Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Thermopower and Electrical Conductance Measurements of Single Molecule Junctions PRAMOD SANGI REDDY, SUNG-YEON JANG, RACHEL SEGALMAN, ARUN MAJUMDAR, University of California Berkeley — The thermopower and electrical conductance of metal-molecule-metal junctions is studied by trapping single molecules between two gold electrodes with either a temperature differential (thermopower) or voltage differential (electrical conductance) applied across the electrodes. The voltage differential generated due to a temperature differential across a single molecule of Benzenedithiol, Dibenzenedithiol and Tribenzenedithiol trapped between Au electrodes is measured. The sign of the measured thermopower is used to show unambiguously that electrical conduction in these single molecule junctions is p-type (hole). The electrical current in a metal-molecule-metal junction due to a voltage differential of $\sim$100 mV is measured. The effect of molecular structure on electrical conductance is studied by 1) systematically varying the length of aliphatic molecules and aromatic molecules 2) changing the end groups binding to the electrodes 3) by adding substituents to the molecules. It is seen that the electrical resistance of aliphatic and aromatic molecules increases exponentially with length, while there was little effect of end groups and substituents for the molecules that we studied. Further, aromatic molecules are found to be much less resistive than aliphatic molecules of similar length.

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Date submitted: 20 Nov 2006 Electronic form version 1.4