View Abstract

CONTROL ID: 3467013

TITLE: Annealing Effect on the Structural and Local Magnetic Properties of Nickel Ferrite Nanoparticles Studied by Hyperfine Interaction Measurements

AUTHORS (FIRST NAME, LAST NAME): Priscila S. Rodrigues[1], Izabela T. Matos[1], Tatiane S. Sales[1], Anastasia Burimova[1], Gabriel Cabrera-Pasca[2], Luciano F. Pereira[1], Rajendra N. Saxena[1], Larissa Otubo[1], Artur W. Carbonari[1]

INSTITUTIONS (ALL): 1. Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo, SP, Brazil.
2. Universidade Federal do Para, Belem, PA, Brazil.

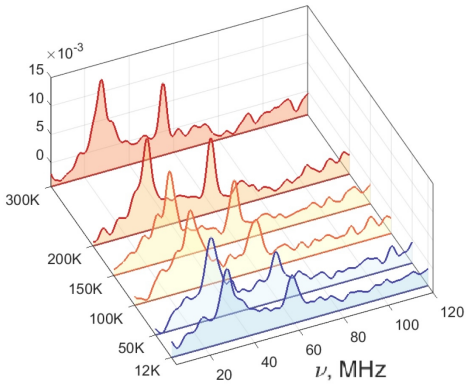

Fig. 1: Fourier transform of TDPAC perturbation factors taken in the range 12 - 300K on cooling

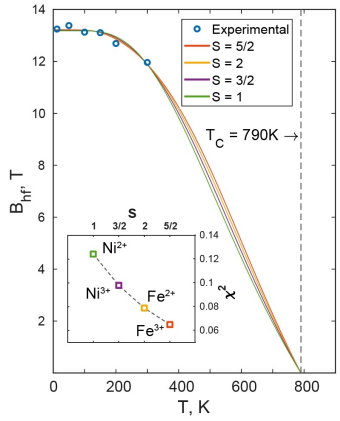

Fig. 2: The evolution of magnetic hyperfine field with temperature and fits for selected ion moments

ABSTRACT BODY:

Abstract Body: Nickel ferrite in the form of nanoparticles is a technologically important material that can be applied for the production of biosensors, catalysts, drug delivery, and magnetic resonance contrast agents. In this work $NiFe_2O_4$ samples comprising spherical nanoparticles of ~6 nm in diameter have been synthesized via a thermal decomposition route. The quality control of the samples was carried out with conventional techniques including X-ray diffraction and transmission electron microscopy. Post-synthesis XRD pattern revealed textured spinel $NiFe_2O_4$. Local magnetic properties were examined with Time Differential Perturbed Angular Correlation (TDPAC) spectroscopy within the 12 - 773K temperature range with $^{111}In(^{111}Cd)$ probe introduced into the samples at synthesis. Quasi-static magnetic properties were observed (including above room temperature), as expected due to the small time window of TDPAC. The TDPAC results shown in Fig. 1 were analyzed using a model with combined electric quadrupole and magnetic dipole interactions. An expressive dynamic interaction was observed upon heating after synthesis. A theoretical model based on the Brillouin function for different ionic moments was applied to study the evolution of the hyperfine magnetic field with temperature (see Fig. 1-2) and allowed to attribute the magnetic interaction to the probe location at Fe^{3+}

site. Site occupancy and the interplay between magnetic and structural properties are discussed with respect to application perspectives.

SUBMITTER (NAME ONLY): Anastasia Burimova
SUBMITTER (EMAIL ONLY): anstburimova@gmail.com