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Electronic Conduction Mechanisms of Self Assembled Monolayers of 7-Ethynyl-2,4,9-trithia-tricyclo[3.3.1.1^{3,7}]decane on Cadmium Sulfide ROBERT MALLIK, IVAN DOLOG, ANTHONY MOZYNSKI, Department of Phyiscs, The University of Akron, JUN HU, Department of Chemistry, The University of Akron — Four-terminal current-voltage (I-V) data are recorded for tunnel junctions of the type Al/barrier/Pb at temperatures ranging from 4K to room temperature. Conductance voltage (G-V) data are then derived numerically. The tunnel barrier is comprised of 7-Ethynyl-2,4,9-trithia-tricyclo[3.3.1.1^{3,7}]decane adsorbed on amorphous CdS ultra-thin films. The CdS films are of the order of 1-4 nm thick, and are prepared by RF sputtering in argon. 7ETTD is then spin-doped onto the CdS films from a dilute ($\sim$1.4 mg.ml^{-1}) solution in dimethylether which produces a self-assembled monolayer of the compound. Analysis of I-V, G-V and other data indicates that a combination of conduction mechanisms come into play depending on the current, voltage, and temperature. These mechanisms are primarily temperature activated hopping, direct tunneling, and, possibly, frontier-orbital coupling. The results show that the addition of a 7ETTD layer dramatically changes the electronic properties of the tunnel barrier. These changes are reflected in corresponding inelastic electron tunneling spectroscopy data.

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