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Metal oxide nanostructures-containing organic polymer hybrid solar cells: Optimization of processing parameters on cell performance

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Abstract

We report the chemical synthesis of various ZnO nanostructures and TiO2 nanoparticles and their dispersion in a P3HT matrix. The photoluminescence studies revealed improved charge transport in the active layer of the optimized TiO2 nanoparticles at a wt. ratio of 0.33, which demonstrated enhanced effective exciton dissociation at the interfaces between the P3HT, ZnO and TiO2 domains. The influence of the synthesis reaction time for the various ZnO nanostructures and TiO2 nanoparticles on the solar cell performances was investigated by varying the TiO2 concentration. The device containing a 0.33 wt. ratio of TiO2 nanoparticles in ITO/SnO2/P3HT:ZnO(24-h):TiO2/MoO3/Al ternary system showed a maximum efficiency of 2.84% under AM 1.5G illumination.