Mössbauer Studies and Magnetic Properties of $BaFe_{12-x}Al_xO_{19}$ Grown by a Wet Chemical Process

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Abstract—Polycrystalline $BaFe_{12-x}Al_xO_{19}$ powders ($0.0 \leq x \leq 4.0$) were fabricated by a wet chemical process. Magnetic properties and crystalline structure were investigated by using an X-ray diffractometer, vibrating sample magnetometer, and Mössbauer spectroscopy. The result of X-ray diffraction patterns shows that the a and c lattice parameters were decreased with increasing x from $a = 5.901$ Å and $c = 23.243$ Å for $x = 0.0$, to $a = 5.818$ Å and $c = 22.754$ Å for $x = 4.0$. The saturation magnetization and the coercivity of $BaFe_{10}Al_2O_{19}$ were 30.2 emu/g, 8.7 kOe, respectively, at room temperature under an applied field of 15 kOe. With increasing x, the relative intensity of octahedral sites has been obviously decreased. The authors interpreted the decreasing of relative area ratio of octahedral sites in Mössbauer spectra as closely related to the Al^{3+} occupation of octahedral sites.

Index Terms—Anisotropy field, barium ferrite, Mössbauer, wet chemical process.