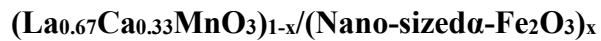


## Structure, microstructure and magnetic properties study of ceramic composite



### ABSTRACT

The structural, microstructure and magnetic properties of polycrystalline  $(\text{La}_{0.67}\text{Ca}_{0.33}\text{MnO}_3)_{1-x}/(\alpha\text{-Fe}_2\text{O}_3)_x$  composites where  $x = 0\%$ ,  $5\%$ ,  $10\%$ ,  $15\%$ ,  $20\%$  were investigated. Polycrystalline  $\text{La}_{0.67}\text{Ca}_{0.33}\text{MnO}_3$  (LCMO) was synthesized via solid state reaction at high sintering temperature while for nano-sized  $\text{Fe}_2\text{O}_3$  (20-50 nm) a commercial product was used. X-ray diffraction (XRD) patterns show that parent compound of  $\text{La}_{0.67}\text{Ca}_{0.33}\text{MnO}_3$  is a single phase without any detectable impurity and give orthorhombic structure with space group  $\text{Pbnm}$  (62) while  $\alpha\text{-Fe}_2\text{O}_3$  is in cubic form with space group  $\text{Ia}\bar{3}$  (206). As  $\text{Fe}_2\text{O}_3$  content  $x$  increases, the magnetization  $M$  values decrease as observed via Vibrating Sample Magnetometer (VSM) at room temperature. Higher magnetization is noticed in pure LCMO rather than in LCMO composites added with  $\alpha\text{-Fe}_2\text{O}_3$ . However, Scanning Electron Microscopy (SEM) shows that nano-sized  $\text{Fe}_2\text{O}_3$  mainly distributed at the grain boundary of  $\text{La}_{0.67}\text{Ca}_{0.33}\text{MnO}_3$ . The particle size of LCMO composites shows fluctuation; meanwhile particle size of  $\alpha\text{-Fe}_2\text{O}_3$  shows almost similar values except for sample with the addition of  $15\%$  of  $\alpha\text{-Fe}_2\text{O}_3$  where lowest particle size with higher coercivity and retentivity are observed. As compared to pure  $\text{La}_{0.67}\text{Ca}_{0.33}\text{MnO}_3$ ,  $\text{Fe}_2\text{O}_3$  doping level at the grain boundaries can be assumed to modify the magnetic properties of  $\text{La}_{0.67}\text{Ca}_{0.33}\text{MnO}_3$ .

**Keyword:** Bulks; Structura; Grain boundaries; Magnetic materials; Perovskite manganites