

Total Thermal Resistance of Graphene-Oxide-Substrate Stack: Role of Interfacial Thermal Resistance in Heat Flow of 2D Material Based Devices

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Abstract : In 2D material based device, an interface between 2D materials and substrates often limits the heat flow through the device. In this paper, we quantify the total thermal resistance of a graphene-based device by series resistance model and show that the thermal resistance at the interface of graphene and substrate contributes to more than 50% of the total resistance. Weak Van der Waals interactions at the interface and dissimilar phonon vibrational modes create this thermal resistance, allowing less heat to flow across the interface. We compare our results with commonly used materials and interfaces, demonstrating the role of the interface as a potential application for heat guide or block in a 2D material-based device.

Keywords : 2D material, graphene, thermal conductivity, thermal conductance, thermal resistance

Conference Title : ICTET 2022 : International Conference on Thermal Engineering and Thermodynamics

Conference Location : New York, United States

Conference Dates : August 08-09, 2022