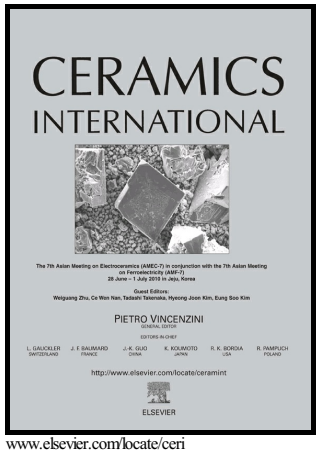

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Nb modified structural, magnetic and magnetocaloric properties of double perovskite $Ba_2FeMo_{1-x}Nb_xO_6$

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Abstract

A systematic study focusing on the effect of Niobium (Nb) doping on the structural, magnetic and magnetocaloric properties of Ba_2FeMoO_6 samples is presented here. The samples of interest $Ba_2FeMo_{1-x}Nb_xO_6$ ($0 \leq x \leq 0.4$) were prepared using the solid state reaction method and were confirmed to possess a cubic structure with Fm-3m space group using the X-ray diffraction analysis and Rietveld refinement. A second order of ferromagnetic phase transition was recorded in both the pure as well as the Nb doped samples using the temperature dependent magnetization and Arrott plots analysis. The pristine Ba_2FeMoO_6 (BFMO) sample indicated a spontaneous magnetization (34.6 emu/g at 100 K) with a relatively sharp magnetic transition at the Curie temperature (T_C) of 315 K as compared to the doped samples. A magnetic entropy change of 0.93 $Jkg^{-1}K^{-1}$ at an applied magnetic field of 2.5 T was measured for the pure BFMO sample. The doped BFMO samples with Mo partially substituted by Nb however, were observed to effectively modify the T_C accompanied by a decrease in magnetization. The results investigated in this work suggest that the magnetic and magnetocaloric properties of the BFMO can be tailored by controlled Nb doping which is of significant importance in order to realize the numerous potential applications of the material in the magnetic refrigeration technology.