

Comparative Study between Co-Precipitation and Sol Gel Method for the Preparation of Ferrites

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Abstract: The preparation of cobalt zinc ferrite that is crystallite magnetic material has been prepared by the famous methods co-precipitation and sol gel. The sol gel auto-combustion method requires low temperature and less time, produces homogeneous particles of uniform size. Whereas the co-precipitation method has possibility of producing pure and homogenous material. Though sol gel method produces high quality materials, co-precipitation has been effective and proved technology. $\text{Co}_{1-x}\text{Zn}_x\text{Fe}_2\text{O}_4$ can be prepared by the co-precipitation and sol gel auto combustion method for the full range of compositions with x varying from $x=0.1-0.9$. To study the structural properties of spinel structure ferrites XRD characterisation has been done. FTIR characterisation used to understand the metal ion bond formation. The formation of $\text{Co}_{1-x}\text{Zn}_x\text{Fe}_2\text{O}_4$ using both the methods was confirmed by the XRD. The transmission wave bond for specific range for both the methods, which corresponds to formation of oxygen bond and it confirms the formation of cobalt zinc ferrite. Spinel structure of ferrite represents the class of magnetic material. Sol gel and coprecipitation are widely used methods. The size and the properties of spinel ferrite nanoparticles can be greatly depends upon on pH, fuel, stirring time and speed, compound, etc. Ferrites are ferromagnetic oxides consisting of ferric oxide and metal oxides. The spinel ferrites are widely studied because of their numerous applications in several fields. Among the different spinel ferrites cobalt ferrite (CoFe_2O_4) with inverse spinel structure are promising magnetization, High electrical properties, good mechanical properties and chemical stability.

Keywords: Cobalt Zinc Ferrite, Sol Gel, Co-Precipitation, XRD, FTIR.

REFERENCES

- [1]. D.U. Bois, Phil. Mag. 29 (1890) 295.
- [2]. Pierre Weiss Phys., 6 (1907) 66.
- [3]. Hilpert S., Ber. Deut. Chem. 12 (1912) 2248.
- [4]. Hedvell J.A Ber. Duet. Chem. 45 (1912) 401.
- [5]. Tammann G.Z. Anorg. Allegaem. Chem. (1927) 87.
- [6]. Jander W.Z. Anorg Allegaem chem. (1927) 1631.
- [7]. Kato and Takei T., Jour. of Institute of Electrical Engineers, Japan
- [8]. <https://youtu.be/JjcRtQ7druY> - video on ferrites
- [9]. Nano particulate crystalline cobalt ferrite for permanent magnet applications journal.
- [10]. <https://youtu.be/JjcRtQ7druY> (Ref. video of ferrite).
- [11]. Standard values of 'hkl' planes were Ref. from jrnl of magnetism and magnetic materials 313 (2007) 293-299.
- [12]. Std. values of IR absorption band ref. from jrnl of magnetism and magnetic materials 313 (2007) 293-299.