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Glass transition dynamics and charge carrier mobility in conjugated polyfluorene thin films HUI QIN, DAN LIU, TAO WANG, Wuhan University of Technology — Conjugated polymers are commonly used in organic optoelectronic devices, e.g. organic photovoltaics (OPVs), light-emitting diodes (LEDs) and field effect transistors (FETs). In these devices, the conjugated polymers are prepared as thin films with thicknesses in the range of tens to hundreds of nanometers, and are interfaced with different function layers made from organic or inorganic materials. We have studied the glass transition temperature (Tg) of poly(9, 9-dioctylfluorene)-co-N-(1, 4-butylphenyl)diphenylamine) (TFB) thin films supported on different substrates, as well as their SCLC charge carrier mobility in photodiodes. Both Monotonic and non-monotonic T_g deviations are observed in TFB thin films supported on Si/SiOx and PEDOT:PSS, respectively. With low to moderate thermal crosslinking, the thickness dependent Tg deviation still exists, which diminishes in TFB films with a high crosslinking degree. The vertical charge carrier mobility of TFB thin films extracted from the SCLC measurements is found increase with film thickness, a value increases from 1 to 50 x 10^{-6} cm^2 V^{-1} s^{-1} in the thickness range from 15 to 180 nm. Crosslinking was found to reduce the carrier mobility in TFB thin films. The Tg deviations are also discussed using the classic layered models in the literature. Our results provide a precise guide for the fabrication and design of high performance optoelectronic devices.

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