

## Structural Investigation and Hyperfine Interactions of $\text{BaBi}_x\text{La}_x\text{Fe}_{12-2x}\text{O}_{19}$ ( $0.0 \leq x \leq 0.5$ ) Hexaferrites

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**Abstract :** Barium hexaferrite,  $\text{BaFe}_{12}\text{O}_{19}$ , substituted by  $\text{Bi}^{3+}$  and  $\text{La}^{3+}$  ( $\text{BaBi}_x\text{La}_x\text{Fe}_{12-2x}\text{O}_{19}$  where  $0.0 \leq x \leq 0.5$ ) were prepared by solid state synthesis route. The effect of substituted  $\text{Bi}^{3+}$  and  $\text{La}^{3+}$  ions on the structure, morphology, magnetic and cation distributions of barium hexaferrite were investigated by X-ray powder diffractometry (XRD), scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX), Fourier transform infrared spectroscopy (FT-IR) and Mössbauer spectroscopy. XRD powder patterns were refined by the Rietveld analysis method which confirmed the formation of single phase magneto-plumbite structure and the substitution of  $\text{La}^{3+}$  and  $\text{Bi}^{3+}$  ions into the lattice of barium ferrite. These results show that both  $\text{La}^{3+}$  and  $\text{Bi}^{3+}$  ions completely enter into barium hexaferrite lattice without disturbing the hexagonal ferrite structure. The EDX spectra confirmed the presence of all the constituents in expected elemental percentage. From  $^{57}\text{Fe}$  Mössbauer spectroscopy data, the variation in line width, isomer shift, quadrupole splitting and hyperfine magnetic field values on Bi and La substitutions have been determined. Cation distribution in the presently investigated hexaferrite system was estimated using the relative area of Mössbauer spectroscopy.

**Keywords :** hexaferrite, mössbauer, cation distribution, solid state synthesis

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