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Electronic Transport through Organic Monolayer Devices DUNCAN STEWART, JASON BLACKSTOCK, CARRIE DONLEY, ZHIYONG LI, DOUGLAS OHLBERG, R. STANLEY WILLIAMS, Hewlett-Packard Laboratories, Palo Alto, CA USA, SEHUN KIM, KAIST, Daejeon, Korea, REGINA RAGAN, UC Irvine, Irvine, CA, USA — We report experimental studies of electronic transport through molecular monolayers. Particular emphasis is placed on combining detailed chemical, physical and electronic characterization in a single test structure, and to whatever degree possible, fabricating well-defined interfaces that enable quantitative chemical and physical analysis. To this end, we describe physical characterization of ultra-flat template-stripped Au and Pt metal electrodes including UHV-STM imaging and incorporation into a new stencil-based nanopore structure. In-situ XPS and IR spectroscopy are used to characterize the organic monolayers and the buried inorganic/organic interfaces. Using this well-characterized device structure, we present detailed I-V characterization including temperature dependence and IETS spectroscopy of several alkane self-assembled and Langmuir-Blodgett monolayers, correlating both electrical switching behavior and IETS spectral responses to the measured chemical and physical structure of the device.

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