Nanostructuring Polymer Solar Cells (PSCs) through Cooperative Orthogonal Non-Covalent Interactions

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Nanostructuring organic polymers and organic/inorganic hybrid materials and controlling blend morphologies at the molecular level are the prerequisites for modern electronic devices including biological sensors, light emitting diodes, memory devices and solar cells. To achieve all-around high performance, multiple organic and inorganic entities, each designed for specific functions, are commonly incorporated into a single device. Accurate arrangement of these components is a crucial goal in order to achieve the overall synergistic effects.

In this presentation, I will describe our research efforts toward a bottom-up approach to construct device favorable nanostructures consisting of multiple components with precise spatial placement and designated functionalities. Our method is built upon supramolecular chemistry through cooperation of several orthogonal non-covalent interactions including BCP self-assembly, P3HT crystallization, fullerene aggregation and complementary hydrogen bonding. By precisely nanostructuring polymer solar cell active layers, we were able to obtain devices with improved efficiencies and enhanced stabilities.