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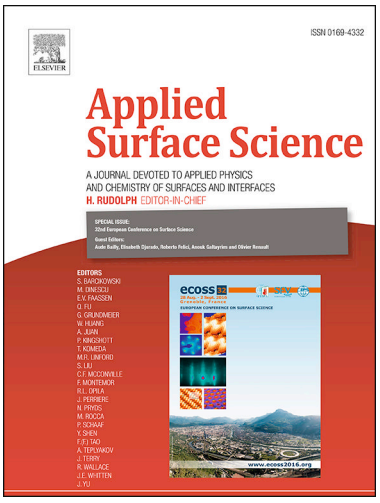

Full Length Article

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Formation and characterization of one-dimensional ZnS nanowires for ZnS/P3HT hybrid polymer solar cells with improved efficiency

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Abstract

Photovoltaic performance of hybrid devices consisting of zinc sulphide (ZnS) one-dimensional (1D) nanowires and P3HT polymer was studied. As we previously reported, hybrid solar cell architecture based on ZnS, where open circuit voltage reaches high value, deserves special attention. In this work, compared to our previous research, zero-dimensional (0D) ZnS nanoparticles were replaced by one-dimensional (1D) ZnS nanowires synthesized simply with a hot injection method. In order to improve the charge transport in hybrid solar cells, additionally, the initial ligand of octadecylamine (ODA) was partially replaced by the o-phenylenediamine. The as-synthesized products were characterized using X-ray diffraction (XRD), transmission electron microscopy (TEM), UV-Vis spectroscopy, photoluminescence (PL) spectroscopy, energy dispersive spectroscopy (EDS), Fourier transform infrared (FT-IR) and nuclear magnetic resonance (NMR) spectroscopy. The performance of the devices significantly depended on the concentration of one-dimensional ZnS nanowires incorporated in the active layer (optimal 10 % wt.) and their morphology. In the presented work, we showed that devices based on 1D ZnS nanowires were distinguished by the high value of V_{oc} parameter (with the maximum achieved value of 0.634V). Also we investigated the spatial

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