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Microstructure and Charge Transport in pBTTT Thin Film Transistors CHENCHEN WANG, Department of Applied Physics, Stanford University, ALBERTO SALLEO, LUDWIG GORIS, Department of Materials Science and Engineering, Stanford University, IAIN MCCULLOCH, Chemistry Department, Imperial College, London, UK, MARTIN HEENEY, Materials Science Department, Queen Mary University, London, UK, ALEXANDER ZIEGLER, Max Planck Institute, Martinsried, Germany — The present work focused on the morphology and charge carrier mobility of poly(2,5-bis(3-alkylthiophen-2-yl)thieno[3,2-b]thiophenes) (pBTTT) films. In annealed pBTTT films on oxide functionalized with octyltrichlorosilane (OTS), TEM study shows that the large-scale terraces observed by AFM, which was believed to be the reason for high charge carrier mobility, are composed of smaller crystalline grains. Using the mobility edge model, we find that, compared with the film on oxide, the density of trap states at the band edge is reduced in the film on OTS, and it is about the same as the trap density in poly(3-hexylthiophene) (P3HT), which has lower carrier mobility. This result indicates that the higher room-temperature mobility of pBTTT (0.34 cm^2/Vs) compared to P3HT (0.02 cm^2/Vs) is due to a high quasi-free carrier mobility and not to a lower trap density as previously thought.

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