

Effect of Gd substitution for La on the structure and magnetic properties of the $\text{La}_{1-x-y}\text{Sr}_x\text{Gd}_y\text{MnO}_3$ nanoparticle

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Magnetic nanocrystalline of $\text{La}_{1-x-y}\text{Sr}_x\text{Gd}_y\text{MnO}_3$ (LSGM) with $y = 0, 0.05, 0.10, 0.15$ and 0.20 are synthesized by a thermal-hydro decomposition method at $800\text{ }^\circ\text{C}$ in air for 6 h. All samples are characterized by TG-DTA, XRD, SEM and VSM. The XRD result shows that all the prepared samples have perovskite structure with rhombohedral phase. The crystalline sizes are in the range of $18.1\text{--}21.1\text{ nm}$, which increases with decreasing Gd content (y value). The SEM images of prepared samples show the spherical nanoparticles shape with agglomeration of particles. The VSM result shows soft-ferromagnetic behavior for all samples with the magnetization (M) value of $9.3\text{--}34.6\text{ emu/g}$. The M value decreases with increasing Gd content. The substitution for La by Gd with a smaller ionic size than La usually leads to a decreases of lattice parameters and decreases of crystalline sizes. The decrease of magnetization value with increasing Gd concentration associated distortion structure with high mismatch factor (σ^2).

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