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Transport Properties of SAM Molecular Diodes with Structural Tunability[1] VLADIMIR BURTMAN, VALY Z. VARDENY, ALEX NDOBE, University of Utah — A new molecular engineering approach is used to fabricate molecular junctions from self-assembled-monolayers (SAM) sandwiched between gold electrodes, with structural tunability based on two-component solid-state mixtures of molecular wires (1,4 methane benzene-dithiol; Me-BDT, and molecular insulator spacers (1-pentanethiol; PT). The electrical transport of the fabricated SAM diodes was investigated at various temperatures versus the ratio r between the molecular wires and insulators. At $r < 10^{-3}$ the diodes are dominated by the isolated molecular wires dispersed in the dielectric spacer matrix; from the conductivity vs. r we determined the value for the Me-BDT molecular resistance to be $4x10^8$ Ohm. We also found that the activation energy in these devices is $\sim$50 meV at low bias and high temperatures; and injection barrier of $\sim$1.5 eV at intermediate bias and low temperatures. At $r > 10^{-3}$ Me-BDT aggregates are formed in the PT matrix resulting in additional in-plane order and substantive changes in the transport properties.

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