

GRADUATE SEMINAR

Hybrid Nano/Micro Composite Sandwich Structures: Mechanical, Impact and Thermal Behavior

Dr. Jandro L. Abot

Center for Intelligent Processing of Composites
Northwestern University

Date: February 14, 2003
Time: 3:00 - 4:00 p.m.
Place: 755 Baldwin Hall

ABSTRACT

Composite sandwich structures are widely used in aerospace and marine applications because of their superior specific stiffness and strength respect to weight. Composite materials such as fiber reinforced polymers are usually considered for the sandwich facings since they can be tailored to meet specific stiffness and strength requirements. The improvement of the polymer matrix of these composites by the addition of nanoparticles to form nanocomposites can bring enormous advantages to the overall structural behavior. However, the development of nanocomposites with superior performance requires the study of the involved phenomena across several orders of magnitude. The typical mechanics analysis at the macro level needs to be complemented with micro and nanomechanics studies. The connections between processing, nanostructure, microstructure and the mechanical performance of polymeric nanocomposites encompassing interface research, failure mechanisms, durability, analysis and design procedures are addressed. To understand and model the thermomechanical behavior of composite sandwich structures, the corresponding characterization of the individual component materials such as composite facings, core and adhesive constitutes the primary task. The processing, thermomechanical behavior and failure mechanisms of sandwich structures under static and impact loading as well as specific issues to these structures such as indentation are described. The progress and challenges in developing such materials and structures are briefly discussed.

BIOGRAPHICAL SKETCH

Dr. Abot is a Post-Doctoral Fellow at Northwestern University. He received his Ph.D. in Theoretical and Applied Mechanics from Northwestern University in Evanston, IL in December 2000. He also holds a M.S. in Theoretical and Applied Mechanics from Northwestern University and a Structural Engineering degree from the University of the Republic in Montevideo, Uruguay. He is an active member of the American Society for Composites, the Materials Research Society, the American Institute of Aeronautics and Astronautics, the American Chemical Society, the Society for Experimental Mechanics and the Society for the Advancement of Material and Process Engineering. He received the Walter Murphy Fellowship Award for two consecutive years and obtained the Best Paper Award from the American Society for Composites in 2002. He has extensive research experience in the mechanical and hygrothermal behavior of polymeric composite materials, nanocomposites, polymers and sandwich structures. He has pioneered work on several areas of their processing, testing and modeling of thermomechanical behavior. He developed constitutive models for the macroscopic scale representation of polymeric composite/polymeric foam sandwich structures under both indentation and impact loads. He is now investigating the processing, structure/property relationships and modeling of the mechanical behavior of epoxy/clay nanocomposites and their interaction with carbon fibers in composite materials. He is also presently responsible for the mechanical testing of materials and structural elements being used for an all-composite Cirrus aircraft. He has published over 20 journal and proceeding papers and contributed to various projects sponsored by NASA, FAA, ONR and industrial consortiums. He is now teaching Mechanics of Materials for sophomores at Northwestern and the laboratory sessions for various graduate courses including Mechanics of Composite Materials and Experimental Stress Analysis.