

Polymer Solar Cell: Design Principle for High Power Conversion Efficiency

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There have been extensively studies on the preparation of photovoltaic devices consisting of organic and polymeric heterojunction materials because of easy processability, low cost of fabrication, and flexible properties. Based on poly(3-hexyl thiopene) (P3HT) and fullerene derivative ([6,6]-phenyl C61-butyric acid methyl ester: PCBM), the power conversion efficiency (η) could now reach 5~6 %. However, η might be even improved when a new design concept is employed. In this study, we used nanoporous template based on block copolymer or alumina membrane to prepare high aligned ultrahigh density array of conducting polymer nanowires. These are directly connected to the anode, which provides excellent pathway for generated holes. The structures are examined by high resolution transmission electron microscopy, X-ray diffraction, and current-sensing atomic force microscopy. The high aligned polymer chains along the nanowires are due to the confinement effect.