

Effect of Annealing Temperature on the Magnetic Properties of Fe Doped SrTiO₃ Nanoparticles

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SrTi_{0.90}Fe_{0.10}O₃ nanoparticles were synthesized by hydrothermal method. SrTi_{0.90}Fe_{0.10}O₃ samples were annealed at 500, 600 and 700 °C in Ar. X-ray diffraction (XRD) results indicate a perovskite structure of all samples. TEM image shows SrTi_{0.95}Fe_{0.05}O₃ nanoparticles of a cubic shape with an average size of 64.7 nm. X-ray absorption spectroscopy (XAS) was used to study the absorption of SrTi_{0.90}Fe_{0.10}O₃ with various formal valences. The results show that Fe with oxidation states of Fe²⁺ and Fe³⁺ are presented in sample. Magnetic properties were measured using vibrating sample magnetometer (VSM). SrTi_{0.90}Fe_{0.10}O₃ exhibits paramagnetic behavior. However, It is found that annealed SrTi_{0.95}Fe_{0.05}O₃ in Ar can increase more oxygen vacancies in the structure causing the F-centre exchange (FCE) coupling interaction of metallic ions resulting in ferromagnetic with the maximum magnetization value of 2.24 emu/g for sample annealed at 700 °C.

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