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Ultra-thin body poly(3-hexylthiophene) transistors with improved short-channel performance CHENCHEN WANG, Applied Physics, Stanford University, JONATHAN RIVNAY, SCOTT HIMMELBERGER, Department of Materials Science and Engineering, Stanford Univerity, KIARASH VAKHSHOURI, ENRIQUE D. GOMEZ, Department of Chemical Engineering, The Pennsylvania State University, ALBERTO SALLEO, Department of Materials Science and Engineering, Stanford Univerity — The microstructure and charge transport properties of binary blend of regioregiolar (rr) and regiorandom(RRa) poly(3-hexylthiophene) (P3HT) are investigated. X-ray diffraction study shows vertical phase separation in the blend films, with rr-P3HT crystallized at the semiconductor/dielectric interface. These thin film transistors with layered structure preserve high field effect mobility when rr-P3HTcontents are reduced to as low as 5.6% where the channel thickness is only a few nanometers. As a result of this ultra-thin active layer at interface, short channel effects due to bulk currents are eliminated, suggesting a new route to fabricate high performance, small size and reliable electronic devices.

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