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Pressure induced phase transitions in Vacancy-doped nanocrystalline manganites through High-pressure Mössbauer spectroscopy
USHA CHANDRA, University of Rajasthan, Jaipur 302055 — Nanocrystalline perovskite Manganites ABO_3 (A=RE, and B= Mn) are interesting materials due to their colossal magneto resistive behaviour. The effect of vacancy-doping at A and B sites show changes in their behaviour as compared to the stoichiometric counterpart. We report here the effect of pressure on the vacancy-doped nanocrystalline manganites synthesized by sol-gel nitrate technique up to 10 GPa. The Mössbauer measurements on nano-crystalline La-deficient sample $La_{0.9}Mn_{0.8}Fe_{0.2}O_{3.15}$ at ambient condition show distribution of Fe^{3+} ions at two different environments. Interesting features are observed with variation in pressure on the sample – an isostructural high spin Fe^{3+} to low spin Fe^{3+} transition (at 2.1 GPa), reversal to high spin again (at 2.8 GPa) and an orthorhombic to monoclinic structural transition (at 4.9 GPa). However nanocrystalline Mn-deficient sample $La_{0.8}Sr_{0.2}Mn_{0.8}Fe_{.16}O_{2.95}$ behaves differently. Unlike La-deficient sample, it retains isostructural high spin Fe^{3+} configuration up to 4.2 GPa. The structural transition from orthorhombic to monoclinic seems to be still incomplete even at 6.3 GPa. Decrease in isomer shift of one of the site indicates strong covalent interaction between Mn and Fe ions. Low temperature Mössbauer measurements at 80 K show appearance of magnetic sextet in Mn deficient sample while La-deficient remains paramagnetic.

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