

## Mössbauer Studies of Perovskite $\text{Gd}_{0.5}\text{Sr}_{0.5}\text{FeO}_{3-y}$

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Perovskite powder  $\text{Gd}_{0.5}\text{Sr}_{0.5}\text{FeO}_{3-y}$  was studied by X-ray diffraction, Mössbauer spectroscopy, vibrating samples magnetometry, and Mohr's salt analysis.  $\text{Gd}_{0.5}\text{Sr}_{0.5}\text{FeO}_{3-y}$  was synthesized by using the solid-solid reaction method. The crystal structure was found to be orthorhombic with lattice parameters,  $a_0=5.531 \text{ \AA}$ ,  $b_0=5.608 \text{ \AA}$  and  $c_0=7.724 \text{ \AA}$ . Mössbauer spectra of  $\text{Gd}_{0.5}\text{Sr}_{0.5}\text{FeO}_{3-y}$  have been taken at various temperatures ranging from 4.2 to 600 K. The spectrum pattern at 4.2 K consisted of four sets of six Lorentzians, and the magnetic hyperfine fields are found to be 275, 486, 514 and 540 kOe. The Néel temperature,  $T_N$ , was found to be 478 K. Mohr's salt analysis for  $\text{Gd}_{0.5}\text{Sr}_{0.5}\text{FeO}_{3-y}$  demonstrated the existence of the mixed valence states,  $\text{Fe}^{3+}$  (73 %) and  $\text{Fe}^{4+}$  (27 %), and  $y=0.11$  at room temperature. It is notable that  $\text{Fe}^{5+}$  was created at 4.2 K. The magnetic susceptibility show that the superexchange interaction was antiferromagnetic.