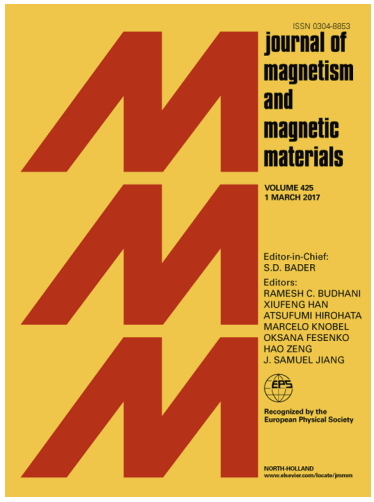

Investigation of Structural and Magnetic Properties of $Nd_{0.7}Ba_{0.3}Mn_{1-x}Ti_xO_3$ (x = 0.05, 0.15 and 0.25) Manganites Synthesized Through a Single-Step Process

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Investigation of Structural and Magnetic Properties of $Nd_{0.7}Ba_{0.3}Mn_{1-x}Ti_xO_3$ (x = 0.05, 0.15 and 0.25) Manganites Synthesized Through a Single-Step Process

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Abstract: The polycrystalline $Nd_{0.7}Ba_{0.3}Mn_{1-x}Ti_xO_3$ (x = 0.05, 0.15 and 0.25) perovskite manganites have been synthesized using combustion synthesis method followed by single-step calcination process. Rietveld analysis of the X-ray powder diffraction (XRD) patterns reveals that the samples crystallize in single phase body-centered orthorhombic crystal structure with space group Imma. The lattice parameters and unit cell volume increase exponentially with doping of Ti^{4+} ions for $Nd_{0.7}Ba_{0.3}Mn_{1-x}Ti_xO_3$ (x = 0.05, 0.15 and 0.25). The temperature dependence of magnetization reveals that all samples undergo transition from paramagnetic (PM) to ferromagnetic (FM) phase on cooling below room temperature. The values of Curie temperature (T_C), Curie-Weiss temperature (T_{CW}) and experimental effective paramagnetic moment (μ_{eff}^{exp}) decrease exponentially on the doping of Ti^{4+} ions. The field dependent magnetization measurements reveal coexistence of FM and antiferromagnetic (AFM) states in the low-temperature region. The experimentally observed saturation moment (μ_{sat}^{exp}) of all the samples is lower than the theoretically calculated values and decreases exponentially with doping of Ti^{4+}, due to AFM component in the FM ordering. The negative slope in the low field region of the M^2 vs. H/M Arrott-plots for all the samples reveals that $Nd_{0.7}Ba_{0.3}Mn_{1-x}Ti_xO_3$ manganites exhibit a first-order magnetic phase transition. The critical exponents β, γ and δ were estimated for $Nd_{0.7}Ba_{0.3}Mn_{1-x}Ti_xO_3$ perovskites.

"Keywords: Perovskite Manganite; Combustion Synthesis; X-Ray Diffraction; Rietveld Refinement; Double Exchange Interaction; Critical Exponent."