Nano scale physics
Magnetic resonance properties of nano scale cobalt based layered double hydroxides

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Layered double hydroxides (LDHs) with general formula $[M^{II}_{1-x}M^{III}_{x}(OH)_2]^{x+}(A^{y-})_{x/y}\cdot zH_2O$. have been widely investigated from point of view various application as catalysts and catalyst support, anion exchanger, electrical and optical functional materials and so on. However their static and dynamic magnetic properties still not investigated properly. In this report we study a set of cobalt based LDH compounds ($M^{II}=Co^{2+}$, $M^{III}=Al^{3+}$, $A=NO_3$ and x=1/3; 1/4; 1/5) using electron paramagnetic resonance technique (EPR) and theoretical modeling of EPR spectra.

Temperature dependent EPR spectra of the powder samples of LDH's nanoparticles have been investigated. Continuous wave EPR measurements were performed at X-band microwave frequency (~9.4 GHz) using a conventional Bruker ELEXSYS E580 EPR spectrometer. The significant changes and strong baseline distortions are observed in all compounds below T = 70 K and none of EPR signals were found above 70 K. The observed wide width of EPR spectra could be related to magnetic resonance contribution of exchange binding Co^{2+} pairs. The powder EPR spectra modeling have been performed by a modified crystal field theory. It was shown that the EPR spectrum is influenced by four Kramers doublets lying in the energy range below T = 200 K. The relatively low exchange interactions in these compounds, anisotropic g-factor values and highly distorted O-H octahedral cage can explain magnetic field smearing of the EPR spectrum.