

Enhanced ferromagnetic properties of diluted Fe doped ZnO with hydrogen treatment

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Abstract

The single-phase diluted magnetic Fe-ion (5%) doped ZnO powders were prepared by solid-state reaction method. The powders were annealed in Ar or Ar/H₂(5%) atmosphere at 1200 °C. The crystal structure, electric and magnetic properties for the Zn_{0.95}Fe_{0.05}O powders have been studied with X-ray diffraction (XRD) vibrating sample magnetometer, resistance and Hall measurement. All the peaks for the XRD pattern of samples belong to the hexagonal (*P6₃mc*) lattice of ZnO, and no indication of a secondary phase. The lattice parameters for the Zn_{0.95}Fe_{0.05}O with an annealing in Ar/H₂(5%) atmosphere were $a_0 = 3.256 \text{ \AA}$ and $c_0 = 5.206 \text{ \AA}$ at room temperature. The hysteresis curve for the Zn_{0.95}Fe_{0.05}O at room temperature was enhanced ferromagnetic behaviour with an annealing in Ar/H₂(5%) atmosphere. We give an explanation for enhanced ferromagnetic behaviour with H₂ treatment by electric properties.

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