Thermophysical Properties Characterization based on ET-Raman and FET-Raman: Down to nm Size

Xinwei Wang[1, S, C]

[1]*Mechanical Engineering, Iowa State University, Ames, IA, U.S.A.*
xwang3@iastate.edu

Over the last two decades, significant research has been reported on characterizing and understanding the thermophysical properties of 2D materials, including thermal conductivity and interface thermal resistance. Out of the techniques being used, Raman-based techniques probably are the most often used. Traditional steady-state Raman techniques suffer very large uncertainties due to absolute temperature measurement and laser absorption evaluation. This talk will introduce the Energy Transport State-resolved Raman (ET-Raman) and frequency domain ET-Raman (FET-Raman), which are transient techniques based on the photothermal phenomenon, and feature unprecedented measurement accuracy. Results will be presented on how these techniques are used to measure the thermal conductivity and interface thermal resistance of 2D materials down to nm thickness, and SWCNT bundles of a few nm thickness. Compared with the pump-probe technique, these techniques take a very different way in transient thermal probing, and have pushed the temporal resolution down to picosecond scale.