Effect of sintering temperature on structure, microstructure and magnetic properties of La0.67Ca0.33MnO3 synthesized via Sol-Gel method

ABSTRACT

A systematic investigation of high purity powder of managenese perovskite polycrystalline La0.67Ca0.33MnO3 (LCMO) has been undertaken in view to understanding the effect of varying temperature ranging between 600°C and 1200°C on structure, microstructure and magnetic properties using Sol-Gel method. The Thermogravimetric analysis (TGA) shows at 600°C - 700°C, decomposition of the carbonates are completed and crystalline into the perovskite phase. X-ray diffraction (XRD) patterns show that parent compound of La0.67Ca0.33MnO3 was in single phase without any detectable impurity and give orthorhombic structure with space group Pbnm (62). Rietveld refinement analysis showed no significant change on lattice parameter. Field emission scanning electron microscopy (FESEM) shows that the lowest particle size is 29.29 nm sintered at 600°C and grain size growth to 722 nm with increment of sintering temperature to 1200°C. The particle size as well as crystallite size shows a strong dependence on the sintering temperature. As the grain size growth from 29 nm to 722 nm, the coercivity value increase to the maximum at 24.7 G and the value drop as the grain size further increase. The variation of the coercivity is believed to be due to the evolution from single domain to multi domain condition. The highest coercivity at two domain or pseudo-single domain condition is due to the effect of magnetostatic and exchange energy.

Keyword: Sol-gel; Structural; Grain boundaries; Magnetic materials; Perovskite manganites