Thermal Conductance Measurements of Aromatic and Aliphatic Self-Assembled Monolayers

ROBERT WANG, SUNG-YEON JANG, R. A. SEGALMAN, ARUN MAJUMDAR, University of California Berkeley — Thermal conductance measurements of solid-solid junctions separated by an interfacial organic self-assembled monolayer (SAM) suggest that molecular heterostructures are a promising new class of thermoelectric materials. Au-SAM-GaAs junctions were fabricated by nanotransfer printing and their thermal conductance was measured by the 3ω technique. SAMS investigated in this study consisted of quaterphenyldithiol and alkanedithiols of varying length. This study explores two key aspects of thermal transport in molecules: 1) the effect of aromatic versus aliphatic molecular structure 2) the effect of molecular length in the aliphatic molecule. Measurements of thermal conductance using the 3ω method were very robust to processing history and no thermal dependence on alkane chain length was observed.

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