

Department of Electrical and Computer Engineering

Center for Integrated Bio and Nano Systems

Friday, October 27, 2017

11:15 a.m. (Refreshments served at 12:15 pm)

Room: CBB 104

Hot Nanophotonics: From Hot Carriers To Hot Thermal Emitters

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Abstract: Nanophotonics has enabled extreme control on the flow of light leading to revolutionary applications including imaging, and chemical sensing. Not only does nanophotonics allow the extreme control on light flow, but also on heat flow. The interplay between light and heat at the crossroads of nanophotonics leads to many promising applications in energy conversion. In this talk, I will describe devices that allow efficient renewable energy harvesting by achieving extreme anisotropy and asymmetry.

First, I will discuss how hot carriers – commonly considered loss pathways in plasmonic devices – can convert low energy photons to higher energies. This new upconversion scheme promises to be broadband, tunable, and an order of magnitude more efficient than existing solid-state upconversion schemes. Next, I will describe a renewable energy harvesting device based on nanophotonic selective thermal emitters. I will show how semiconductor nanostructures enable high efficiency waste heat recovery. Finally, I will show how thermal emitters based on extremely anisotropic materials – carbon nanotubes – can revolutionize heat to electricity conversion. The extreme control on light and heat flow would open new avenues for addressing one of the greatest technological challenges of our time – providing clean energy to the world.

Bio: Gururaj (Guru) Naik is an assistant professor at Electrical & Computer Engineering, Rice University since this fall. Previously, he was a post-doctoral scholar in the Dionne group at Stanford University. He received a B.E. from Visvesvaraya Technological University and an M.E. from the Indian Institute of Science, both in India. During his PhD in Electrical & Computer Engineering at Purdue University, he developed new plasmonic materials for nanophotonic applications. His research interests lie in the application of nanophotonic principles for energy, imaging and health. Guru is a recipient of IEEE Photonics Society Graduate Student Fellowship, an Outstanding Graduate Research award from Purdue University and a Gold Medal from the Indian Institute of Science.

Contact Prof. Jiming Bao (jbao@uh.edu) if you would like to arrange for a time to meet with Dr. Naik.