Magnetic Properties of Water-Based Sol-Gel Derived $BaFe_{12}O_{19}/SiO_2/Si(100)$ Thin Films

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***Abstract*—Thin films with barium hexaferrite (BaM) layers on thermally oxidized silicon wafers were fabricated by water-based sol-gel method. Polycrystalline $BaFe_{12}O_{19}/SiO_2/Si(100)$ thin films were characterized with Rutherford backscattering, x-ray diffraction, vibrating sample magnetometer, and atomic force microscope as well as Fourier transform infrared spectroscopy (FT-IR). The thin films were annealed at 600–900 °C in air for 2 hours. The pattern for the sample annealed at a temperature above 650 °C indexed well on the M-type hexagonal structure and no other phases were detectable. The films were composed of uniformly distributed hexagonal-type grains, with diameters between 400 and 600 Å. Surface roughness of the films was between 20 and 40 Å. The perpendicular coercivity $H_{C\perp}$ and in-plane one $H_{C//}$ were 4766 Oe and 4480 Oe, respectively, at room temperature under an applied field of 10 kOe annealed at 650 °C for 2 hours.**

***Index Terms*—Ba–ferrite, sol-gel, thin films.**