The Department of Mechanical Engineering/College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar

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California Institute of Technology

Lecture Title: Micromechanics and Structural Behavior of Cellular Solids

Tuesday, June 21, 2011, 11AM, Room 173 Light Engineering

Abstract

Cellular materials of either foam or lattice-based architectures have multifunctional properties that promote their implementation in a wide spectrum of technologies, including ultralight weight structures, impact/blast protection systems, smart or active structures. Emerging manufacturing technologies such as rapid prototyping and three dimensional printing are opening new horizons for the fabrication of application tailored cellular architectures with enhanced multifunctionality and hierarchical features. Exploiting the full potential of cellular solids in engineering applications is contingent on achieving a thorough understanding of the coupling between their macroscopic response under complex stress states and their topological and microstructural features (e.g. nodal connectivity, periodicity, and randomness).

In this presentation, we shall explore the effects of topology and microstructural morphology on the macroscopic structural behavior (stiffness and failure) of cellular solids under both uniaxial and biaxial stress states. Results from a parametric computational\experimental investigation in conjunction with a newly developed energy based yield criterion will be used to illustrate the anisotropic macroscopic response for different cellular architectures and its sensitivity to microstructural features. Furthermore, the relationship among nodal connectivity, morphological regularity and dominant deformation modes at and prior to the onset of failure is explored through a quantitative technique that is based on the partition of the elastic strain energy into its bending and stretching components.

Biography

Dr. Maen Alkhader received his PhD from Illinois Institute of Technology in 2008 and joined Graduate Aerospace Laboratories (GALCIT) at California Institute of Technology in 2009 as a Postdoctoral Scholar. His research interests are in cellular solids, time-dependent materials, impact/blast resistant materials, materials for energy technologies, high-strain-rate behavior and dynamic failure of materials.

Directions: Please refer to website: http://www.sunysb.edu or call Augusta Kuhn at 631-632-8310 for more information.
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