

Growth and magnetic behaviours of La_{0.7}Sr_{0.3}MnO₃ nanoparticles synthesized via thermal treatment method

ABSTRACT

La_{0.7}Sr_{0.3}MnO₃ (LSMO) nanoparticles were synthesized by thermal treatment method using water as solvent and polyvinyl pyrrolidone (PVP) as capping agent. The as prepared precursor was calcined at various temperatures ranging from 500°C to 1000°C. Structural characterization using X-rays diffractions (XRD) showed that the LSMO nanoparticles, calcined at temperature \times 600°C, have single phase of La_{0.7}Sr_{0.3}MnO₃ with rhombohedral crystal structure without any secondary phases being detected. The average particle size of nanoparticles increased gradually from 23 to 163 nm for samples calcined at 500 to 1000°C. Magnetic measurement at room temperature using vibrating sample magnetometer (VSM) indicated that the LSMO nanoparticles had soft ferromagnetic behaviour with coercivity ranged from 3.43 to 33.78 G. The magnetic saturation (M_s) of nanoparticles increased with the increment of particle size. From Electron Spin Resonance (ESR) measurement, the g-value of LSMO nanoparticles increased with the increasing of calcination temperature. The ESR indicated a coexistence of ferromagnetic and paramagnetic phases in LSMO nanoparticles below Curie temperature (T_c). The T_c was in the range of 50-80°C for LSMO calcined at 500°C and it is in the range of 80-110°C for LSMO calcined 600, 700, 800, 900, and 1000°C.

Keyword: Electron resonance; Magnetic properties; Nanostructures; Rietveld analysis; Thermal treatment