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Electronic Polarization at Pentacene/Polymer Dielectric Interfaces: Imaging Surface Potentials and Contact Potential Differences as a Function of Substrate Type, Growth Temperature, and Pentacene Microstructure YANFEI WU, GREG HAUGSTAD, C. DANIEL FRISBIE, University of Minnesota, UNIVERSITY OF MINNESOTA TEAM — Interfaces between organic semiconductors and dielectrics may exhibit interfacial electronic polarization, which is equivalently quantified as a contact potential difference (CPD), an interface dipole, or a vacuum level shift. Here we report quantitative measurements by Scanning Kelvin Probe Microscopy (SKPM) of surface potentials and CPDs across ultrathin (1-2 monolayer) crystalline islands of the benchmark semiconductor pentacene thermally deposited on a variety of polymer dielectrics (e.g., poly(methyl methacrylate), polystyrene). The CPDs between the pentacene islands and the polymer substrates are in the range of -10-+50 mV, they depend strongly on the polymer type and deposition temperature, and the CPD magnitude is correlated with the dipole moment of the characteristic monomers. Surface potential variations within 2 monolayer (3 nm) thick pentacene islands are approximately15 mV and may be ascribed to microstructure (epitaxial) differences. Overall, the microscopy results reveal both strong variations in interfacial polarization and lateral electrostatic heterogeneity; these factors ultimately should affect the transport properties of these interfaces in devices.

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