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Thermal conductance of interfaces with molecular layers - low temperature transient absorption study on gold nanorods supported on self assembled monolayers WEI WANG, JINGYU HUANG, CATHERINE MURPHY, DAVID CAHILL, UNIVERSITY OF ILLINOIS AT URBANA CHAMPAIGN, DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING TEAM, DEPARTMENT OF CHEMISTRY COLLABORATION — While heat transfer via phonons across solid-solid boundary has been a core field in condense matter physics for many years, vibrational energy transport across molecular layers has been less well elucidated. We heat rectangular-shaped gold nanocrystals (nanorods) with Ti-sapphire femtosecond pulsed laser at their longitudinal surface plasmon absorption wavelength to watch how their temperature evolves in picoseconds transient. We observed single exponential decay behavior, which suggests that the heat dissipation is only governed by a single interfacial conductance value. The "RC" time constant was 300ps, corresponding to a conductance value of 95MW/m^{2}K. This interfacial conductance value is also a function of ambient temperature since at temperatures as low as 80K, which are below the Debye temperature of organic layers, several phonon modes were quenched, which shut down the dominating channels that conduct heat at room temperature.

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