



## Synthesis, Structural and Magnetic properties of $Ni_{0.8}M_{0.2}Fe_2O_4$ (M=Co,Cu) Nanoparticles synthesized by Citrate Precursor Method

• Rakshan Noor • Vijeta Nushra • Priya Tiwari  
• Rakesh Kumar Singh

Received : November 2012  
Accepted : March 2013  
Corresponding Author : Rakesh Kumar Singh

**Abstract :**  $Ni_{0.8}M_{0.2}Fe_2O_4$  (M=Co,Cu) Ferrite Nanoparticles were successfully synthesized by chemical based Citrate Precursor Method. The Citrate was annealed at temperature  $450^\circ C$  for 1hr, 3hr. The annealed powders were characterized using X-ray diffractometer (XRD) and vibrating sample magnetometer (VSM). The particle sizes was found to be 29 nm, 15nm for Ni-Co ferrites and 29 nm, 29 nm for Ni-Cu ferrite nanoparticles respectively. The magnetization values were 46.10 emu/g, 0.41 emu/g for Ni-Co ferrite and 38.01 emu/g, 0.19 emu/g for Ni-Cu ferrite respectively at annealing temperatures  $450C$  for for 1hr and 3hr.

**Key words:** Ferrites Nanoparticles, Citrate precursor method, Magnetization.

### Rakshan Noor

B.Sc. III year, Physics (Hons.), Session: 2010-2013,  
Patna Women's College, Patna University, Patna,  
Bihar, India

### Vijeta Nushra

B.Sc. III year, Physics (Hons.), Session: 2010-2013,  
Patna Women's College, Patna University, Patna,  
Bihar, India

### Priya Tiwari

B.Sc. III year, Physics (Hons.), Session: 2010-2013,  
Patna Women's College, Patna University, Patna,  
Bihar, India

### Rakesh Kumar Singh

Assistant Professor, Department of Physics,  
Patna Women's College, Bailey Road,  
Patna – 800 001, Bihar, India  
E-mail : [rakeshsinghpu@gmail.com](mailto:rakeshsinghpu@gmail.com)

### Introduction :

Synthesis of spinel ferrite nanomaterials has been intensively pursued because of their basic scientific importance and technological applications and due to their special Magnetic and electric properties (Gubin et al. 2005, Georgia Papaefthymiou, 2009). Magnetic ferrites such as Ni ferrite have a wide range of applications in several domains including biomedical applications, magnetic ferrofluid, microwave absorption, repulsive suspension for levitated railway systems and gas sensing capabilities towards low concentrations of chlorine gas and Similarly Co ferrite has been used for magnetic recording applications such as digital recording media which finds applications in audio and video tapes (Ishino and Narumiya, 1987; Gubin et al. 2005; Georgia 2009).

Research in this field has received a major boost in the recent years due to development of a number of preparation processes to produce pure phase ferrites in nanoparticle range (Pal and Chakravorty, 2003, Singh et al., 2010). The magnetic properties of ferrite nanoparticle are strongly influenced by the method of synthesis and process parameters even though the common