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# Effect of $\text{Bi}^{3+}$ ions on the Humidity Sensitive Properties of Copper Ferrite Nanoparticles

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## Highlights

- Ferrite nanoparticles synthesized by solution combustion method
- Humidity sensing property was studied
- The maximum sensitivity was found is  $S_f = 925.64$
- The electrical conduction mechanism have been studied

## Abstract

The response of humidity sensitivity factor of bismuth substituted copper ferrite nanoparticles is prepared by solution combustion route by using metal nitrates. From this preparation technique, bismuth substituted copper ferrites were confirmed to demonstrate the cubic spinel structure by X-ray diffraction measurement and FTIR spectral absorption bands observed at  $\nu_1 = 560 \text{ cm}^{-1}$  to  $580 \text{ cm}^{-1}$  and  $\nu_2 = 404 \text{ cm}^{-1}$  to  $407 \text{ cm}^{-1}$  for tetrahedral and octahedral sites in cubic spinel structure of ferrites. The prepared nanoparticles of ferrites are extremely resistive in the range of mega-ohms ( $\text{M}\Omega$ ) at room temperature and their humidity sensitivity is also very high. The electrical resistance is decreased for different concentration of bismuth in copper ferrites, noticeably with increasing the relative humidity. The relative humidity of  $\text{Bi}_x\text{CuFe}_{2-x}\text{O}_4$  nanoparticles in the range from 10% RH to 90% RH at room temperature is generated. With the substitution of bismuth, the sensitivity factor is decreased at low relative humidity. The maximum humidity sensitivity factor  $S_f = 925.64$  was achieved for  $\text{Bi}_{0.1}\text{CuFe}_{1.9}\text{O}_4$  nanoparticles.

**Keywords:** Humidity sensitivity, relative humidity, copper ferrite nanoparticles, porosity and solution combustion route.

## Introduction

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