

# Crystal structure, optical and magnetic properties of perovskite

## Gd(Mn<sub>0.7</sub>Ni<sub>0.3</sub>)O<sub>3</sub> ceramic nanoparticles: An experimental and first-principles studies

Sivasamy, Ramesh

Venugopal, Potu

Espinoza-González, Rodrigo

The perovskite Gd(Mn<sub>0.7</sub>Ni<sub>0.3</sub>)O<sub>3</sub> ceramic nanoparticles were synthesized by a facile sol-gel technique. The structure, electronic structure, surface morphology, optical and magnetic properties of GdMn<sub>0.7</sub>Ni<sub>0.3</sub>O<sub>3</sub> nanoparticles were investigated. X-ray diffraction pattern confirms the formation of pure orthorhombic perovskite GdMn<sub>0.7</sub>Ni<sub>0.3</sub>O<sub>3</sub> ceramic nanoparticles with Pbnm space group. Spin-polarized band structure and partial density of states reveal the ferromagnetic behavior of the sample. The optical band gap was calculated using the Tauc plot it is found to be 3.2 eV.

Magnetization curves such as zero-field-cooled, field-cooled and hysteresis loop are further confirmed that the sample shows paramagnetic at the surface and complex magnetic behavior at low temperature. The mixture of ferromagnetic and antiferromagnetic complex magnetic behavior arises from the distorted crystal structure and coexistence of Gd<sup>3+</sup>, Mn<sup>3+</sup> and Mn<sup>4+</sup> ions with multiple exchange interaction in the sample.