ABSTRACTS

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BR-10. Magnetic Properties of Polycrystalline Y-type Hexaferrite
Ba$_2$Sr$_{2-x}$Ni$_x$(Fe$_{1-y}$Al$_y$)$_{12}$O$_{22}$ using Mössbauer Spectroscopy. J. Kim$^1$, H. Choi$^1$ and C. Kim$^1$
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Synthesis of the polycrystalline Ba$_2$Sr$_{2-x}$Ni$_x$(Fe$_{1-y}$Al$_y$)$_{12}$O$_{22}$ ($x = 0.0, 1.5, y = 0.00, 0.01, 0.03$) was accomplished by the polymerizable complex method. The samples were investigated for the crystallographic and magnetic properties by x-ray diffraction (XRD), vibrating sample magnetometer (VSM), and Mössbauer spectrometer. The Mössbauer spectra were obtained by a conventional spectrometer with a $^{57}$Co source in a Rh matrix in the temperature range from 4.2 to 295 K. From refined XRD patterns, all samples were confirmed of the rhombohedral structure with space group R-3m. Also, we were able to identify six distinguish sublattices, which are four octahedral sites (18h$_{ VI}$, 3b$_{ V I}$, 6c$_{ V I}$, and 3a$_{ V I}$) and two tetrahedral sites (6c$_{ V I}$*- 6c$_{ V I}$). The lattice constant of a$_0$ and c$_0$ decrease by Sr, Al substitution because the ionic radius of Sr$^{2+}$ (1.12 Å) is smaller than that of Ba$^{2+}$ (1.34 Å) and the ionic radius of Al$^{3+}$ (0.535 Å) is smaller than that of Fe$^{3+}$ (0.645 Å). The zero-field-cooled (ZFC) measurement between 4.2 and 295 K applied 100 Oe shows that spin transition temperature ($T_S$). Substitution of Sr ions increased $T_S$. Al ions were further substituted after Sr ions were substituted, and $T_S$ increased to around room temperature. The Mössbauer spectra were fitting six distinguish sublattices: 18h$_{ VI}$, 3b$_{ V I}$, 6c$_{ V I}$*, 6c$_{ V I}$, and 3a$_{ V I}$. The measured isomer shift of all samples indicated that the charge state of Fe ions is Fe$^{3+}$. The Mössbauer spectra according to temperature change confirmed the changes in the magnetic hyperfine field curves at $T_S$.


BR-11. Static and dynamics magneto-viscoelasticity in Co$_{1-x}$Zn$_x$Fe$_2$O$_4$
(0 $\leq$ x $\leq$ 1) based magnetic nanofluid. A. Singh$^1$, A. Rath$^1$, P. Kumar$^2$, R. Pant$^1$, G. Basheed$^1$ and K.K. Maurya$^1$
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The study of rheological characteristics of magnetic nano-fluid plays an important role in device development, as magnetic control on fluid behavior is a promising field in numerous applications. The present work investigates the magneto-viscoelastic behavior of Zn substituted cobalt ferrite based magnetic fluid synthesized by surface modified chemical Co-precipitation route. The crystalline spinel phase and purity of all the samples have been confirmed by X-ray diffraction (XRD) and High-resolution transmission electron microscopy (HRTEM). The crystallite size calculated by W-H methods which are corroborated with HRTEM. The room temperature magnetic measurements confirm systematic decrease in saturation magnetization. Although for x = 0.4 the decrease is slightly low as compared to other composition. This has been confirmed from viscoelastic measurements performed in dynamics and oscillatory mode using magneto rheometer. The steady-state rheograms (viscosity vs shear rate curve) shows a decrease in dynamics viscosity behavior with the increase of Zn substitution. The rheograms for all compositions are well fitted with power-law confirming the shear thinning behavior with n $\leq$ 1. Also from magento-sweep rheograms (viscosity vs magnetic field), we have found that the steady increase in viscosity with increase in magnetic field is due to the formation of a chain like structure which causes an interruption in smooth streamline flow of the MNFs. With a small addition of Zn, we have observed a drastic decrease in the viscosity of fluid behavior. Field-induced viscoelastic behavior of Co-Zn MFs in static and dynamic mode provides significant information for optimization of MNFs for various applications.