Hybrid polymer/metal oxide solar cells based on ZnO columnar structures

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Abstract

We focus on the preparation of hybrid polymer/zinc oxide (ZnO) solar cells, in which the metal oxide consists of ZnO columnar structures grown perpendicularly on a flat, dense "backing" layer, as a means to provide a direct and ordered path for photogenerated electrons to the collecting electrode. We used scanning electron microscopy, absorption spectroscopy and photovoltaic device measurements to study the morphology and device performance of the prepared structures. Different solution chemical routes were investigated for the synthesis of the inorganic device components, i.e. the ZnO columnar structures and the "backing" layers, which act as a seed-growth layer for the ZnO rods. The growth of the ZnO rods was dependent on the morphological and structural characteristics of the seed layer and moreover, the seed layer itself was also affected by the synthetic conditions for ZnO rod growth. Different polymers (high hole-mobility MEH-PPV based polymer and P3HT) were compared in these structures and power conversion efficiencies of 0.15 and 0.20% were achieved under 1 Sun illumination, respectively. Results are discussed in terms of the optoelectronic properties of the polymers.

Indexed keywords

Engineering controlled terms: Absorption spectroscopy; Electrodes; Electrons; Molecular structure; Morphology; Polymers; Scanning electron microscopy; Zinc compounds

Engineering uncontrolled terms: Hybrid polymer/metal oxide solar cells; Photogenerated electrons; Photovoltaic device measurements; ZnO columnar structures

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