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Effect of Co substitution on magnetic ground state in $\text{Sm}_{0.5}\text{Ca}_{0.5}\text{MnO}_3$

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Abstract: The effect of cobalt doping on the structural and magnetic properties of polycrystalline $\text{Sm}_{0.5}\text{Ca}_{0.5}\text{Mn}_{1-x}\text{Co}_x\text{O}_3$ ($0 \leq x \leq 0.20$) has been studied. Powder X-ray diffraction (XRD), dc magnetization and ac susceptibility measurements have been performed. The orthorhombic deformation caused by the Jahn-Teller (JT) effect can be counterbalanced by Co^{3+} doping. Meanwhile, antiferromagnetic (AFM), spin glass (SG) and phase separation (PS) ferrimagnetic states appear, successively, with the increase of x . The critical slowing down model and the dynamic scaling equation were applied in some samples. The existence of two distinct length scales for SG and finite FM (ferromagnetic) order is the source of the progressive deviation which exists in the dynamic scaling fitting for $x = 0.05$. Moreover, the small peaks at ~ 8 K in $\chi''(T)$ curves are believed to be induced by the canted moments of Mn ions as observed in $\text{Nd}_{2/3}\text{Ca}_{1/3}\text{MnO}_3$.

Keywords: Manganites; Ac susceptibility; Spin glass; Phase separation

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