2020 MMM Conference

View Abstract

CONTROL ID: 3467011

TITLE: Synthesis and characterization of Fe_3O_4-HfO_2 nanoparticles by magnetization and hyperfine interactions measurements

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

INSTITUTIONS (ALL): 1. Instituto de Pesquisas Energéticas e Nucleares, IPEN-CNEN/SP, São Paulo, São Paulo, Brazil.
2. Universidade Federal de Pará, Abaetetuba, PA, Brasil, Pará, Brazil.

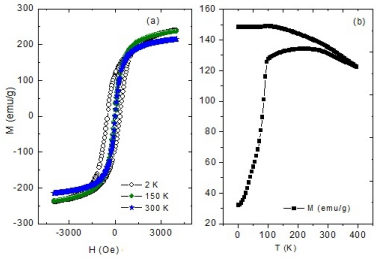

Fig. 1: Results for Fe_3O_4-HfO_2 NPs (a) Magnetic measurement, ZFC and FC magnetization curves, were carried out for the sample doped with Hf between 2-300K with an applied field of 500Oe and (b) M x H measurements at different temperatures.

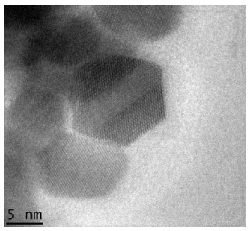

Fig. 2: TEM image showing spherical and hexagonal NPs ascribed to Fe_3O_4 and HfO_2, respectively.

ABSTRACT BODY:

Abstract Body: Nanoparticles (NPs) that combine biocompatibility and enhanced physical characteristics for biomedical applications are currently an area of intense scientific research. Hafnium oxide NPs is an innovative approach in the anticancer treatment by radiotherapy due to their low toxicity and enhancement of local dose in the tumor reducing the total radiation dose for the patient [1]. The combination of this amazing property with the excellent magnetic hyperthermia performance of Fe_3O_4 NPs can produce a promising nanomaterial for cancer therapy. In the present work, we have synthesized NPs samples of Fe_3O_4 doped with 10%Hf and HfO_2 doped with 10% Fe by chemical procedures. The samples had their morphological, structural, and magnetic properties characterized by some results being displayed in Fig. 1. The crystal structure of the samples was characterized by X-ray Diffraction (XRD), whose results present a single phase. Transmission Electron Microscopy (TEM) images show spherical and hexagonal NPs with an average size of 12 nm as displayed in Fig. 2. The magnetic property was investigated by magnetization measurement. The results from the temperature dependence of ZFC-FC magnetization show a large peak in the ZFC curve corresponding to a broad distribution of blocking temperatures as shown in Fig. 1(b). Fortunately, when irradiated with neutrons in a research reactor, the nuclear reaction $^{180}Hf(n,\gamma)^{181}Hf$ yields the probe nucleus $^{181}Hf(^{181}Ta)$ used by the perturbed angular correlations (PAC) technique to measure hyperfine interactions. Both samples show electric quadrupole interaction characteristics of the HfO_2 phase indicating that the Fe replaces Hf in HfO_2 NPs, but rather than substituting Fe, Hf form HfO_2 NPs diluted in Fe_3O_4 NPs. Moreover, a pure time-dependent magnetic dipole interaction below 300 K was observed for Fe_3O_4 NPs mixed with 10% of HfO_2.

References: References: [1] J.A. Fild et al Chemosphere, Vol. 84, p. 1401-1407 (2011).

SUBMITTER (NAME ONLY): Tatiane Sales
SUBMITTER (EMAIL ONLY): tatianenas1@gmail.com

© Clarivate Analytics | © ScholarOne, Inc., 2020. All Rights Reserved.
ScholarOne Abstracts and ScholarOne are registered trademarks of ScholarOne, Inc.
ScholarOne Abstracts Patents #7,257,767 and #7,263,655.

@ScholarOneNews | System Requirements | Privacy Statement | Terms of Use

Product version number 4.17.1 (Build 84). Build date Mon Jun 29 07:51:24 EDT 2020. Server ip-10-236-29-188