

Magnetic behavior and structural analysis of hexagonal $\text{Lu}_{1-x}\text{Ba}_x\text{Mn}_{0.5}\text{Fe}_{0.5}\text{O}_3$ ($0 \leq x \leq 0.3$) perovskite

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In this work we studied the magnetic behavior of the perovskite (with ABO_3 nominal formula) family $\text{Lu}_{1-x}\text{Ba}_x\text{Mn}_{0.5}\text{Fe}_{0.5}\text{O}_3$ ($0 \leq x \leq 0.3$) synthesized by a wet chemical method. The structural analysis was carried out by X-ray powder diffraction (XRPD) with Rietveld analysis. These analyses revealed that all the samples show a hexagonal rearrangement with space group $\text{P6}_3\text{cm}$ and the increase Ba content, increase the lattice parameters. With high resolution X-ray emission spectroscopy (HR-XES) we studied the change of the valence states of the cation Mn consequence of the Ba^{2+} -doping; this information was obtained by measuring changes in some spectral features, such as energy shifts, possible satellite lines, line shapes and relative intensities. For 3d transition elements, the high-resolution $\text{K}\beta$ spectrum shows a clear sensitivity to the chemical environment¹. These spectra were measured using a non-conventional spectrometer with conventional X-ray sources². X-ray photoelectron spectroscopy (XPS) was used to investigate and confirmed the change Mn^{+3} - Mn^{+4} in the $\text{Lu}_{1-x}\text{Ba}_x\text{Mn}_{0.5}\text{Fe}_{0.5}\text{O}_3$ samples. The magnetization as a function of the temperature reveals an unusual magnetic behaviour. This effect is attributed to the increase of the concentration of Mn^{+4} with the increasing of the Ba content. The magnetic behaviour of this perovskites with the cation Lu and Mn in the A site is due for the Dzyaloshinskii-Moriya (DM) interactions between the cations in the B site. The change in the valence state of the Fe or Mn cations change the DM interactions and also the magnetic behaviour.

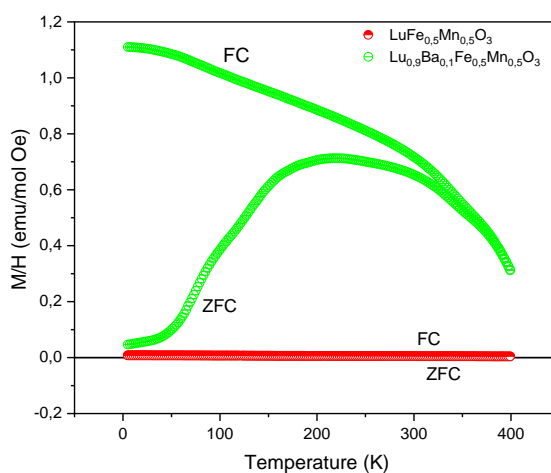


Figure 1. Magnetic behavior of the samples $x=0$ and $x=0.1$. We show the change in the magnetization with the increase Ba content

References

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