

Subsequent doping and dedoping process for fine patterning/stacking of all-polymer optoelectronic devices

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Polymer electronics have limitations in precisely patterning/stacking polymer semiconductors. With the assistance of a molecular oxidizing agent and reducing agent, for donor and acceptor semiconductors, respectively, the precise patterning and stacking of various polymer semiconductors could be possible. Such doping-induced solubility control methods have been previously well-developed, however, various electronic devices using these methods were exceedingly limited. To pattern/stack various polymers, it is necessary to satisfy two important strategies: doping for desolubilizing polymers and dedoping for recovering the genuine characteristics of each polymers. The reversible optophysical properties of both p- and n-type polymer semiconductors after doping and dedoping are well-observed. Based on this doping-dedoping interplay, various high-performance electronic devices are demonstrated: 1) all-polymer patterned complementary inverter, 2) all-polymer stacked planar heterojunction photodiode, and 3) all-polymer patterned ambipolar transistor.