Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Direct Observation of a Molecular Junction using High-Energy X-ray Reflectometry JULIAN BAUMERT, Brookhaven National Laboratory, MICHAEL LEFENFELD, Columbia University, ELI SLOUTSKIN, Bar-Ilan University, MOSHE DEUTSCH, Bar-Ilan University, COLIN NUCKOLLS, Columbia University, BEN OCKO, Brookhaven National Laboratory — Very little is known about the structure of organic molecular thin films at their rest potential. Further, it is not known whether the structure of these films is modified by an applied potential. We present a new x-ray scattering technique, which allows high-resolution structural studies of buried self-assembled monolayers (SAMs) that are sandwiched between silicon and mercury junctions. The high-energy x-ray beams, utilized in the present studies (32 keV), penetrate through the conducting silicon electrode. The x-ray reflectivity interference pattern thus provides information on the thickness and orientation of the molecules in the electronic junction. Our results, for alkane-thiol and alkane-silane layers, show that the SAMs form homogenous densely packed monolayers within the deeply buried interface. The thickness of these layers is compared with the SAMs prepared at the vapor/vacuum interfaces on mercury and silicon.

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Date submitted: 01 Dec 2004 Electronic form version 1.4