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| Title | Influence of manganese on multiferroic and electrical properties of lanthanum ferrite nanoparticles | | |
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| Abstract: In the present work, we have successfully prepared pure and Manganese (Mn) doped single phase nanocrystalline LaFeO3 by using an auto combustion route. X-ray diffraction (XRD) study ensures the purity of phase whereas the transmission electron microscope (TEM) measurement confirms the nanocrystalline nature. The details of the DC and AC conduction mechanism are studied to illustrate the dielectric behavior and charge transfer mechanism. The DC resistivity increases with the doping concentration which has been illustrated by Mott's variable range hopping (VRH) model. The AC conductivity mechanism as a function of frequency (20Hz ≤ *f* ≤ 1MHz) and temperature (303K ≤ T ≤ 573K) is explained by correlated barrier hopping (CBH) model. The dielectric constant and activation energy (AC) increase with Mn concentration whereas dielectric loss decreases. So, the leakage behavior decreases within the samples. The XPS spectra confirm that there is a rise of Fe2+ and Mn4+ ions in the samples with the doping concentration which may be responsible for the enhancement in magnetization. Mixed ferromagnetic (ferromagnetic and antiferromagnetic) order exists within the samples. As a result exchange bias arises. We have achieved the highest value of the coercive field (2.5 kOe) in Mn doped LaFeO3 system. The room temperature ferroelectric and magnetodielectric measurements indicate that the polarization and magnetodielectric coefficient increases significantly by virtue of Mn doping. Therefore, an enhancement of multiferroic and magnetodielectric properties has been achieved for chemically prepared nanocrystalline lanthanum ferrite (LaFeO3) system by virtue of Mn doping. All the observations indicate that these materials to be potential candidates in the emerging field of spintronics. |  |
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