Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Complex Organic Semiconductor Devices Utilizing Threshold Voltage Shifting and Carrier Sign Reversal HOWARD KATZ, CHENG HUANG, JAMES WEST, Johns Hopkins University — We consider a range of materials and mechanisms that lead to nonvolatile switching in field-effect transistors made from organic semiconductors (OFETs). Charging of gate dielectrics, secondary dielectrics, and/or the semiconductor/dielectric interface can greatly shift the threshold voltage in these OFETs. The dielectrics can consist of nonpolar electrets or ferroelectric polymers. In the particular case of SiO_2 electret coated with a hydrophobic surface layer, the shift is permanent on the timescale of years and is in quantitative agreement with measured surface charge. The semiconductor perfluoro copper phthalocyanine is shifted from electron- to hole-carrying by application of sufficient field from a corona apparatus. Inverter circuits were built from pairs of OFETs based on a single semiconductor, differing only in the quantity of stored gate charge.

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Date submitted: 28 Nov 2005 Electronic form version 1.4