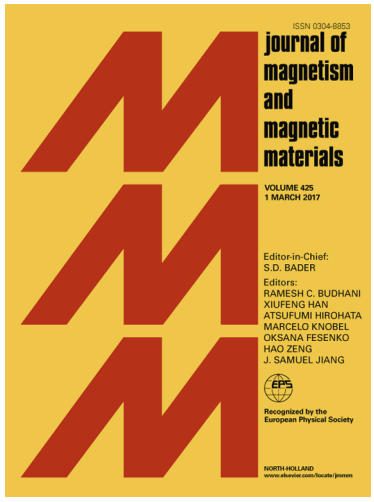


Research articles

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# Influence of Zn concentration on the structural and magnetic properties of nanocrystalline $Cu_{1-x}Zn_xFe_2O_4$ mixed ferrites synthesized using novel combustion method

C. Murugesan[1], Nagaiah Kambhala[2], S. Angappane[2] and G. Chandrasekaran[1]

[1]Department of Physics, Pondicherry University, Puducherry - 605014, India.

[2]Centre for Nano and Soft Matter Sciences, Jalahalli, Bangalore - 560013, India.

**Abstract**

In this work, we report the structural and magnetic properties of nanocrystalline $Cu_{1-x}Zn_xFe_2O_4$ mixed ferrites synthesised using novel combustion method. The prepared samples are spinel structured and the secondary phase $\alpha$-$Fe_2O_3$ is also present in $CuFe_2O_4$. The size of the crystallites ranges between 9.6 nm to 31 nm and the lattice constant increases from 8.342 Å to 8.435 Å. The FTIR absorption bands of $CuFe_2O_4$ are observed at 571 $cm^{-1}$ and 409 $cm^{-1}$ for tetrahedral and octahedral sites, respectively. These bands are shifting to 547 $cm^{-1}$ and 397 $cm^{-1}$ for Zn substitution. Raman spectra show the change in local environment of tetrahedral and octahedral interstitial sites with Zn. The FE-SEM images show that the prepared samples are nano sized and the substitution of Zn decreases the agglomeration. The magnetic study reveals that the saturation magnetizations initially increases from 21.45 emu/g (x = 0) to 44.16 emu/g (x = 0.2) and then decreases at 300 K. The superparamagnetic behavior is observed for samples of x $\geq$ 0.4 concentration. The temperature dependent zero field cooled and field cooled magnetic measurements confirm the superparamagnetic nature and the observed blocking temperature decreases from 120.4 K to 32.3 K. The hysteresis curves measured at 20 K show the coercivity and it varies from 663 Oe to 70 Oe for increasing Zn content.