

**STEVENS INSTITUTE OF TECHNOLOGY  
DEPARTMENT OF MECHANICAL ENGINEERING**

Seminar Series

Thursday, February 16, 2006  
Carnegie Bldg, Room 315  
11:00 AM

**Nanotribological wear properties of thin films using instrumented  
scratch testing**

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**ABSTRACT**

Hard, thin film coatings are used in surface engineering applications to reduce friction and wear on surfaces. In the contact of surfaces, high stress perturbations occur at the near-surface due to localized asperity contact, which are larger than the Hertz stresses forming in the sub-surface. Coatings are designed to protect a surface against the high near-surface contact stresses. Understanding the coating life is an important concern for component reliability and cost issues. This talk discusses the use of instrumented techniques to determine properties of thin film materials such as fracture toughness, friction and wear properties. First, a technique to calculate the fracture toughness of thin film coatings is presented. As a sliding indenter translates over a surface, microcracks can form at the trailing edge. The technique uses a relationship between applied normal load and surface fracture spacing for an array of microcracks within a scratch track. Then, a model of friction and wear of diamond like carbon (DLC) films is discussed in the context of tribochemical molecular interaction of adsorbates and sliders. Lastly, the use of instrumented indentation and scratch techniques to determine properties of near-surfaces is limited by accurate representations of tip-shapes. The application of atomic force microscopy to tip-shape determination is presented with examples to standard materials.

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Dr. Korach has a Ph.D. in Mechanical Engineering from Northwestern University in 2004, where he was a Walter P. Murphy Graduate Fellow and held an NSF IGERT Traineeship in Virtual Tribology. He received his M.S. and Bachelor of ME from the Georgia Institute of Technology in 1999 and 1995, respectively. From 1995-1997, he worked in the Papermaking Division of the Institute of Paper Science and Technology. Since 2004, he has been an Assistant Professor in the Department of ME at SUNY-Stony Brook. His research encompasses the fields of tribology and solid mechanics, both theoretical and experimental. He is a member of ASME, the Society for Tribological and Lubrication Engineers (STLE) and ASEE, and received the Apprentice Faculty Grant in 2001 from the Educational Research and Methods Division of ASEE, was a 2005 NSF Summer Institute in Nanomechanics and Materials Fellow, and received a Promising Inventor Award from the SUNY Research Foundation in 2005.