

CRYSTALLOGRAPHIC STRUCTURE AND MAGNETIC RESPONSE OF $\text{HoA}_x\text{Mn}_{1-x}\text{O}_y$ (A = Ni, Co)

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Abstract – Holmium manganese oxides doped with nickel and cobalt present a rich magnetic phase diagram due to the existing connection between doping and the manganese valence. This work is a part of an effort to determine the crystallographic structure of doped holmium manganese oxide and correlate to the magnetic response. The samples were prepared by a modified polymeric precursors method and analyzed by X-Ray Diffraction (XRD) associated to Rietveld refinement and magnetization and AC susceptibility measurements.

Crystallographic and magnetic properties of holmium manganese oxides have been studied due to the relations between structural aspects and colossal magnetoresistance effects [1]. However, several characteristics related to crystalline and electronic structure and the magnetic response of such materials are not fully elucidated [2] [3]. Furthermore, $\text{ErA}_x\text{Mn}_{1-x}\text{O}_y$ (A = Ni, Co) compounds also have been studied, showing a response with high values of Θ , due to strong antiferromagnetic interactions coupled with ferromagnetic correlations near to the transition temperature as a result of the fact that substitutions of cobalt atoms in manganese sites causes a replacement of Mn^{+3} to Mn^{+4} and Co^{+3} to Co^{+4} valences [4].

Holmium manganese oxide doped with nickel and cobalt were synthesized by polymeric precursors method [5]. Amounts of chemical, Ho_2O_3 (99.9%), MnCO_3 (99.9%), Ni_2O_3 (99.9%) and $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ (98.0%) were diluted in stoichiometric ratio in deionized water at 75°C in constant stirring. Subsequent, these homogeneous solutions were mixed with citric acid in proportion Metal/Carboxylic Acid of 1:3 and furthermore ethylene glycol was added at molar ratio of Carboxylic Acid/Ethylene Glycol of 60:40. After the evaporation of water in temperatures in the order 85°C , the resins formed have been thermally treated at 400°C in order to eliminate residual organic materials, and calcinated at $800^\circ\text{C}/4\text{h}$, $900^\circ\text{C}/4\text{h}$ and $1100^\circ\text{C}/10\text{h}$ in oxygen atmosphere. Structural characterization was performed by X-Ray Diffraction (XRD) associated with Rietveld refinement, as shown in Figure 1 and analyzed taking into account DC and AC magnetic susceptibility measurements.

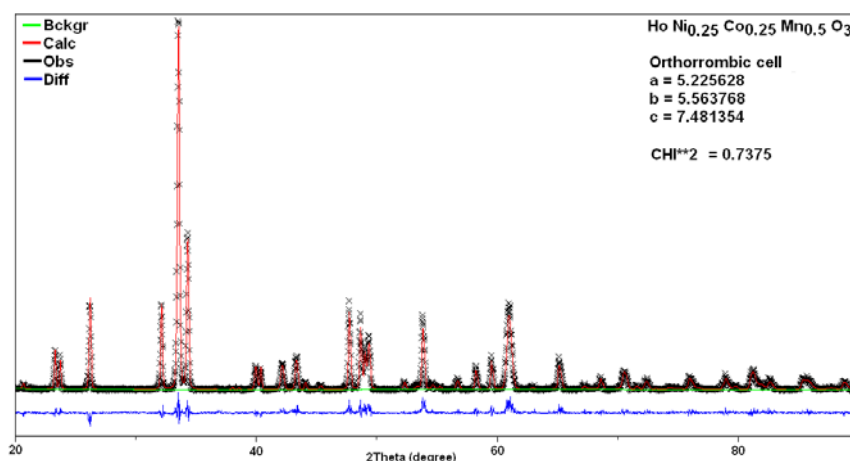


Figure 01 – Rietveld Refinement of $\text{HoNi}_{0.25}\text{Co}_{0.25}\text{Mn}_{0.50}\text{O}_3$ sample

References

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