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Synthesis of $La_{0.7}Ca_{0.3-x}Sr_xMnO_3$ nano-crystallites by mechanical activation and study their microstructure and magnetotransport properties

Sh. Abarashi, N. Tajabor*, M. Rezaei, M. Behdani

Ferdowsi University of Mashhad, Faculty of sciences, D epartment of Physics, Mashhad, Iran

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Abstract: In this work, substituted lanthanum manganites with calcium and strontium, $La_{0.7}Ca_{0.3-x}Sr_xMnO_3$ (x = 0, 0.1, 0.2, 0.3), were prepared by a high-energy ball milling method and their microstructure and magnetotransport properties were studied. The raw materials were Mn_2O_3, La_2O_3, CaO and SrO, mixed in the stoichiometric ratio to obtain these manganites. The mechanical activation process was performed at room temperature in a SPEX 8000 mixer/mill. X-ray diffraction was used to determine the phase transformation as a function of the milling time. The XRD results showed that after up to 10 h of milling process, using a charge ratio of ball to powder of 10:1, crystallite powder with an orthorhombic structure (S.G. Pbnm) was formed for all compounds. Mean crystallites size of the samples obtained from the XRD patterns and TEM micrograph are about 20 nm. Magneto-resistivity of the disc shape samples was measured using four point probe technique, in the temperature ranging from 77 to 300 K in presence of an external magnetic field up to 1.5 T. Maximum metal-insulator transition temperature is 190 K for $La_{0.7}Ca_{0.3}MnO_3$. In this compound the maximum magnetoresistivity factor is 38%, in magnetic field of 1.5 T and temperature of 190 K.

Keyword: *Manganite, Magnetoresistance, Mechanical activation, Metal-Insulator Transition.*

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*Corresponding author, Tel.: +98(0511) 8763647 , Fax: +98(0511) 8763647, E-mail: ntajabor@yahoo.com