phys. stat. sol. (a) **189**, No. 3, 883–887 (2002)

Structural and Magnetic Properties of $CoAl_{0.1}Fe_{1.9}O_4$ Thin Films Prepared by a Sol–Gel Method

Sam Jin Kim (a), Woo Chul Kim (a), In Bo Shim (a), Chul Sung Kim (a), and Seung Wha Lee (b)

(a) Department of Physics, Kookmin University, Seoul 136-702, Korea

(b) Department of Electronics Engineering, Chungju National University, Chungbuk, 380-702, Korea

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

Subject classification: 61.10.Kw; 68.37.Ps; 75.70.Ak; 81.20.Fw; S10.15

Thin films of Al substituted cobalt ferrite layers on thermally oxidized silicon wafers were fabricated by a sol–gel method with various annealing temperatures. The structural and magnetic properties of the films were investigated with a X-ray diffractometer, a vibrating sample magnetometer (VSM) and atomic force microscopy (AFM). The crystallization temperature for $CoAl_{0.1}Fe_{1.9}O_4$ powder was determined to be 390 °C by using thermogravimetry analysis (TGA) and differential thermal analysis (DTA). The crystal structure is found to be a single cubic spinel structure without any preferred crystallite orientation. Lattice constants monotonically decreased from 8.379 to 8.362 Å with increasing annealing temperature from 400 to 800 °C. Increasing the annealing temperature from 300 up to 800 °C, the grain size increased from 80 up to 250 Å, while the surface roughness was minimized at 700 °C to a value of 2.0 nm. Parallel and perpendicular coercivity at room temperature showed maximum value in the sample annealed at 600 °C and their values were 3300 and 2700 Oe, respectively. Coercivity is strongly dependent on not only annealing temperature but also surface roughness.