New Materials for Photonics in the Mid-Infrared: From Lasers and Detectors to Plasmonics and Metamaterials

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Weds, February 24, 4:10pm in Packard 416
Refreshments will be served at 4pm

Abstract:
Significant opportunities exist in the mid-infrared region of the electromagnetic spectrum; while it is rich in vibrational absorption bands of gaseous chemicals and atmospheric transmission windows, devices remain underdeveloped when compared with their counterparts in the visible and near-infrared.

We describe our progress on mid-infrared diode lasers and avalanche photodetectors, both compelling building blocks for future sensing/imaging systems, as well as alternative plasmonic materials for localizing and manipulating light at subwavelength scales. Rather than metals, we focus our attention on crystalline semimetals and doped-semiconductors, as their unique optical properties can be continuously tuned with composition and doping, respectively, yielding a new class of designer plasmonic materials. Moreover, these crystalline ‘metals’ can offer greatly reduced optical losses, as well as the tantalizing prospect of seamless integration of plasmonic and metamaterial functionality with optically-active semiconductors. We anticipate that these capabilities will enable new paradigms in nanophotonic device design and functionality.

Seth R. Bank received the B.S. degree from the University of Illinois at Urbana-Champaign in 1999 and the M.S. and Ph.D. degrees in 2003 and 2006 from Stanford University, all in electrical engineering. In 2006, he was a post-doctoral scholar at the University of California at Santa Barbara. He is currently an Associate Professor of Electrical and Computer Engineering at the University of Texas at Austin, where he holds a Temple Foundation Endowed Faculty Fellowship. His primary research interests are centered around the growth and application of novel heterostructures and nanocomposites to electronic and photonic devices. He has coauthored over 200 papers and presentations in these areas.

He is the recipient of a 2010 Young Investigator Program Award from ONR, a 2010 NSF CAREER Award, a 2009 Presidential Early Career Award for Scientists and Engineers (PECASE) nominated by ARO, a 2009 Young Investigator Program Award from AFOSR, the 2009 Young Scientist Award from the International Symposium on Compound Semiconductors, a 2008 DARPA Young Faculty Award, the 2008 Young Investigator Award from the North American MBE Meeting, and his group has received several student paper awards.