Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

High-resolution electrical characterization of polyaniline/p-type organic semiconductor interfaces in thin-film transistors KWANG SEOK LEE, TIMOTHY J. SMITH, University of Texas at Austin, CHRIS ZANGMEISTER, National Institute of Standards and Technology, JOUNG EUN YOO, KEITH J. STEVENSON, YUEH-LIN (LYNN) LOO — While the work functions of polyaniline (PANI) and gold are known to be similar (ca. 5eV), we found the electrical properties of PANI/ and gold/p-type organic semiconductor interfaces in dihexylthiophene (DHT-Ant) and pentacene thin-film transistors (TFTs) to be significantly different. Specifically, the current-voltage (IV) characteristics of DHT-Ant TFTs with PANI electrodes show current crowding in the saturation regime. Such current crowding is absent in DHT-Ant TFTs with gold electrodes. Surface potential measurements reveal reduced potential drops at the gold/DHT-Ant interface, relative to the PANI/DHT-Ant interface suggesting limited hole injection into DHT-Ant from PANI. In contrast, pentacene TFTs with PANI electrodes show near-ideal IV characteristics and negligible surface potential drops at the electrode/channel interface, whereas pentacene TFTs with gold electrodes exhibit significant potential drops at the electrode/channel. Hole injection thus appears to be more efficient from PANI than gold in pentacene TFTs, which can be directly correlated with the similar pentacene grain size and the identical fused ring orientation across the PANI/channel interface.

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Date submitted: 20 Nov 2006 Electronic form version 1.4