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Interfacial Charge Transfer in Nanoscale Polymer Transistors JEFFREY WORNE, RAJIV GIRIDHARAGOPAL, KEVIN KELLY, DOUGLAS NATELSON, Rice University, JOHN ANTHONY, University of Kentucky — Interfacial charge transfer plays an essential role in establishing the relative alignment of the metal Fermi level and the energy bands of organic semiconductors. While the details remain elusive in many systems, this charge transfer has been inferred in a number of photoemission experiments. We present electronic transport measurements in very short channel (L ¡ 100 nm) transistors made from poly(3-hexylthiophene) (P3HT). As channel length is reduced, the evolution of the contact resistance and the zero gate voltage conductance are consistent with such charge transfer. Short channel conduction in devices with Pt contacts is greatly enhanced compared to analogous devices with Au contacts, consistent with charge transfer expectations. Alternating current scanning tunneling microscopy (ACSTM) provides further evidence that holes are transferred from Pt into P3HT, while much less charge transfer takes place at the Au/P3HT interface. We have also begun to use these same techniques to investigate the nature of interfacial charge transfer between metal electrodes and pentacene. We use these data together with our previous results to develop a more complete picture of metal/organic interfaces.

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