

EFFECT OF PARTICLE SIZE ON DEGREE OF INVERSION IN FERRITES

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Ferrites with the spinel structure are important materials because of their structural, magnetic and electrical properties. The suitability of these materials depends on both the intrinsic behavior of the material and the effects of the grain size. Mössbauer spectroscopy was employed to investigate the cation distribution and degree of inversion in bulk and nanosized particles of CuFe_2O_4 , MnFe_2O_4 and NiFe_2O_4 ferrites. The Mössbauer spectra of all bulk ferrites showed complete magnetic behavior, whereas nanoparticle ferrites showed combination of ferromagnetic and superparamagnetic components. Moreover, the cation distribution in nanoparticle materials was also found to be different to that of their bulk counterparts indicating the particle size dependency. The inversion of Cu and Ni ions in bulk sample was greater than that of nanoparticles; whereas the inversion of Mn ions was less in bulk material as compared to the nanoparticles. Hence the degree of inversion decreased in CuFe_2O_4 and NiFe_2O_4 samples whereas, it increased in MnFe_2O_4 as the particle size decreased and thus showed the anomalous behavior in this case. The nanoparticle samples also showed paramagnetic behaviour due to superparamagnetism and this effect is more prominent in MnFe_2O_4 . Mössbauer spectra of bulk and nanoparticles CuFe_2O_4 is shown in Fig.1.

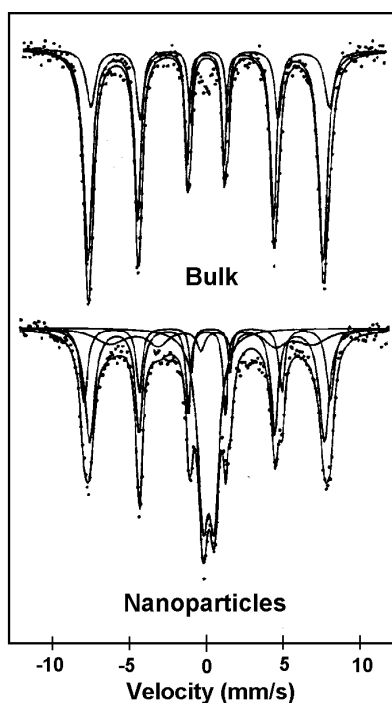


Fig.1 Mössbauer spectra of CuFe_2O_4

References

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