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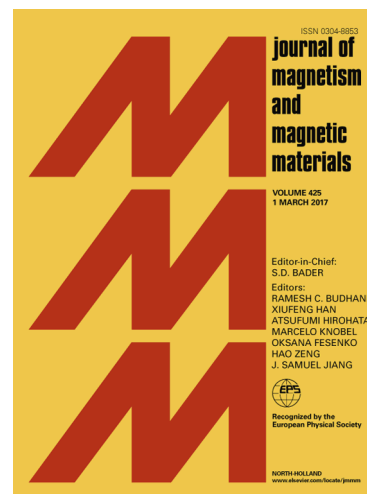
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Effect of Al on the microstructure, magnetic and millimeter-wave properties of high oriented barium hexaferrite thin films

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ABSTRACT: The microstructure, magnetic and millimeter-wave properties of high oriented barium hexaferrite ($\text{BaAl}_x\text{Fe}_{12-x}\text{O}_{19}$) thin films with Al doping level x from 0 to 2 are reported. The films were grown on Pt/TiO₂/SiO₂/Si substrate by Sol-gel method. It is found that with increasing x from 0 to 2 the hexagonal grain disappear, together with Curie temperature dropped from 449 °C to 332 °C and saturated magnetization ($4\pi M_s$) decreased from 3.8 kG to 1.9 kG, it is attributed to the fact that the Fe ions were substituted by non-magnetic Al ions, leading to the Fe³⁺-O-Fe³⁺ super-exchange interaction became weak. The ferromagnetic resonance (FMR) measurement showed that the FMR linewidths is as low as 113Oe @ 58GHz, and the FMR frequency shifted to higher frequency range when increasing Al doping level. These result offer the potential application of barium ferrite thin films in tunable millimeter wave devices such as filter, circulator and isolator.

Key words: barium hexaferrite; thin films; millimeter-wave properties; Sol-gel method

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