Interfacial Control of Polymer Dielectric Materials in Organic Thin-Film Transistors

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Organic thin-film transistors (OTFTs) have been extensively studied for organic electronics. In these devices, organic semiconductor-dielectric interface characteristics play a critical role in influencing OTFT operation and performance. In this study, we explore how the physicochemical characteristics of the polymer gate dielectric affects the thin-film growth mode, microstructure, and OTFT performance parameters of pentacene TFTs. Especially, the influence of the polymer gate dielectric surface viscoelastic properties (surface glass transition temperature) on overlying organic semiconductor film growth, film microstructure, and TFT response are investigated in detail. Based on the results, TFT measurements have been demonstrated to represent a new and sensitive methodology to probe polymer surface viscoelastic properties as well as the degree of polymer dielectric film crosslinking.