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Radical Polymer Utilization for Interfacial Improvement of Organic Field-Effect Transistors SEUNG HYUN SUNG, NIKHIL BAJAJ, JEFFREY RHOADS, GEORGE CHIU, BRYAN BOUDOURIS, Purdue University — Metal-semiconductor interfacial contact is one of the crucial factors for high-performance organic electronic device applications. In particular, the performance of organic field-effect transistors (OFETs) is critically dependent on the engineering of the interface between the organic semiconductor and the source/drain electrodes. Here, we modulate the performance of pentacene-based OFETs through the inclusion of a specific radical polymer, poly(2,2,6,6-tetramethylpiperidine-1-oxyl methacrylate) (PTMA), at the pentacene-gold electrode interface. Using a simple and fast inkjet printing method, the OFET performance is highly enhanced by the systematic deposition of a thin PTMA layer. The insertion of the radical polymer has an impact on the highly-improved OFET performance due to its redox charge transport ability and the amorphous nature allowing the stable growth of the pentacene. The synergistic effect facilitates the charge injection at the interface of the metal and organic semiconductor, resulting in the highly improved OFET performance. As such, the fundamental insights associated with radical polymers can be widened and their utilization as a highly-improved, low-cost interfacial modifier in myriad organic electronic devices is of great promise.

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