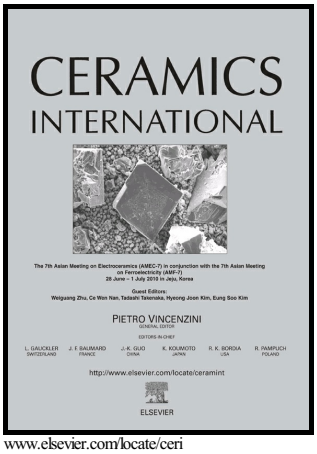

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Crystal structure and multiferroic behavior of perovskite $YFeO_3$

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Abstract

We present a study of multiferroic properties of $YFeO_3$ synthesized by means of high-energy ball milling assisted by annealing at low temperature. Fe_2O_3 and Y_2O_3 powders were mixed in a stoichiometric ratio, milled for 5 h, pressed and annealed at temperature from 773 to 1073 K. X-ray diffraction (XRD) analysis confirmed the formation of single-phase orthorhombic structure. Magnetic hysteresis loops, at room temperature, from vibrating sample magnetometry show the transition from ferromagnetic order to G-antiferromagnetic order, related to the transformation from amorphous to crystalline orthorhombic single phase. The value of Néel temperature of single phase $YFeO_3$ was obtained at 595 K, lower than previously reported. Dielectric behavior at room temperature of $YFeO_3$ single-phase sample shows a direct dependence with frequency of both dielectric constant and dielectric loss, in good agreement with Maxwell-Wagner effect. A fit made using Cole-Cole equation shows that the Low Temperature Dielectric Relaxation, LTDR, corresponds to a Debye-type relaxation. Finally, it was found that AC conductivity (σ_{AC}) increases linearly with frequency. All results show that $YFeO_3$ synthesized by high-energy ball milling assisted with annealing possess a multiferroic behavior.

Keywords: Yttrium ferrite, $YFeO_3$, multiferroic, mechanochemical processing, high-energy ball milling.