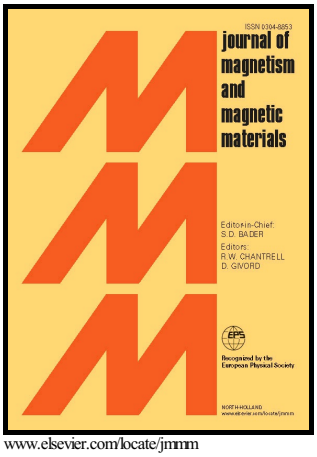

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PII: S0304-8853(16)31676-6
DOI: http://dx.doi.org/10.1016/j.jmmm.2016.08.015
Reference: MAGMA61700

To appear in: *Journal of Magnetism and Magnetic Materials*

Received date: 10 April 2016
Revised date: 8 July 2016
Accepted date: 3 August 2016

Cite this article as: Clément Guibert, Jérôme Fresnais, Véronique Peyre and Vincent Dupuis, Magnetic Fluid Hyperthermia probed by both calorimetric and dynamic hysteresis measurements, *Journal of Magnetism and Magnetic Materials,* http://dx.doi.org/10.1016/j.jmmm.2016.08.015

Magnetic Fluid Hyperthermia probed by both calorimetric and dynamic hysteresis measurements

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Abstract

In this paper, we report an investigation of magnetic fluid hyperthermia (MFH) using combined calorimetric and newly implemented dynamic hysteresis measurements for two sets of well characterized size-sorted maghemite nanoparticles (with diameters of about 10 nm and 20 nm) dispersed in water and in glycerol. Our primary goal was to assess the influence of viscosity on the heating efficiency of magnetic nanoparticles described in terms of specific loss power (SLP) or specific absorption rate (SAR) and dynamic hysteresis and in particular to investigate how this SLP depends on the transition from Néelian to Brownian behavior of nanoparticles expected to occur between 10 nm and 20 nm (for maghemite) and dependent on the viscosity. While we observed a good agreement between calorimetric and dynamic hysteresis measurements, we found that the SLP measured for the different systems do not depend noticeably on the viscosity of solvent. Calculations performed according to Rosensweig's linear model[1] allow us to quantitatively reproduce our results at low field intensities, provided we use a value for the magnetic anisotropy constant much smaller than the one commonly used in the literature. This raises the question of the temperature dependance of the magnetic anisotropy constant and its relevance for a quantitative description of MFH.

Keywords: `elsarticle.cls`, LaTeX, Elsevier, template

2010 MSC: 00-01, 99-00

The use of magnetic nanoparticles (MNP) to convert radiofrequency elec-