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A Blend Approach to P3HT Based Field Effect Transistor Performance Enhancement via Inclusion of 2,5-bis(3-dodecylthiophen-2-yl)thieno[3,2-b]thiophene PING-HSUN CHU, Georgia Institute of Technology, LEI ZHANG, University of Massachusetts, Amherst, JUNG OK PARK, MOHAN SRINIVASARAO, Georgia Institute of Technology, ALEJANDRO L. BRISEÑO, University of Massachusetts, Amherst, ELSA REICHMANIS, Georgia Institute of Technology — Improved OFET performance through a polymer-small molecule semiconductor blend approach was demonstrated. However, a number of serious issues remain. For example, the threshold voltage (Vth) of the blend OFETs is still at a relatively high value (|Vth|>10V), which is incompatible with most of portable electronics. Moreover, electrode treatment or thermal annealing is required to avoid a sacrifice in the device performance. Herein, a small molecule, 2,5-bis(3-dodecylthiophen-2-yl)thieno[3,2-b]thiophene (BTTT), is proposed to be incorporated within poly(3-hexylthiophene) (P3HT) polymer thin-films and is demonstrated to lead to overall improvement in transistor performance. The resultant blend OFETs exhibited approximately a 5-fold increase in charge carrier mobility, 10-fold increase in on-off current ratio and concomitantly, controlled the Vth as low as 1.7 V. It is worth noting that no pre- or post-treatment is required during the blend OFET fabrication process. Further, the thin-film deposition was conducted under ambient conditions using a volatile low boiling point solvent, suggesting a promising method for low-cost, high-throughput, large-area flexible device fabrication under non-stringent conditions.

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