

The Department of Mechanical Engineering
 Presents
 Faculty Recruitment Candidate

Mark Losego, Ph.D.

Assistant Research Professor
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Fri, Feb. 28, 2014
11:10 AM — 12:30 PM*
Winston Chung Hall 205/206



Nanoscale Heat Transport at Organic-Inorganic Interfaces

Abstract:

Compared with our ability to precisely control the flow of electrons or light within a material, our capacity to design the flow of heat, particularly at the nano-scale, is rather rudimentary. Crucial to nanoscale thermal management is an understanding of interfacial heat transport. Interfaces between two materials act as barriers to heat flow. For nano-scale systems, these interfaces largely determine the thermal conductivity of the entire material. However, thermal transport across interfaces is still not well understood. This talk will describe experimental work that attempts to validate recent molecular dynamics (MD) simulations suggesting that interfacial thermal conductance can be strongly modulated by adjusting the strength of interfacial bonds. Our experimental system consists of self-assembled monolayers (SAMs) on SiO₂ substrates having either methyl or mercapto terminations. Gold films are transfer printed onto these surfaces forming either a van der Waals or covalent bond respectively. The interfacial thermal conductance across the Au/SAM interface is measured via time-domain thermoreflectance (TDTR) and found to increase by nearly 2x when the interface is switched from a van der Waals interaction to a covalent bond. The interfacial bond stiffness is independently measured using pico-second acoustics. Together these experiments represent the first clear demonstration of how changing the stiffness of a single atomic-scale interfacial bonding layer affects thermal conductance. Methods for expanding this understanding to create new materials systems will be discussed as well as opportunities for engineering organic-inorganic interfaces for other molecularly enabled systems.

About the Speaker:

Mark D. Losego is an Assistant Research Professor of Chemical and Biomolecular Engineering at North Carolina State University. He earned his Ph.D. in materials science and engineering at North Carolina State University in 2008 and conducted postdoctoral research in nano-scale heat transport at the University of Illinois until 2011. Losego's research focuses on understanding transport phenomena at organic / inorganic interfaces and within three-dimensionally nanostructured systems used in energy and environmental applications.

***Faculty only 12:00 — 12:30 PM (Non-ME Faculty are welcome)**

