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Preparation of Chitosan-coated Magnetite Nanoparticles by Sonochemical Method for MRI Contrast Agent

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Manganese ferrite MnFe2O4 prepared by the direct compostion method has been investigated by X-ray diffraction and Mössbauer spectroscopy. The crystal structure is found to have a cubic spinel structure with the lattice constant $\alpha_0 = 8.513$ Å. The iron ions are in ferric state and occupy both the tetrahedral (A) and octahedral (B) sites; the fractions of the iron ions at the A-sites and B-sites are 0.26 and 1.74, respectively. Its Néel temperature is found to be 560 K. Above the Néel temperature the quadrupole splitting is found to be 0.63 mm/s. On the other hand, all the electric quadrupole shift values are zero below the Néel temperature within experimental error. These seemingly contradictionary phenomena have been explained by the model that the magnetic hyperfine field is randomly oriented with respect to the principal axes of the electric-field-gradient tensor.

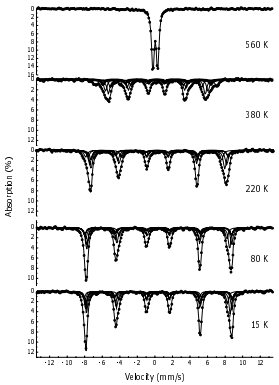

Fig. 1. Mossbauer spectra of Manganese ferrite at various temperatures.

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Study on the Magnetic Properties of Oxo-Centered {Mn3O} - Type Spin Triangles

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We report the results of experimental and theoretical studies on the magnetic properties of two variants of trinuclear oxo-centered Mn complexes, Mn_3O-I and Mn_3O-II [1]. In the Mn_3O-I, three identical Mn^{3+} (S = 2) ions form a nearly equilateral triangle and the Mn_3O-II consists of two Mn^{3+} (S = 2) ions and one Mn^{2+} (S = 5/2) ion. Temperature dependence of the magnetic susceptibility χ has been measured with a SQUID magnetometer from room temperature down to 1.8 K. The magnetic susceptibility χ of both molecules shows a typical behavior for an antiferromagnetic (AFM) spin ring system, whereby χT decreases gradually as temperature decreases. Field dependence of magnetization has been measured using a pulsed magnet up to H = 30 T at T = 1.7 and 0.5 K. Magnetization versus field shows a stepwise behavior with broad steps in both compounds. In particular, a sharp step at zero field was detected in the hysteresis loop of Mn_3O-II, suggesting the existence of a level anticrossing gap at zero field. Model Hamiltonians of both molecules will be presented with parameters deduced from the fitting of the measured magnetic properties.

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