

Preparation of Fe-Doped ZnO Ferromagnetic Semiconductor by Sol-Gel Method With Hydrogen Treatment

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Zn_{1-x}Fe_xO ($x = 0.00, 0.01, 0.03, 0.05, 0.07$, and 0.10) compounds were fabricated by the sol-gel method. The crystal structure and magnetic properties were investigated as a function of doped Fe concentration. Specifically, we have used hydrogen treatment for the control of phase separation. The X-ray diffraction patterns show that the wurzite structure of ZnO does not change for the doping range below $x = 0.07$. Furthermore, we could not find any Fe cluster or phase separation in the X-ray diffraction patterns. The Fe-doped ZnO indicate ferromagnetic behaviors with the Curie temperature higher than room temperature. Then, the magnetic moment per Fe atom increased with increasing Fe concentration.

Index Terms—Diluted magnetic semiconductor (DMS), ferromagnetic, hydrogen treatment, spintronics.