

Vol 6 Issue 4 Jan 2017

ISSN No : 2249-894X

*Monthly Multidisciplinary
Research Journal*

*Review Of
Research Journal*

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A REVIEW ON STRUCTURAL, ELECTRICAL AND MAGNETIC PROPERTIES OF CD AND CO SUBSTITUTION IN NICKEL FERRITE NANOPARTICLES

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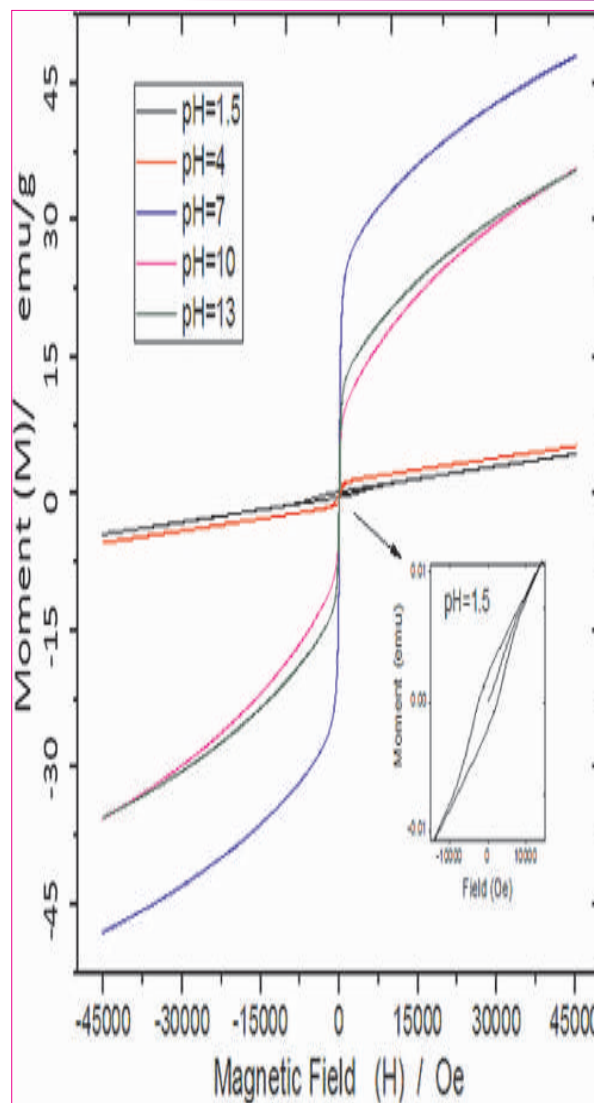
ABSTRACT:

In this communication, I present the review on the reported work on chemical grown nickel ferrites nanoparticles. Here, effect of cadmium and cobalt substituted in nickel ferrites has been discussed. In order to studies on the structural, electrical and magnetic properties in the context of agglomeration effect and grain boundary density have been discussed in detail.

KEYWORDS: structural, electrical and magnetic properties, nickel ferrite nanoparticles.

1. INTRODUCTION:

Ferrite with general formula MFe_2O_4 ($M = Ni, Co, Cu, Zn, Fe, Mn$ etc.). Ferrites are useful for various practical applications such as super Ferro-fluids, magnetic resonance imaging enhancement, magnetic drug delivery,



bio-molecule separation, magnetic high density storage and sensor etc[1-4]. Generally, ferrites possess spinal type structure. Various kind of synthesis method have been reported including sol-gel, auto-combustion, solid state reaction, co-precipitation and hydrothermal process. Among all the above methods, for nanocrystalline auto-combustion is simple and best synthesis method.

Keeping in mind all the above important aspects and results of the studies on Cd and Co substitution ferrites nanoparticles using chemical synthesis method, in this communication, I report the summary and significant facial appearance of few reported work, as a review, on structure, electrical and magnetic properties of ferrites based nanoparticles.



Manish K. Rangolia

2. MATERIALS

In this review article, three different research articles have been published in ferrites nanoparticles. First article covers the investigation structural, electrical, magnetic and ac frequency dependent electric properties of sol-gel auto combustion method grown cadmium substituted $Ni_{1-x}Cd_xFe_2O_3$ nano structured ferrites [5]. Second research article is cobalt substituted nickel cadmium ferrite prepared by solution combustion method [6]. Last report covers the effect of cadmium substituted nickel ferrites prepared by auto combustion technique [7].

3. REVIEW

Devmunde et al [5] studied the effect of Cd^{2+} substitution nickel ferrites nanoparticles on structural, magnetic and dielectric properties. X-ray diffraction (XRD) measurements were performed at room temperature. From XRD, confirmed that single phasic nature as well as obtained crystallite size (between 46 to 58 nm). Grains having a spherical shape to be confirmed by transmission electron microscopy (TEM). Various in dielectric and tan delta loss have been discussed in context of Cd^{2+} content. Particles size dependent studied magnetic properties of nickel ferrites.

Patil et al [6] reported on dielectric and magnetic properties of $Ni_{0.4}Co_xCo_{0.6-x}Fe_2O_4$ nanoparticles. The TG-DTA analysis shows weight loss and endo/exothermicity of reaction during sintering temperature. Frequency dependent dielectric, $\tan\delta$, conductivity were studied in the frequency range 20Hz to 1MHz. The saturation magnetization, magnetic moment and Coercivity are found to be increase with increase copper content.

Manojit et al [7] have been reported on Characterization of cadmium substitution nickel ferrites nanoparticles. In order to studied structural properties by performing XRD measurements which reveals that single phase of spinal structural and lattice parameter increase with increase Cd concentration. To calculate crystallite size $\sim 27 - 33$ nm also varies with Cd content. To obtained the concentration, chemical bonding and absorption bands value by using FT-IR analysis in the range of 1000-100 cm^{-1} .

4. CONCLUSION

The present review work on three different reported work on ferrites based nanoparticles exhibited structural, electrical and magnetic properties which is highly depending upon different ion substituted (Co & Cd) in materials. Overall, from above reports conclude that understood physical properties in the context of various in particles size and some eternal parameter (ac freq. field, magnetic field etc)

ACKNOWLEDGEMENT

Department of Physics, Saurashtra University, Rajkot is thankfully acknowledged for the support and guidance in writing this review article.

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