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Mössbauer and XPS studies of $(\text{Mn}, \text{Zn})_x\text{Co}_{1-x}\text{Fe}_2\text{O}_4$ ferrites

Summary

We report the evolution of the magnetic properties of $(\text{Mn}, \text{Zn})_x\text{Co}_{1-x}\text{Fe}_2\text{O}_4$ ($x = 0, 0.5$ and 1.0) compounds as a function of particle size. The fine powders with grain size of about 5 nm were synthesized by citrate precursor method and annealed from 300 to 1300 C. The distribution of cations amongst the tetrahedral (A) and octahedral (B) sites has been investigated by x-ray photoelectron spectroscopy (XPS) and Mössbauer spectroscopy. The Mössbauer measurements were recorded at 4 K in zero field and in an applied field of 6 T. The Curie or Neel temperature enhancement observed is explained on the basis of redistribution of Zn and Mn ions at both tetrahedral (A) and octahedral (B) sites in nanosize samples. Field cooled (FC) and zero field cooled (ZFC) magnetization measurements were performed by Squid magnetometry from 4 –400 K and indicate spin glass like behaviour of the nanophase samples.

Author: Mr DOLO, J J (Department of Physics, University of Free State, P/Bag X13, Phuthaditjhaba 9866, South Africa)

Co-authors: LANČOK, A (Institute of Inorganic Chemistry, AS CR, v.v.i.250 68 Husinec - Řež 1001 Czech Republic); SWART, H.C. (Department of Physics, University of Free State, P.O Box 339, Bloemfontein 9300, South Africa); MSOMI, J. Z. (Department of Physics, University of Free State, P/Bag X13, Phuthaditjhaba 9866, South Africa)

Presenter: Mr DOLO, J J (Department of Physics, University of Free State, P/Bag X13, Phuthaditjhaba 9866, South Africa)

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