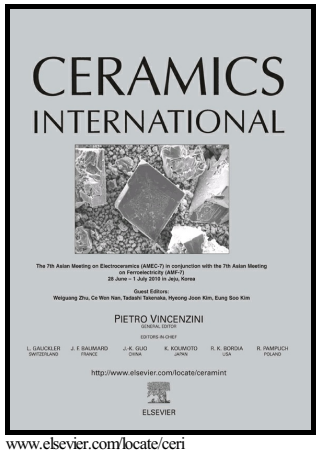

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Effect of annealing temperature on the structural and magnetic properties of Ba-Pb-hexaferrite powders synthesized by sol-gel auto-combustion method

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Abstract

The annealing temperature (T_a) dependent development in phase purity, morphology and magnetic properties of $Ba_xPb_{1-x}Fe_{12}O_{19}$ (x = 0, 0.2, 0.4, 0.6, 0.8 and 1) powders synthesized via sol-gel auto-combustion route were studied. The hexagonal phase of $PbFe_{12}O_{19}$ forms directly via solid-state-reaction between α-Fe_2O_3 and PbO during annealing of the combustion product at T_a ~ 900 °C, but the $BaFe_{12}O_{19}$ phase forms at T_a ~ 1200 °C through the formation of $BaFe_2O_4$ and α-Fe_2O_3 intermediate-phases at low T_a. The Ba_xPb_{1-x} $Fe_{12}O_{19}$-phase purity of the sample depends on T_a. For T_a > 1000 ºC, PbO evaporates from Pb-containing samples. With increasing T_a, growth of hexagonal-shaped sharp-edged particles was observed for Barium-rich samples, however, the sharp-edges dissolute for Lead-rich samples. High saturation magnetization was observed for Ba-rich samples annealed at 1100 ºC. For all the studied samples, magnetic coercivity increases with x but decreases with T_a. The magnetic properties of the samples were correlated with its structure, microstructure and grain-size.

Keywords: Ba-Pb hexaferrites; High temperature annealing; Mössbauer spectroscopy; grain size; magnetic coercivity.