutorial on nanotechnology, and Center Director Jack Gillespie is serving on an academic panel: New Breakthroughs, Future Materials, Preparing Students to Take the Lead - A Global Perspective.

The Conference (May 21-24) and Exhibition (May 22-24) will take place at the Baltimore Convention Center.

"We will also have a booth at the event, and we encourage people to stop by," says Dirk Heider, assistant director of technology at CCM.



TOP STORY

(Continued)

Center affiliated researchers are chairing sessions on a broad range of topics, from processing, automated assembly, process modeling, and design and analysis to green materials, nanomaterials, armor, multifunctional materials, and cost modeling.

Presentations will address CCM's work in various processes—including automated tape placement, liquid composite molding, and ultrasonic consolidation—and materials, for example, carbon nanotubes, natural-material sandwich structures, and 3D braided composites.

In many cases, the presentations are being delivered in partnership with CCM's industrial and government collaborators, including a number of Center alumni.

Thostenson's tutorial will define nanotechnology and its capabilities as an enabling technology for multifunctional materials.

The academic panel, moderated by Ronald Gibson, Distinguished Research Professor at the University of Nevada-Reno, will address some of the strategies universities are adopting to provide the knowledge and skills that will be needed in the future to continue advanced materials R&D.

In addition to involvement through presentations, panels, and the tutorial, Center-affiliated students will participate in the SAMPE Wing and Bridge Competition.

"Our student SAMPE chapter has been very active in this competition for the past four years," says graduate student Ray McCauley. "The contest has also spurred undergraduate involvement at the Center, so there has been an influx of undergraduate students getting experience in composites and advanced materials. This has been key to getting more hands in the competition as well as inspiring students to do research and pursue graduate school."

"This year we have nearly 20 students, grad and undergrad, taking part in the competition," he adds. "With spring break coming to a close, there is going to be a little more action in the manufacturing lab from us. It should be an exciting semester."

Center Director Jack Gillespie urges representatives of industry and academia in the region to come out to SAMPE to learn more about the wealth of exciting developments going on in advanced composites.

"SAMPE is a great forum for information dissemination, technology transfer, education, and networking in the materials field," he says, "and we're pleased to have such an extensive presence on the program."

[Click here for a full list of Center-affiliated participants.](#)



Click **[here](#)** to download the SAMPE Conference and Exhibition Brochure

CCM STUDENT WINS FIRST-PLACE SAMPE AWARD

By Diane Kukich

James Sargianis, a master's student in mechanical engineering affiliated with CCM, took home a first-place award for his presentation at the SAMPE Baltimore-Washington Research Symposium on Feb. 8, 2012. In addition to a \$500 cash award, Sargianis qualifies as a finalist for the student competition at the 2012 SAMPE National Conference in Baltimore, Md., in May. His expenses to the conference will also be covered by SAMPE.

Advised by Prof. Jonghwan Suhr, Sargianis is conducting research on natural material based sandwich composites with enhanced vibrational and acoustic performance.

“Composite sandwich structures offer superior mechanical properties at a low weight and are therefore quite popular in applications such as aircraft cabins and wind turbine blades,” Sargianis says. “However, these same properties translate into efficient noise radiation and thus poor acoustic performance. One idea for improving acoustic properties was to use sandwich composites based on natural materials.”

“The advantage to using natural materials, as opposed to synthetic materials such as carbon or glass fibers,” he adds, “is that we can essentially ‘grow’ our own materials. By growing our own materials, the carbon emissions resulting from synthetic material production would be reduced, along with other environmentally friendly benefits such as being recyclable and biodegradable.”

The researchers have observed that with the use of these natural materials—which contain constituents such as cotton or bamboo fiber-based face sheets, or balsa and pine wood cores—acoustic performance can be substantially increased with only slight sacrifices in mechanical performance and weight.

In addition, they have found that coupling a natural fiber based face sheet with a synthetic foam core provides a 233 percent improvement in acoustic performance, with minimal sacrifices in mechanical performance.

“James is continuing a long tradition of our students taking top prizes at SAMPE competitions,” says CCM Director Jack Gillespie, who serves as faculty advisor to the UD student SAMPE chapter. “We have been fortunate to attract top students to the Center, and in turn the environment here helps them reach their potential as researchers and leaders.”



Photo by Evan Krape

According to a 2012 report by the National Science Board, Delaware scientists and engineers top the nation in the publication of research in scholarly journals, a key measure of productivity.

UDaily

DELAWARE ACADEMIC SCIENTISTS AND ENGINEERS RANK FIRST IN PUBLICATION OF RESEARCH

11:40 a.m., Feb. 20, 2012--Among university scientists and engineers, Delaware academic researchers are the most productive in the nation, far out-publishing their peers, according to a report prepared by the National Science Foundation and issued by the National Science Board.

According to *Science and Engineering Indicators 2012*, Delaware academics top the nation in the publication of research

articles in scholarly journals — an important measure of productivity and contributions to scientific knowledge.

Based on 2008 data, Delaware academics published 812 articles per 1,000 doctorate holders in science and engineering fields compared to the national average of 580 articles. Massachusetts was the second-highest producer at 785 articles.

[Click here to read the entire article in UDaily.](#)

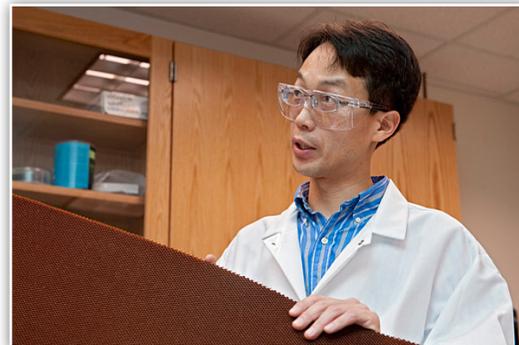
UD RESEARCHERS FIRST TO ATTEMPT 3D CARBON NANOTUBE ARCHITECTURES

10:35 a.m., Feb. 23, 2012--A team of three University of Delaware mechanical engineering professors, plus researchers from three other academic institutions, are collaborating to develop three-dimensional (3D) carbon nanotube structures.

Both light and strong, carbon nanotubes (CNTs) are considered a revolutionary material with many useful applications due to their unique shape and excellent mechanical, electrical and thermal properties. Over the past 20 years, researchers have explored their use in advanced electronics, optics and structural materials such as composites.

While many scientists have studied carbon nanomaterials in one- and two-dimensional forms for CNTs and graphene, respectively, this is the first attempt to create and use 3D carbon nanotube solid networks.

[Click here to read the entire article in UDaily.](#)

Photo by Evan Krape

Jonghwan Suhr at work in his laboratory.

UDaily

UD'S DARRIN POCHAN NAMED FELLOW OF THE AMERICAN PHYSICAL SOCIETY

2:43 p.m., Feb. 29, 2012--Darrin Pochan, professor of materials science and engineering at the University of Delaware, has been named a fellow of the American Physical Society (APS).

The fellowship recognizes individuals who help advance physics through original and independent research. Membership as an APS Fellow distinguishes Pochan among the top one-half percent of all APS members.

"Darrin is an excellent scholar and educator and his scientific impact has been extensive and highly admired," remarked David C. Martin, Karl W. and Renate Böer Professor and chair of the Department of Materials Science and Engineering (MSEG), who nominated Pochan.

Pochan's expertise is in developing new nanostructures and functional materials through the assembly of soft materials like polymers and proteins.

These new materials, Pochan said, can be designed to have biomedical applications in drug therapy or tissue regeneration. For example, assembled hydrogel biomaterials can serve as drug therapy delivery agents or matrices for the regeneration of diseased tissue in the body.

"The potential of hydrogels to impact cancer treatment, in particular, is great for both the local delivery of chemotherapeutic drugs to a tumor site as well as for tissue regeneration after a cancer tumor has been removed," he explained. "Working on the nanoscale, we are controlling and fine-tuning the nanostructure of these materials to enhance the desired effect in biological systems.

Martin noted that Pochan is an "integral member of the MSEG faculty," and has made significant contributions to the department, most notably with the establishment and equipment of the University's W. M. Keck Electron Microscopy laboratory. He is also a dedicated teacher who values the contributions of his students, particularly those graduate students who have conducted research with him.

[Click here to read the entire article in UDaily.](#)



Darrin Pochan, professor of materials science and engineering, has been named a fellow of the American Physical Society

Photo by Kathy F. Atkinson.

OPPORTUNITIES

JOB

The Center for Composite Materials in the College of Engineering at the University of Delaware is currently recruiting applicants for:

1 POSTDOCTORAL RESEARCHER

position in the areas of thermoplastic process modeling. Qualifications include a PhD in engineering or related field with an emphasis on polymer composites. Applicants are required to be knowledgeable in thermoplastic processing (PEEK, PEKK, PEI), first principle process modeling and finite element analysis. Hands on experience in fabricating and testing of composites is required. Good written and oral communication skills; ability to interact effectively with industrial and government sponsors, as well as other CCM staff and students.

2 POSTDOCTORAL RESEARCHER

position in the areas of numerical analysis & design and/or process modeling and manufacturing science of composite materials structures. Qualifications include a PhD in engineering or related field with an emphasis on polymer composites. Applicants are required to be knowledgeable in finite element analysis and current state-of-the-art FEA software, possess a solid understanding of the basic principles of structural mechanics and be able to apply these principles to composite structures. Hands on experience in fabricating and testing of composites are also a plus. Good written and oral communication skills; ability to interact effectively with industrial and government sponsors, as well as other CCM staff and students.

To apply, please submit cover letter and resume to Corinne Hamed, hamed@udel.edu.

Founded in 1974 within the University of Delaware's College of engineering, the Center for Composite Materials (UD-CCM) is an internationally recognized, interdisciplinary center of excellence for composites research and education. UD-CCM has extensive capabilities ranging from basic research through specific applications, clearly encompassing applied research that serves to transition basic research to products and applications. The Center has a broad range of state-of-the-art advanced equipment housed in two dedicated buildings for composites basic and applied research. Sponsored research expenditures are over \$12M annually. CCM is host to seven (7) NSF/DoD Centers of Excellence since 1986.

3 LIMITED TERM RESEARCHER

position in the areas of numerical analysis & design and/or process modeling and manufacturing science of composite materials structures. Qualifications include a Masters in engineering or related field with an emphasis on polymer composites. Applicants are required to be knowledgeable in finite element analysis and current state-of-the-art FEA software, possess a solid understanding of the basic principles of structural mechanics and be able to apply these principles to composite structures. Hands on experience in fabricating and testing of composites are also a plus. Good written and oral communication skills; ability to interact effectively with industrial and government sponsors, as well as other CCM staff and students.

PUBLICATIONS

NEW

BOOKS

Mewis, J., Katholieke Universiteit Leuven, Belgium and N. J. Wagner, Colloidal Suspension Rheology, Cambridge University Press, Cambridge, 2012, www.cambridge.org/9780521515993.

CONFERENCES

McAllister, Q. P., J. W. Gillespie, Jr. and M. R. VanLandingham, "Probing the Surface Properties of High Performance Fibers," Adhesion Society Annual Meeting and Expo, New Orleans, LA, February 26-29, 2012.

JOURNALS

Alfredsson, K. S., A. A. Gawandi, J. W. Gillespie, Jr., L. A. Carlsson, and T. A. Bogetti, "Flexural Analysis of Discontinuous Tile Core Sandwich Structure," *Composite Structures*, 94, pp. 1524 – 1532, 2012. www.sciencedirect.com/science/article/pii/S0263822311004429.

Gurnon, A. K. and N. J. Wagner, "Large Amplitude Oscillatory Shear (LAOS) Measurements to Obtain Constitutive Equation Model Parameters: Giesekus Model of Banding and Non-banding Wormlike Micelles," *Journal of Rheology*, 56 (2), pp. 333-352, 2012. <http://dx.doi.org/10.1122/1.3684751>.

McAllister, Q. P., J. W. Gillespie, Jr., and M. R. VanLandingham, "Nonlinear Indentation of Fibers," *Journal of Materials Research*, 27 (1), pp. 197-213, 2012. DOI:10.1557/jmr.2011.336.

Sargianis, J. and J. Suhr, "Effect of Core Thickness on Wave Number and Damping Properties in Sandwich Composite," *Composites Science and Technology*, 72 (6), pp. 724-730, 2012. www.sciencedirect.com/science/article/pii/S0266353812000450

Wu, A. S., T-W. Chou, J. W. Gillespie, Jr., D. Lashmore, and J. Rioux, "Electromechanical Response and Failure Behaviour of Aerogel-Spun Carbon Nanotube Fibres under Tensile Loading," *Journal of Materials Chemistry*, doi: 10.1039/c2jm15869h, February 2012.

CONSORTIUM

NEWS

We would like to thank **Chesapeake Defense Services Inc.**, Belcamp MD, **Graco Inc.**, Minneapolis, MN, and **Pratt & Whitney**, Middletown CT, for becoming our newest consortium members. We would also like to thank **Greene Tweed**, Kulpsville, PA, **V System Composites**, San Diego, CA, and **SURVICE Engineering**, Belcamp MD, for renewing their memberships and 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 38 YEARS
OF SIGNIFICANT
CONTRIBUTIONS TO
COMPOSITES SCIENCE
AND TECHNOLOGY,
THE EDUCATION OF
STUDENTS, AND THE
CREATION AND
TRANSFER OF
TECHNOLOGY TO
INDUSTRY.



CELEBRATING 38 YEARS OF SIGNIFICANT CONTRIBUTIONS TO
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