

Chemical substitutions tuned exchange bias effect in $\text{Sm}_{0.1}\text{Ca}_{0.9-x}\text{Sr}_x\text{MnO}_3$ ($x = 0.2, 0.3$) manganites

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Magnetic properties of antiferromagnetic (AFM) manganite $\text{Sm}_{0.1}\text{Ca}_{0.9-x}\text{Sr}_x\text{MnO}_3$ ($x = 0.2, 0.3$) have been investigated, focusing mainly on the exchange bias (EB) effect. The studied compounds exhibit the ground state with heterogeneous spin configuration, consisting of the C -type and G -type AFM phases, and a FM-like phase with very weak spontaneous magnetic moment. For both compositions, EB effect is observed. Contributions from different interfaces between coexisting magnetic phases to the EB effect are discussed. For $x = 0.3$ compound, the phase separation leads to unusual magnetic properties: narrowing of $M(H)$ loops in field cooling process, unconventional EB effect associated with spontaneous magnetization at temperatures below T_{N-G} , strong magnetic field dependence of the negative EB at cooling fields below 100 Oe turning into practically field independent one for cooling fields above 0.5 kOe, significant shift of EB with temperature with a change of the sign from negative at 10 K to positive above 40 K. The atypical magnetic properties are discussed.