



The Macrogram

Hartford Chapter of the ASM International
Build on our Strengths - Leverage our Diversity - Network to Succeed

MONTHLY MEETING – TOPIC

May 13, 2008 - Student Night

Topic: UConn Research

Speakers: Student members of UConn
Materials Advantage Chapter

Directions: Chuck's Steak House & Margarita Grill
Mexican Cantina - 1428 Stafford Rd., Storrs Mansfield,
CT, Ph: (860) 429-1900

Agenda:

Cocktails: 5:30-6:30 PM

Dinner: 6:30-7:30 PM

Program: 7:30-8:30 PM

Program Charges:

Regular Members - \$28.00

Retirees - \$15.00

Full Time Students - \$15.00

Entrée Selections: (Please specify)

- Prime Rib
- Chicken Teriyaki
- Bake Scrod

Technical Chairperson: Rainer Hebert

Reservations: Call Shirley at Dynamic Metals (860) 583-3336 by noon May 8th. Students contact Rainer Hebert (860) 486-3155. **Thanks!**

Abstract - Presentations:

Over seventy research projects of the graduate students of UConn's Materials Science and Engineering Program pass through extensive peer and faculty review with the best competing to be the three selected for presentation to the Hartford Chapter.

Preparation of Hydroxyapatite/Poly(L-Lactide) Nanofibrous Scaffold for Bone-Repair Application Using Electrospinning Technique

Speaker: Fei Peng

Structurally, bone is a composite of nanosized hydroxyapatite (HA) particles and fibrous collagen. The HA crystals are embedded within the collagen fiber matrix and are aligned along the long axis of fibers. Inspired by the biological system, an HA/Poly(L-lactide) (PLLA) nano-composite scaffolds with different fibrous assembly and high porosity were fabricated using electrospinning technique. In detail, HA particles with a length around 150-200 nm and an aspect ratio around 5-7 were synthesized using a metathesis reaction. The HA particles were co-electrospun into PLLA nanofibers with either random or aligned fibrous assemblies using different collectors. It was for the first time that up to 20 wt% HA nanoparticles was homogeneously distributed within the PLLA nanofibers and well aligned along the long axis of the fibers. Such obtained microstructure closely mimicked the micro-arrangement of the inorganic/organic components in the ECM of nature bone. The results of tensile test proved that such fabricated composite scaffolds also had prospectively improved mechanical properties. And the results of in vitro cell culture study demonstrated that HA-incorporated scaffolds had improved biocompatibility and cell signaling properties, which make the scaffolds prospective candidates for bone-repair application.

Characterization of the Recast Microstructure in Laser-Drilled Ni-based Superalloys

Speaker: Jacquelynn K. McGuinness Garofano

Percussion laser drilling is a well-established technique for drilling cooling holes in gas turbine engine components and airfoils. Laser machining can, however, lead to a range of complex metallurgical effects particularly in the recast layer and heat-affected zone (HAZ) that may surround the drilled hole. It is important to understand these effects since the recast and HAZ could have a deleterious effect upon the mechanical properties of laser-drilled components. We have used electron microscopy techniques to study metallurgical effects in laser-drilled Ni-based superalloys as part of a major program on percussion laser drilling of cooling holes. In this paper we report a microstructural study on laser-drilled powder-metallurgy (P/M) Inconel 100 (IN100), which was selected for this study because it has a very homogeneous microstructure consisting of fcc γ grains with a hierarchical range of L_{12} γ' phase. As such, this system should provide an extremely sensitive test of HAZ effects.

Stability and Electronic Structure of CdSe Nanorods from First Principles

Speaker: Thomas Sadowski

The focus of this study is to provide a more comprehensive understanding of the stability and electronic structure of cadmium selenide (CdSe) nanorods. In particular, first principles computational methods have been applied to infinitely long nanorods of CdSe in the wurtzite crystal structure over a range of topologies and diameters. The dependence of the total energy (i.e. stability) of the nanorods, their electronic band gaps, and the tendency of surface atoms to reorient are assessed as a function of the types of terminating surface facets of the nanorods, their cross-sectional topologies, and diameters. Consistent with our prior work on CdSe quantum dots, calculations show that hexagonal cross-sections containing surface atoms with one dangling bond are highly stable, possessing a large electronic band gap and exhibiting minimal surface reorientation. It is also shown that the total energy of a nanorod of arbitrary size can be approximated by an algebraic expression based on *ab initio* bulk, surface and edge energies.



Visit the UConn Materials Advantage Chapter's Web Site
www.engr.uconn.edu/ucma

2008-2009 UCMA Executive Board

President: Julie Anne Mackey

Vice President: Salay Stannard

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Bios:

Fei Peng got her bachelor's degree on polymer materials and engineering within three years at Beijing Institute of Petro-Chemical Technology in China in Sep, 2002. Ms. Peng continued her graduate study on synthesis and catalytic mechanism of rare-earth coordinated complexes for the ring-opening polymerization of poly(ϵ -caprolactone) at Zhejiang University, Hangzhou, China and got her master's degree on chemistry in Mar, 2005. She came to IMS of Uconn in Aug, 2005 and started her PhD research on inorganic/organic composite materials for bone-repair applications under the advisory of Prof. Mei Wei.

Jacquelynn K. McGuinness Garofano was a member of the Honors College at Southern Connecticut State University studying physics with minors in chemistry and mathematics. She earned her Bachelor of Science in Physics in May 2006. That fall she was accepted into the graduate program in Materials Science and Engineering at the University of Connecticut as a student in Mark Aindow's research group. Jackie is also heavily involved at the university serving as Graduate President of Material Advantage Student Chapter and President of the Materials Research Society University Chapter this year.

Thomas Sadowski received his first bachelors degree in 2001 from the University of Connecticut (UConn) majoring in information systems. That following fall (September 2002), he enrolled at Southern Connecticut State University (SCSU) where he pursued a double bachelor's degree in physics and computer science and a minor in mathematics. He also spent time working as a teaching assistant in both the Physics and Computer Science Departments.

Since his arrival at UConn in the fall of 2006, Thomas has worked in Professor Rampi Ramprasad's computational material science group studying the electronic and structural properties II-VI family of semiconductors using ab initio techniques for application toward photovoltaic devices.

Upon graduating from UConn, Thomas plans to pursue a career in academia where he can teach in addition to continuing his research. He hopes to take what he has learned about electronic structure theory and techniques with him and apply them towards the goal of creating his own computational material science group.



Student Night on May 8, 2007 featured presentations by four graduate students of Material Science Engineering at the University of Connecticut in Mansfield, CT. The students are members of the [UConn Student Materials Advantage Chapter](#). Each student highlighted aspects of his research on various thin films. Shown in the photo, from the left, are John Rugh (Hartford Chapter Chairman), Ramesh Nath (whose presentation was judged as the best), Shan Zhong (whose presentation was judged as second best), Rainer Hebert (Faculty Advisor of the UConn Materials Advantage Chapter), Bamidele Allimi and Chunguang Tang.



The Hartford and UConn Materials Advantage Chapters held a joint meeting on May 9, 2006 at Willington Pizza House near campus for **Student Night** presentations. In the photo at the left are shown, Rampi Ramprasad (student chapter advisor), Will Osborn (chosen as top presenter), Neal Madefrau (second runner up), Robin Bright (first runner up) and Arnie Grot (Hartford Chairman).