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P-01 HIGH MAGNETIC PERFORMANCE IN Al-SUBSTITUTED $BaFe_{12}O_{19}$ NANOPARTICLES BY A WET CHEMICAL PROCESS

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In order to understand the magnetic recording behavior, it is important to study the coercivity, anisotropy, and saturation magnetization as well as small particle sizes. The coercivity is closely related to the magnetic anisotropy, which can be modified by substituting Fe^{3+} with other ions. In our study, a wet chemical process has prepared Al-substituted barium ferrite nanoparticles $BaFe_{11}AlO_{19}$. Structural and magnetic properties of $BaFe_{11}AlO_{19}$ powers were characterized with an x-ray diffractometer, a vibrating sample magnetometer, and Mössbauer spectroscopy. The results of x-ray diffraction measurements showed that the $BaFe_{11}AlO_{19}$ had an *M*-type hexagonal structure with lattice parameters a=5.871, c=23.900 Å and x-ray density ρ_x=5.194 g/cm^3. The particle size was 37 nm. Mössbauer spectra of $BaFe_{11}AlO_{19}$ measured at various absorber temperatures of 15-800 K. Its Curie temperature is found to be 700 ± 5 K. The average hyperfine field H_{hf}(T) of the $BaFe_{11}AlO_{19}$ shows a temperature dependence of $[H_{hf}(T)-H_{hf}(0)]/H_{hf}(0)=-0.34(T/T_C)^{5/2}-0.05(T/T_C)^{3/2}$ for $T/T_C<0.7$, indicative of spin-wave excitation. The anisotropy fields H_A was 21.2 kOe and anisotropy constant K_1 was 2.86×10^6 erg/cm^3 at room temperature, as determined the law of approach to saturation (LAS). The saturation magnetization was 44.3 emu/g and the coercivity was 7.56 kOe.