

**The George W. Woodruff School of Mechanical Engineering
Georgia Institute of Technology**

Mechanical Engineering Seminar

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Tuesday, May 5, 2009 - - MRDC 4211 - - 11:00 a.m.

ABSTRACT

Design, Fabrication, and Reliability Challenges for Nano- and Micro-Structures

With the dramatic advances in the semiconductor industry, with the expanded focus into wireless and optoelectronic systems, and with the system-level integration of heterogeneous functions, there are several material, processing, reliability, and technology challenges. In my presentation, I will highlight some of our ongoing projects that address these challenges. For example, I will discuss our fixtureless stress-engineering and magnetic actuation techniques to experimentally measure the interfacial strength of nano-scale and micro-scale thin film structures used in microelectronic, photovoltaic, and other systems. I will illustrate how these techniques can be used to characterize interfacial fracture under monotonic and fatigue loading. I will also discuss the thermo-mechanical reliability of solder interconnects through viscoplastic modeling, material microstructure evolution, and laser moiré interferometry. Specific examples from automotive, defense, and implantable medical device applications will be presented to highlight the solder damage-mapping methodology. My talk will also focus on our lithography-based free-standing micro-scale structures that can be used as compliant off-chip interconnects. These interconnects, optimized for mechanical and electrical performance, address one of the important bottlenecks with next-generation microsystems. These innovative compliant interconnects have been successfully fabricated at the wafer-scale and assembled on substrates. By scaling these structures to nano-scale and by bio-conjugating these structures, we are also exploring whether these structures can be used for detecting progressive change in cancer-specific serum biomarkers. I will conclude my talk with a discussion on my proposed initiatives for the coming years.

BIOSKETCH

Dr. Suresh Sitaraman is a Professor in the George W. Woodruff School of Mechanical Engineering at Georgia Tech. Prior to joining Georgia Tech in 1995, Dr. Sitaraman was with the IBM Corp. Dr. Sitaraman's expertise is in the areas of fabrication, characterization, thermo-mechanical modeling and reliable design of micro-scale and nano-scale structures for a wide range of applications. Dr. Sitaraman has co-authored more than 200 technical publications over the past few years.

Dr. Sitaraman has received the Sustained Research Award from Georgia Institute of Technology – Sigma Xi in 2008 and the Outstanding Faculty Leadership Award for the Development of Graduate Research Assistants, Georgia Institute of Technology in 2006. His co-authored papers have won the Commendable Paper Award from IEEE Transactions on Advanced Packaging in 2004 and the best paper award from IEEE Transactions on Components and Packaging Technologies in 2001 and 2000. Dr. Sitaraman has also received the Metro-Atlanta Engineer of the Year in Education Award in 1999, the Outstanding Faculty Education Award from the Packaging Research Center in 1998, and the NSF-CAREER Award in 1997. Dr. Sitaraman serves as an Associate Editor for IEEE Transactions on Advanced Packaging. Dr. Sitaraman is an ASME Fellow.

For more information, please contact the host, Dr. David McDowell at 404-894-5128.