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Behavior of the Kapitza Resistance at Liquid/Solid Interfaces: Insights from Molecular Dynamics and Continuum Studies ANOOSHEH NIAVARANI, SANDRA TROIAN, California Institute of Technology, 1200 E. California Blvd. MC 128-95, Pasadena, CA — While Kapitza (1941) first proposed the concept of thermal boundary resistance in superfluid helium, Khalatnikov (1952) soon realized that this phenomenon was caused by acoustic phonon mismatch across any interface separating dissimilar materials. Acoustic phonon mismatch has also been invoked as the source of instability in viscous nanofilms exposed to a large thermal gradient [1]. Liquid films approaching nanoscale dimensions are especially prone to thermal boundary resistance effects which can substantially alter the internal temperature profile. For this purpose, non-equilibrium molecular dynamics (NEMD) simulations provide an especially convenient tool for investigation [2-4]. Using NEMD and continuum studies, we explore the origins of the discontinuity in temperature at liquid/solid interfaces and specify regimes leading to deviations from Fourier's law. These findings suggest that although thermal convection effects are often negligible in nanofluidic systems, the Kaptiza resistance can nonetheless strongly influence hydrodynamic flow at small scales. [1] E. Schaffer et al., Macromolecules 36, 1645 (2003) [2] L. Xue et al., Int. J. Heat Mass Transfer 47, 4277 (2004) [3] B. Kim, A. Beskok and T. Cagin, J. Chem. Phys. 129, 174701 (2008) [4] S. Murad and I. Puri, Appl. Phys. Lett. 92, 133105 (2008)

Sandra Troian
California Institute of Technology,
1200 E. California Blvd. MC 128-95, Pasadena, CA

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