

Effects of La^{3+} Substitution on the Magnetic Properties of Double Perovskites A_2FeMoO_6 ($\text{A} = \text{Ca}$ and Ba)

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Abstract—We have studied effects of the partial substitution of La^{3+} for A^{2+} on the magnetic properties of double perovskites A_2FeMoO_6 ($\text{A} = \text{Ca}$ and Ba). Polycrystalline $\text{A}_{2-x}\text{La}_x\text{FeMoO}_6$ ($0 \leq x \leq 0.3$) samples have been prepared by the conventional solid-state reaction in a stream of 5% H_2/Ar gas. The X-ray data indicate that $\text{A} = \text{Ca}$ is monoclinic with the space group $P2_1/n$ and $\text{A} = \text{Ba}$ is cubic with the space group $Fm\bar{3}m$. The substitution of La^{3+} for A^{2+} results in a cell volume increase for $\text{A} = \text{Ca}$ and a cell volume reduction for $\text{A} = \text{Ba}$. Saturation magnetization, which is $3.5 \mu_B/\text{f.u.}$ for undoped $\text{A} = \text{Ca}$ ($x = 0$) and $3.9 \mu_B/\text{f.u.}$ for undoped $\text{A} = \text{Ba}$ ($x = 0$), decreases with increasing x . This decrease of magnetization arises from the reduction of moment associated with the electron doping and the disorder at the Fe and Mo sites. The partial substitution of La^{3+} for Ba^{2+} considerably enhances the Curie temperature T_c from 316 K for $x = 0$ to 334 K for $x = 0.2$. However, the T_c in $\text{Ca}_{2-x}\text{La}_x\text{FeMoO}_6$ is not enhanced significantly with increasing x .

Index Terms—Double perovskite, magnetic hysteresis, magnetization, X-ray diffraction.