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Study of Móssbauer and neutron diffraction for $La_{0.67}Pb_{0.33}Mn^{57}_{1-x}Fe_xO_3$

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Observations of the colosscal magnetoresistance (CMR) and other intricate physical phenomena in the perovskite manganite oxides $R_{1-x}A_xMnO_3$ (R= La, Nd, Pr, Sn, Y; A= Ca, Sr, Ba, Pb) have triggered renewed attention to this class of materials[1,2]. Polycrystalline samples of $La_{0.67}Pb_{0.33}Mn^{57}_{0.99}Fe_{0.01}O_3$ have been prepared with the aim of investigating the influence of the presence of the metal ^{57}Fe. Their magnetic and crystallographic properties are studied using Móssbauer spectroscopy and neutron dffraction. The structure of $La_{0.67}Pb_{0.33}MnO_3$ was found to be rhombohedral, with lattice constants a_0 = 5.4932 Åand α = 60.207 o. The lattice constants a_0 of the samples became almost similar with increasing ^{57}Fe contents ($0.01 \leq x \leq 0.05$). However, the lattice constants α increased. Increased ^{57}Fe contents dropped rapidly the magnetization and the Curie temperature (T_C). This results show that Fe favours an antiferromagnetic coupling in the Mn-O layer, and finally it leads to weaking of the ferromagnetic double exchange coupling. Also our magnitic structure neutron diffraction refinements support above results. Móssbauer spectra of $La_{0.67}Pb_{0.33}Mn^{57}_{0.99}Fe_{0.01}O_3$ were taken at various temperatures ranging from 14 to 350 K. As the temperature increased towards (T_C)= 340 K, line broadening and 1, 6 and 3, 4 line width differences occurred because of anisotropic hyperfine field fluctuation. The anisotropic field fluctuation of $+H$ (P_+ = 0.83) was greater than H (P_- = 0.17). We also calculated the frequency factor and the anisotropy energy as 49.34 $\Gamma/\bar{h}$ and 383 erg/cm^3, respectively, using the relatively accurate data for T= 130 K that is associated with the large line broadening.

G. F. Goya et al. J. Appl. Phys. 91 (2002) 7932.

H. H. Hamdeh et al. J. Magn. Man. Mater. 232 (2001) 175.