

Abstract Submitted
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Thermal Resistance and Temperature Jumps at Liquid/Solid Interfaces: Insights from Molecular Dynamics Simulations SANDRA TROIAN, California Institute of Technology, MC 128-95, Pasadena, CA 91125 — At macroscale dimensions, it is normally assumed that two distinct materials maintain equal temperature across the surface of contact. Even in the presence of a thermal flux across the interface, the contacting boundary is assumed to maintain thermal equilibrium so long as the interfacial resistance is negligible in comparison to that of the bulk. This has long been assumed an excellent approximation for liquid/solid interfaces, since liquids will conform in shape even to roughened surfaces. Recent molecular dynamics simulations of nanoscale films, however, have revealed the existence of intrinsic temperature jumps at liquid/solid interfaces. While previous studies have shown how stronger interaction energy between the liquid and solid will diminish temperature jumps, they cannot be altogether eliminated due to commensurability mismatch. Here we show a non-local effect in which the magnitude of the thermal jump is controlled by the thermal flux in the bulk. This finding suggests that temperature jumps across a liquid/solid interface are not simply a local effect due to the density mismatch across the interface. These jumps are also controlled by the rate of heat transfer, underscoring the importance of thermal resistance effects in nanoscale hydrodynamic systems.

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