Reactive Dedoping Method for Non-Power-Driven Polymeric Schottky Junction Photodiode

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A simple and strategic junction engineering technology is reported to enhance non-power-driven polymeric Schottky junction photodiode performances by synergetic contributions of reactive dedoping effects. It is shown that dedoping poly(3-hexylthiophene-2,5-diyl) (P3HT) films with 1-propylamine (PA) solution meaningfully decreases not only defect-acceptor density but also intrinsic doping level, resulting in significantly enlarged depletion region width of metal-polymer Schottky junctions. Also, it is shown that non-solvent effects of PA-dedoping process further make paracrystalline disorder lower and thus, charge carrier mobility higher. As a result of such synergetic merits of the PA-dedoping method, non-power-driven green-selective polymeric Schottky junction photodiodes are reported with a high specific detectivity over 6×10^{12} Jones, low noise-equivalent power of 5.05×10^{-14} $WHz^{-0.5}$, fast temporal response of 26.9 μs, and wide linear dynamic range of 201 dB.