

ABSTRACT:

Thermal Phenomena in Nanoelectronics

Xianfan Xu, James J. and Carol L. Shuttleworth Professor of Mechanical Engineering
School of Mechanical Engineering, Purdue University, USA
xxu@purdue.edu

In this presentation I will discuss our studies of thermal transport phenomena in nanoscale materials and devices using laser-based measurement techniques. 2-dimensional (2D) materials promise many new applications in electronics and photonics. I will discuss our studies on 2D materials including van der Waals layered single element materials and topological insulators, and the unique transport properties only existing in these materials that can be utilized to build functional devices. For example, we discovered exceptionally large, directional transport processes in topological insulators which can be utilized for controllable thermal transport and thermoelectric effect. We also use femtosecond pump-probe laser spectroscopy to study ultrafast energy transport dynamics to improve our understandings of the enhanced thermal transport processes in these materials and to improve the device reliability in 2D electronic devices.