

# MCEN GRADUATE SEMINAR

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## **Nanoscale Thermal Transport**

### **ABSTRACT**

Thermal transport in nanostructures differs significantly from that in macrostructures because of the size effects on energy carriers. Understanding nanoscale thermal transport is of fundamental importance to a variety of technologies. Size effects on transport properties in nanostructures can be utilized to engineer new thermoelectric materials with improved energy conversion efficiency, which requires both low thermal conductivity and good electron transport properties. Engineering hybrid micro/nano-structures with hydrophobic and hydrophilic coatings could enhance phase-change heat transfer efficiency by orders of magnitude. This talk will review some of our past and current activities in understanding and utilizing the nanoscale size effects in thermal transport in energy conversion and thermal management. Some of our recent developments in modeling and experimental frameworks, such as multiscale modeling and pump-and-probe measurements using extreme ultraviolet (EUV) light will be highlighted.

### **BIOGRAPHY**

Dr. Ronggui Yang is the Sanders Faculty Fellow and an assistant professor of Mechanical Engineering at the University of Colorado at Boulder. Dr. Yang is also a faculty research scientist of the National Science Foundation Engineering Research Center for Extreme Ultraviolet Science and Technology ([NSF EUV ERC](#)) and the DARPA Focus Center on Nanoscale Science and Technology for Integrated Micro/Nano-Electromechanical Transducers ([DARPA iMINT Center](#)). Dr. Yang received his Ph.D degree focusing on Nanoscale Heat Transfer with Applications in Nanoelectronics and Thermoelectrics from Massachusetts Institute of Technology (MIT) in December 2005. Prior to MIT, he had a master's degree in MEMS from UCLA in 2001, a master's degree in Engineering Thermophysics from Tsinghua University in Beijing in 1999, and a Bachelor's degree in Thermal Engineering from Xi'an Jiaotong University in 1996. His research interests are on the application of nanostructures for thermal and energy systems. Dr. Yang authored and co-authored more than 30 journal papers with annual citation >150 times to his credit and has delivered more than 50 invited talks and seminars. His innovative research has won him numerous awards including the NSF CAREER Award in 2009, the Technology Review's TR35 Award in 2008, the DARPA/MTO Young Faculty Award (YFA) in 2008, the Goldsmid Award for Research Excellence in Thermoelectrics from the International Thermoelectrics Society in 2005, a NASA Tech Brief Award in 2004, and a few Best Research Paper Awards and nominations from the ASME and IEEE. He also won the best research award from his department in 2008 and was recently selected as one of the 100 most creative young engineers in the nation to attend the National Academy of Engineering's 15<sup>th</sup> annual Frontiers of Engineering symposium to be held in September 2009.