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Barium Hexaferrite Thin Films Prepared by the Sol-Gel Method

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Nano-crystalline hexaferrite $BaFe_{12}O_{19}$ (BaM) thin films have been prepared by the sol-gel method. A solution of Ba-nitrate and Fe-nitrates was dissolved in solvent with the stoichiometric ratio Ba/Fe=1/10. Films were spin-coated onto SiO_2/Si substrates, dried and then heated in air at various temperatures. In films prepared at a drying temperature T_d=250 °C and a crystallizing temperature 650 °C, single-phase BaM was obtained. High coercivities were obtained in these nano-crystalline thin films, 4~5.5 kOe for hexaferrite. Polycrystalline BaM/SiO_2/Si(100) thin films were characterized by Rutherford backscattering (RBS), thermogravimetry (TGA), differential thermal analysis (DTA), x-ray diffraction (XRD), and vibrating sample magnetometry (VSM), as well as Fourier transform infrared spectroscopy (FTIR). The perpendicular coercivity $H_{C\perp}$ and in-plane coercivity $H_{C//}$ after annealing at 650 °C for 2 hours were 4766 Oe and 4480 Oe, respectively, at room temperature, under a maximum applied field of 10 kOe.