

Structural and Magnetic Properties of Calcium Mixed Ferrites Prepared by Co-Precipitation Method

Authors : Sijo S. Thomas, S. Hridya, Manoj Mohan, Bibin Jacob, Hysen Thomas

Abstract : Ferrites are iron based oxides with technologically significant magnetic properties and have widespread applications in medicine, technology, and industry. There has been a growing interest in the study of magnetic, electrical and structural properties of mixed ferrites. In the present work, structural and magnetic properties of Nickel and Calcium substituted Fe_3O_4 nanoparticles were investigated. $\text{Ni}_x\text{Ca}_{1-x}\text{Fe}_2\text{O}_4$ nanoparticles ($x = 0, 0.1, 0.3, 0.5, 0.7, 0.9$) were synthesized by chemical co-precipitation method and the samples were subsequently sintered at 900°C . The magnetic and structural properties of $\text{Ni}_x\text{Ca}_{1-x}\text{Fe}_2\text{O}_4$ were investigated using Vibrating Sample Magnetometer and X-Ray diffraction. The XRD results revealed that the synthesized particles have nanometer size and it varies from 46-72 nm as the calcium concentration diminishes. The variation is explained based on the increase in the reaction rate with Ni concentration which favors the formation of ultrafine particles of mixed ferrites. VSM results show pure CaFe_2O_4 exhibit paramagnetic behavior with low saturation value. As the concentration of Ca decreases, a transition occurs from paramagnetic state to ferromagnetic state. When the concentration of Ni becomes dominant, magnetic saturation, coercivity, and retentivity become high, indicating near ferromagnetic behavior of the compound.

Keywords : co-precipitation, ferrites, magnetic behavior, structure

Conference Title : ICEMA 2018 : International Conference on Engineering Materials and Applications

Conference Location : Mumbai, India

Conference Dates : February 22-23, 2018