Special Issue

Nanoscale Thermal Transport and Management

Message from the Guest Editors

All electronic devices generate Joule heat as a byproduct, which affects the performance, reliability, and service life of these devices. Thus, thermal management is indispensable in various applications, such as microprocessors, power semiconductor devices, light-emitting diodes, photovoltaic systems, batteries, etc. Heat sinks, heat pipes, thermal interface materials, and forced convection are widely used techniques for cooling. Moreover, phase change materials, microchannels, and thermoelectric cooling are innovative and promising techniques for thermal management. With the continuous decrease in the size of devices, the characteristic length of devices and structures has shrunk to the nanoscale, which is smaller than that of the phonon mean free paths or even comparable to the phonon wavelength. As a result, interfaces play a vital role in nanoscale thermal transport, and thermal boundary resistance dictates the overall thermal resistance of nanostructures and nanosystems. Therefore, the investigation of nanoscale thermal transport is crucial for thermal management.

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