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Mössbauer studies of ferromagnetism in Fe-doped ZnO magnetic semiconductor

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Abstract

$\text{Zn}_{1-x}\text{Fe}_x\text{O}$ ($x = 0.01, 0.02, 0.03$) compounds were fabricated using the solid-state reaction method. In order to determine the magnetic behavior and ionic state of the doped transition metal (^{57}Fe) in ZnO, we carried out Mössbauer measurements at various temperatures ranging from 13 to 295 K. Mössbauer spectra for $\text{Zn}_{0.97}\text{Fe}_{0.03}\text{O}$ at 13 K have shown the ferromagnetic phase (sextet) and paramagnetic phase (doublet), but the only paramagnetic phase (doublet) is seen at 295 K. The hysteresis loop below 77 K for $\text{Zn}_{0.97}\text{Fe}_{0.03}\text{O}$ indicated the coexistence of ferromagnetic and paramagnetic phases.

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