

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

Mechanical Engineering Seminar

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Professor

Department of Mechanical Engineering and Applied Mechanics
University of Pennsylvania

Lecture Title: Mechanical and Chemical Effects in the Adhesion of Thin Shells

Friday, April 17, 2009, 2:00 PM, Room 173 Light Engineering

Abstract

The adhered state of thin films used in electronic applications and of biological cells are strongly influenced by a variety of mechanical factors, which include chemistry-dependent adhesive interactions at interfaces. Transitions between bistable snapped-in and snapped-out configurations are predicted from a model that includes nonlinear shell kinematics coupled with elastic material response and an adhesion law. Non-uniform energy and traction fields are a general signature of adhered states. Coupling between these spatially non-uniform fields can result in segregation of chemical species that directly affects equilibrium states. One example occurring in biology is the enhanced adhesion of closed vesicles (e.g., cells) via integrin segregation in membranes. A second example is impurity driven failure of film-substrate, wafer-substrate, and wafer-wafer interface (e.g., due to moisture). Surface topography is found to have a strong influence on the equilibrium configurations including the distributions of adhesive species and tractions.

Biography

John L. Bassani is the Richard H. and S. L. Gabel Professor of Mechanical Engineering at the University of Pennsylvania. He is also a Professor of Materials Science and Engineering, a member of the Laboratory for Research on the Structure of Matter, and a member of the Institute of Medicine at Penn.

Professor Bassani earned his BS in Mechanical Engineering from Lehigh University and his PhD in Engineering from Harvard University. He spent two years at the Massachusetts Institute of Technology as an Assistant Professor before joining Penn, where he has served as chair of Mechanical Engineering and Applied Mechanics for eight years. He has been a Visiting Professor at the University of California at Santa Barbara, Harvard University and Brown University. He received the NSF Presidential Young Investigator Award, is a Fellow of ASME, has served on several editorial boards, and is currently the President of the Society of Engineering Science. Professor Bassani's research interests include: the relationship between properties of discrete and continuous media, adhesion and interfacial mechanics, formation and properties of nanostructures, mechanics of living cells, plastic deformation of crystals and polycrystals, and mechanics of fracture and fatigue.

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