phys. stat. sol. (a) **189**, No. 3, 889–892 (2002)

Magnetic Properties of Nanocrystalline $Co_{0.9}Zn_{0.1}Fe_2O_4$

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(Received May 1, 2001; accepted September 30, 2001)

Subject classification: 75.50.Gg; 75.50.Ss; 75.50.Tt; 75.60.Ej; 75.70.Ak; S11.2

Nanocrystalline Co–Zn ferrite films grown on thermally oxidized silicon wafers were fabricated by a sol–gel method. Magnetic and structural properties of the films were investigated using X-ray diffraction, atomic force microscopy (AFM), scanning electron microscopy, Auger electron spectroscopy, and vibrating sample magnetometer (VSM). Ferrite films annealed above 673 K had only a spinel structure without any preferred crystalline orientation. In polycrystalline thin films, their composition was confirmed to be Co:Zn:Fe:O = 0.9:0.1:2.0:4.0 and there was no observation of inter-diffusion between the ferrite film and the substrate. Images of AFM show that their rms surface roughness was less than 5 nm and that the size of grains was about 48 nm for annealing temperatures greater than 1073 K. The results of VSM measurement show that the films had a moderate saturation magnetization and that there was no significant difference of their magnetic properties while applying an external field parallel and perpendicular to planes of the films. The maximum value of the coercivity was 1900 Oe for Co–Zn ferrite thin film annealed at 873 K.