

## Annealing effect of hybrid solar cells based on poly (3-hexylthiophene) and zinc-oxide nanostructures

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### Abstract

The structural growth and optical and photovoltaic properties of the organic–inorganic hybrid structures of zinc oxide (ZnO)-nanorods/poly-3-hexylthiophene (P3HT) and two variations of organic polymer blends of ZnO/P3HT:C(sub60) fullerene and ZnO/P3HT:[6,6]-phenyl C(sub61) butyric acid methyl ester were studied in detail during thermal annealing. The ordering of the P3HT nanocrystals increased during annealing, which also improved hole transport in the hybrid structures. The optical constants of the ZnO/P3HT:[6,6]-phenyl C(sub61) butyric acid methyl ester (PCBM) films elevated with annealing temperature due to the improved crystallisation induced by the formation of P3HT crystalline domains. As a result, a maximum power conversion efficiency of approximately 1.03% was achieved for the annealed ZnO/P3HT: PCBM device at 140 °C. These findings indicate that ZnO-nanorods/P3HT: PCBM films are stable at temperatures up to 160°C.