

Ferromagnetic effects on transition metal doped Ga₂O₃-based semiconductor

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Received 27 June 2004, accepted 14 October 2004

Published online

PACS 61.66.Fn, 75.50.Pp, 76.80.+y

Single phases of polycrystalline Ga_{2-x}TM_{2x}O₃ (x=0.00, 0.05, 0.10) powder samples were prepared by a standard solid-state reaction method. The X-ray diffraction patterns of the Ga_{2-x}TM_{2x}O₃ (x=0.00, 0.05, 0.10) powders showed no detectable TM phase. All the peaks for the X-ray diffraction patterns of samples belong to the monoclinic (C2/m) lattice of β-Ga₂O₃. The lattice parameters for the Ga_{1.8}Fe_{0.2}O₃ and Ga_{1.8}Mn_{0.2}O₃ are found to be $a_0 = 12.264 \text{ \AA}$, $b_0 = 3.047 \text{ \AA}$, $c_0 = 5.820 \text{ \AA}$, $\beta = 103.814^\circ$ and $a_0 = 12.218 \text{ \AA}$, $b_0 = 3.044 \text{ \AA}$, $c_0 = 5.810 \text{ \AA}$, $\beta = 103.852^\circ$ at room temperature. The hysteresis curve at the room temperature for the Ga_{2-x}Fe_{2x}O₃ (x=0.05, 0.10) powders was attributed to a paramagnetic and to a ferromagnetic phase. As the TM doping increased, the magnetization and the ferromagnetic effect were both increased.