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Magnetic properties studies of Fe-substituted La0.67Sr0.33MnO3

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The magnetic phase transitions for pure ceramic La0.67Sr0.33FexMn1-xO3 (x = 0, 0.05, 0.1, 0.2, 0.3 and 0.5) perovskites are investigated. The understanding of the magnetic interactions that occur in these perovskites manganite afford the opportunity to tune their properties for practical applications. The double exchange interactions in Mn3+-O-Mn4+ was found to be suppressed by the superexchange interactions in Mn3+(4+)-O-Mn3+(4+) as the Fe content x increases. The samples were found to be a mixed phase of ferromagnetism FM and antiferromagnetism AFM with a paramagnetic component. The saturation magnetization decreased from 52 emu/g to 1 emu/g at 300 K and from 80 emu/g to 5 emu/g at 2 K due to antiferromagnetic interactions. Exchange bias effect was observed at low temperatures especially at 240 K and 260 K with maximum values of 190 Oe and 194 Oe respectively. 57Fe Mössbauer spectroscopy measurements show a transition from a paramagnetic state to a mixed spectra of FM-AFM and paramagnetic components. The percentage contributions of the magnetic phases and their hyperfine magnetic field values were estimated from the 57Fe Mössbauer results.

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