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

Mechanical Engineering Seminar

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Lecture Title: Failure Mechanics and Damage Tolerance Designs of Advanced Composite/Hybrid Materials and Structures

Monday, November 19, 2012, 2PM, Room 173 Light Engineering

Abstract

Recently, extensive applications of advanced composite materials are found in aerospace, civil and marine structures, for example, more than 50% materials used in new Boeing 787 "Dreamliner" airplanes are composite materials. Also, composite materials are increasingly employed in naval battle ships, and earthquake engineering due to their high impact resistances, strengths, stiffness and light weights. However, traditional metals or concrete and composite materials must co-exist since composite materials may not completely replace metals in the near future. Therefore, a major structures/mechanics/materials research effort is the interfacial failure between composite materials and metals (hybrid materials or structures), because the damage tolerance of composites and metals is well known. This talk will summarize some new mechanics and materials research results across extremely small time-scales and length-scales including the dynamic failure mode transitions at the interface of composite/hybrid materials. A common failure mode of delamination, which recently occurred in new Boeing 787 airplanes, is extensively investigated and design considerations including the biologically inspired design are proposed to suppress or postpone delamination failure and improve the structural damage tolerance.

Biography

L. Roy Xu is an Associate Professor of Mechanical Engineering. After he received the Ph.D. degree in Aeronautics and Materials Science from California Institute of Technology, he joined Vanderbilt University as a faculty of Civil Engineering and Materials Science, before his current position. His honor and award include an Office of Naval Research Young Investigator Award in Structural Mechanics, and a Fellow of the American Society of Mechanical Engineers (ASME). He is the current Chair of the ASME Fracture and Failure Mechanics Technical Committee. As an author of 41 journal papers (h-index 13), his interdisciplinary research includes structural failure analysis and materials designs for aerospace, civil and marine applications, design and testing of composite structures, nanotechnology including nanocomposite materials and nanoindentation, funded by the National Science Foundation and the Department of Defense.

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