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Concurrent Measurement of Thermopower and Current-Voltage Characteristics of Molecular Junctions PRAMOD REDDY, University of Michigan, Ann Arbor, AARON TAN, Materials Science and Engineering, University of Michigan, Ann Arbor, SEID SADAT, Department of Mechanical Engineering, University of Michigan, Ann Arbor — The Seebeck coefficient and the current-voltage characteristics of metal-molecule-metal junctions (MMMJs) are concurrently measured using a new atomic force microscope based technique. This enables the determination of the identity and the energetic separation of the molecular orbital that is closest to the Fermi level of the metal electrodes. Molecular junctions created by contacting a gold-coated atomic force microscope tip with four different self assembled monolayers (made from benzenethiol, dibenzenethiol, tribenzenethiol, tetrabenzenethiol) on gold substrates were found to have positive Seebeck coefficients ranging from 8 - 20 microvolts/K. The positive sign of the Seebeck coefficient unambiguously shows that charge transport in these junctions is dominated by the highest occupied molecular orbital (HOMO). Moreover, the Seebeck coefficient of the molecular junctions is found to increase monotonically with the length of molecular junctions. Further, by analyzing the current-voltage characteristics, the energetic separation of the HOMO level with respect to the Fermi level of the electrodes is also determined and is found to decrease with increasing lengths of the molecular junctions.

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