Effect of Cobalt Doping on ZnO/CuO Heterojunction Solar Cell

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In this study, we report optical and electrical characterization of nanostructured ZnO/CuO heterojunctions with cobalt doping. CuO p-layer was deposited by DC sputtering and ZnO nanorods (n-layer) were fabricated on fluorine doped tin oxide (FTO) substrate by a chemical bath deposition technique. We investigated the structural, optical, and electrical properties of the ZnO/CuO heterojunction. Optical properties were investigated using UV-VIS spectroscopy. Absorption measurements show a decrease in electronic band gap with increase in cobalt concentration. Current- Voltage (I-V) measurements show that as the cobalt percentage increased from 0-20%, the power conversion efficiency of the CuO/ZnO solar cell increased from 1.70% to 2.93%. This increase in conversion efficiency also resulted in changes in fill factor (62.09% - 69.93%), current density (3.62 mA/cm$^2$ – 5.07 mA/cm$^2$), and open circuit voltage (0.56 V - 0.61 V). Our external quantum efficiency (EQE) measurements show an increase in EQE from 5.11% to 9.34% in the visible range with doping. We will discuss the implications of these results based on cobalt incorporation in ZnO nanostructure.

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