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Transport through thiol SAMs: Effect of monolayer order, dynamics and temperature GEETHA DHOLAKIA, ELORET/NASA Ames Research Center, W. FAN, M. MEYYAPPAN — We discuss the self assembly and charge transport of organic thiol molecules and discuss the influence of structure, order and dynamics in the monolayer [1] on the transport and also the effect of temperature by scanning tunneling microscopy/spectroscopy (STM/S). Conjugated thiol molecular wires and organometals such as terpyridine metal complexes provide a new platform for molecular electronic devices. Molecular resolution STM imaging in vacuum reveals that the molecular wires adopt an incommensurate, almost vertical SAM structure with a rectangular unit cell, while terpyridine metal thiol complexes tend to lie flat on the Au(111) substrate. STS of the molecular wires show that inherent asymmetry in the molecular structure and asymmetric coupling to contacts results in asymmetric, weakly rectifying I-Vs. STS on alkanethiols do not show a marked temperature dependence down to 150K. We also show that packing and order greatly influence the transport measurements and that the presence of molecular order in the monolayer is very important for reproducible I-Vs. Thus a good control of the molecule-substrate interface needs to be ensured for device reliability. We also point out that molecular electronic devices need to be made tolerant to fluctuations as these cannot be totally eliminated in low dimensional soft systems. [1] Geetha R. Dholakia et. al, PHYSICAL REVIEW B 69, 153402 (2004).

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