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**Nanoscale Orientation Effects on Carrier Transport in a Low-Band-Gap Polymer** BAN DONG, BINGYUAN HUANG, AARON TAN, PETER GREEN, University of Michigan — We show that the out-of-plane hole mobility of the low-band-gap polymer poly[4,8-bis-(2-ethylhexyloxy)-benzo[1,2-b:4,5-b']dithiophene-2,6-diyl-alt-4-(2-ethylhexyloxy-1-one)thieno-[3,4-b]thiophene-2,6-diyl] (PBDTTT-C) is film thickness dependence; and this behavior is associated with the morphology. Due to a geometric confinement and to polymer/substrate interactions, the average orientation of the chains in the thinnest films was predominantly parallel to the substrate. In this thickness range, the out-of-plane hole mobilities $\mu$ were necessarily low and $\beta$, a measure of the strength of the field dependence of the mobility, was largest. Within the framework of the Gaussian Disorder model, the relative value of $\beta$ suggests that the largest effect of positional disorder on the carrier transport was most significant in the thinnest films. The hole mobility $\mu$ increased and depended less on the electric field ($\beta$ decreases in magnitude) with increasing thickness, due evidently to the increased degree of orientation of the domains with respect to the direction of the field (normal to the interfaces). These findings demonstrated the profound impact of the substrate on the morphology and of the morphology on the charge carrier mobility.

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