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Magnetic Properties and Photovoltaic Applications of ZnO:Mn Nanocrystals

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Abstract

A simple and large-scale synthetic method of Mn doped ZnO (ZnO:Mn) was developed in this work. ZnO:Mn nanocrystals with hexagonal structure were prepared by thermal decomposition of zinc acetate and manganese acetate in the presence of oleylamine and oleic acid with different temperatures, ligand ratios, and Mn doping concentrations. The particle size (47-375 nm) and morphology (hexagonal nanopyramid, hexagonal nanodisk and irregular nanospheres) of ZnO:Mn nanocrystals can be controlled by the ratio of capping ligand, reaction temperature, reaction time and Mn doping concentration. The corresponding optical and magnetic properties were systemically studied and compared. All samples were found to be paramagnetic with antiferromagnetic (AFM) exchange interactions between the Mn moments in the ZnO lattice, which can be affected by the reaction conditions.

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