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Effect of Copper Oxide Nanoparticles as a barrier for Efficiency Improvement in ZnO Dye-Sensitized Solar Cells

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CuO nanoparticles (CuO NPs) were used as a barrier layer in ZnO dye-sensitized solar cells (DSSCs) to obtain high power conversion efficiency. The barrier layer was investigated in terms of the size of CuO NPs by varying power of pulsed Nd:YAG (1064 nm) laser ablation. Morphological and optical properties of CuO NPs were characterized by transmission electron microscopy (TEM), UV-visible spectrophotometry (UV-vis) and dynamic light scattering (DLS). It was found that the CuO NPs are rather spherical in shape with diameter in between 20 - 132 nm. In addition, the energy gap of CuO decreases with the increase of CuO NPs size. The power conversion efficiency of ZnO DSSCs was measured under illumination of simulated sunlight obtained from a solar simulator with the radiant power of 100 mW/cm^2. The results showed that the ZnO DSSC with the CuO NPs with size of 37 nm exhibits the optimum power conversion efficiency of 1.01% which is higher than that of one without CuO NPs. Moreover, the power conversion efficiency of the ZnO DSSCs decreases with the increase of CuO NPs size.

Keywords: CuO nanoparticles, dye-sensitized solar cells, laser ablation, ZnO DSSCs

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