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Probing Surface Glass Temperature of Polymer Films via Pentacene Growth Mode, Microstructure, and Thin-Film Transistor Performance[1] CHOONGIK KIM, ANTONIO FACCHETTI, TOBIN MARKS, Northwestern University — Pentacene-based organic thin-film transistors (OTFTs) have been extensively studied in organic electronics. In this study, we report the fundamental importance of the polymeric gate dielectric glass transition temperature on pentacene film growth mode, and microstructure and corresponding OTFT performance. From the knowledge that nanoscopically-confined thin polymeric films exhibit glass-transition temperatures deviated from the corresponding bulk materials, we show here that pentacene films grown on polymeric gate dielectrics at temperatures well-below their bulk glass transition temperature (T_g(b)) exhibit morphological/microstructural transitions and dramatic OTFT performance variations at a well-defined temperature [herein defined as the polymer surface glass transition temperature, or T_g(s)] characteristic of the polymer structure and independent of the film thickness. Our results demonstrate that TFT measurements represent a new methodology to probe polymer surface viscoelastic properties.

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