Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Organic Field Effect Transistor Interfaces Probed In-situ during operation by Sum Frequency Generation HONGKE YE, ASHRAF ABU-AKEEL, Department of Chemical and Biomolecular Engineering, JIA HUANG, HOWARD KATZ, Department of Materials Science and Engineering, DAVID H. GRACIAS, Department of Chemical and Biomolecular Engineering, Johns Hopkins University, Baltimore, Maryland 21218 — In order to gain a molecular level understanding of the electrical conduction in thin film organic semiconductors, we have integrated an electrical probe station with an SFG spectroscopy system. Thin film transistors consisting of organic semiconductors 5,5'-bis(4-hexylphenyl)-2,2'-bithiophene (6PTTP6) and pentacene, were fabricated on silicon substrates with top contacts. SFG spectra show strong correlations with the electrical characteristics measured. In particular, the SFG spectra of the interfaces changed with increasing gate voltage (Vg). For both 6pttp6 and pentacene the non-resonant SFG background correlated with the increase in conductivity (slope of the IV curve after turn on) measured of the semiconductor layer with increasing Vg. For 6pttp6 we observed that the dependency of the methylene peak intensity on gate voltage correlated well with the dependence of the saturation current on gate voltage. These results point to the fact that charging of molecules and the field effects in OFETs can be probed in-situ using SFG and electrical testing, and we can gain a molecular level understanding of OFET interfaces from the results.

David Gracias
Johns Hopkins University

Date submitted: 02 Dec 2005 Electronic form version 1.4