

2009-2010 Graduate Seminar Series

The Department of Mechanical Engineering – Engineering Mechanics

Proudly Presents

Professor Wendy Crone

University of Wisconsin - Madison

Professor Wendy C. Crone's research is in the area of solid mechanics, and many of the topics she has investigated are connected with nanotechnology and biotechnology. As a Professor in the Department of



Engineering Physics with affiliate appointments in the Departments of Biomedical Engineering and Materials Science and Engineering at the University of Wisconsin-Madison, she has applied her technical expertise to improving fundamental understanding of mechanical response of materials, enhancing material behavior through surface modification and nanostructuring, exploring the interplay between cells and the mechanics of their surroundings, and developing new material applications and medical devices. She has worked in the medical device industry and has publications and patents pending on medical devices and biomaterials. As a sample of prior accomplishments, her research group has demonstrated the capability of shape memory alloy-based

thermomechanical data storage device at the nanoscale, adapted plasma surface modifications techniques to produce highly biocompatible shape memory alloys, developed magnetic methods for control over the position and orientation of nanowires, and conducted foundational experiments on the mechanical behavior of responsive hydrogels. Prof. Crone was granted a CAREER Award by the National Science Foundation, co-founded the MEMS and Nanotechnology Technical Division of the Society for Experimental Mechanics, and recently received the top Hot Talk/Cool Paper Award from the Materials Research Society.

Thursday, Sept. 10, 2009 3:00 – 4:00 p.m. Room 112, ME-EM Bldg.

Bioactive Polyurethane Copolymers: Hemocompatibility, Mechanics, and Medical Device Applications

After several decades of research into hemocompatible biomaterials, there remain surprisingly few materials that can be used in blood-contacting applications. We have synthesized copolymers of polyurethane (PU) with glycosaminoglycans incorporated into the polymer backbone as a chain extender during PU synthesis. These materials have a range of material properties, including tunable mechanical behavior and bioactive functions. We created PU copolymers with the anti-thrombotic glycosaminoglycan dermatan sulfate (DS) which are non-adhesive materials displaying a dramatic increase in material hydrophilicity, accompanied by a decrease in protein adsorption and cell attachment. This new PU-DS biomaterial possesses easily-tailored anti-adhesive properties that may render it attractive for blood-contacting or other non-fouling applications. The PU copolymers with hyaluronic acid (HA) that we developed are naturally anti-thrombotic. Incorporation of even small amounts of HA results in negligible platelet adhesion and significantly decreased red blood cell adhesion. The PU-HA materials have tunable mechanical properties and were found to be highly cytocompatible and supported cell adhesion and viability. These potent anti-thrombogenic properties demonstrate its great promise for use in vascular applications. To this end, we developed two medical devices for the treatment of brain aneurysms using the PU-HA material as a component. Methods of fabrication and results of preliminary in vitro and in vivo testing of the two novel aneurysm occlusion devices will also be presented.

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and the Department of Mechanical Engineering – Engineering Mechanics www.me.mtu.edu/seminar