

Nanoscale Thermal Transport Measurements in Electronic Thin Films



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LECTURE ABSTRACT

Future electronic devices will benefit from the remarkable properties of Van der Waals (VdW) materials, particularly as the material thicknesses approach the single atomic layer limit. VdWs materials offer a crossover from indirect to direct electronic bandgaps in MoS₂ and other transition metal dichalcogenides (TMDs), layer-dependent magnetic phases in few-layered CrI₃, strain and layer-dependent anisotropic thermal conductivity, etc. These remarkable properties are critical building blocks for future nano-electronic, optoelectronic, photonic, and thermoelectric devices. This lecture will cover experimental investigations from my research group on phonon transport measurements in VdW materials. Special attention will be devoted to an overview of heat conduction at the nanoscale and a review of optical techniques for nanoscale thermal characterization. I will also present representative thermal conductivity measurements in graphene interface materials, inorganic-organic films, and substrate and superstrate encased VdW thin films. VdW materials provide a novel platform for fundamental studies of heat flow in nanoscale materials and prospective applications in thermal management and nano-thermoelectric devices.

SPEAKER BIOSKETCH

Oluwaseyi Balogun is an Associate Professor of Mechanical Engineering and Civil and Environmental Engineering at Northwestern University. He received his B.S. degree from the University of Lagos, Nigeria, and his M.S. and Ph.D. degrees from Boston University, all in Mechanical Engineering. Dr. Balogun's research focuses on nanoscale heat transport measurements and thermal properties of small-scale materials, experimental mechanics of soft biological materials, and optical and elastic wave sensors. His research is relevant to applications that involve nanoscale heat conduction, elastic wave propagation, optical sensing, and nanometrology. He currently serves as the co-director for the Center for Smart Structures and Materials at Northwestern University. He is a member of the IEEE UFFC and IEEE Nanotechnology Societies and a recipient of the 2020 & 2021 IEEE Nanotechnology Council Distinguished Lecturer awards.

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