Quantitative nanoscale viscosity measurements using magnetic nanoparticles

Victoria L. Calero-DdelC, Darlene I. Santiago-Quiñonez, and Carlos Rinaldi*
Department of Chemical Engineering, University of Puerto Rico, Mayagüez
P.O. Box 9000, Mayagüez PR 00681

Supporting Information

A. Characterization Of Cobalt Ferrite Nanoparticles.

Magnetic Characterization.

Magnetic properties of the nanoparticles were measured using a Quantum Design MPMS XL-7 SQUID magnetometer.

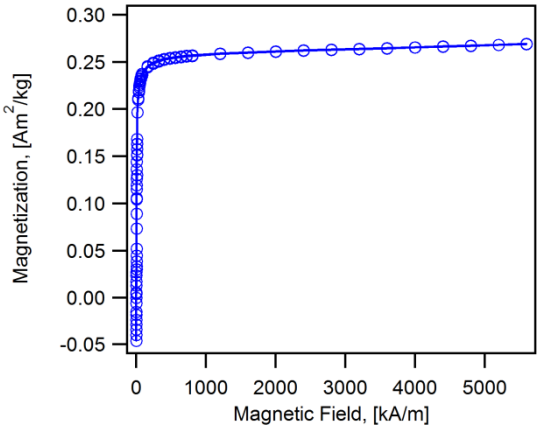

Figure 1: Equilibrium magnetization curve at 300 K for the cobalt ferrite nanoparticles suspended in mineral oil.

Thermogravimetric Analysis Of Cobalt Ferrite Nanoparticles.

According to TGA using a TA Instruments Q-2950 instrument, 90.68% (w/w) of the synthesized and washed nanoparticles was organic material. Thermo gravimetric analysis showed large drops in sample weight at ~190 ºC and ~470 ºC which were attributed to free oleic acid and oleic acid bound to the surface of the nanoparticles, respectively.

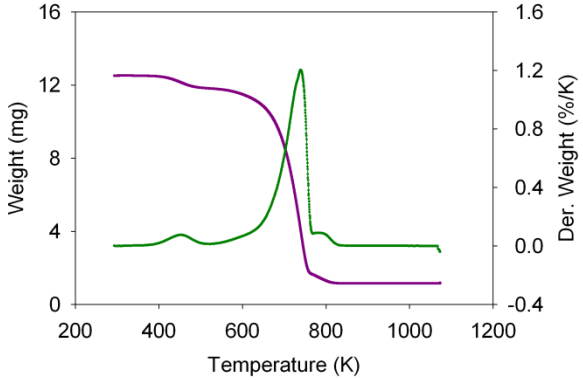

Figure 2: Thermogravimetric analysis of the cobalt ferrite nanoparticles synthesized by thermodecomposition method.

B. Characterization of mineral oil.

Differential Scanning Calorimetry Of Mineral Oil.
Differential scanning calorimetry (DSC) was done using a TA instruments Q2000 DSC. The DSC curve was obtained by cooling the sample at a rate 5 K min^{-1} (**Figure 4**). An exothermic event was observed starting at ~255 K.

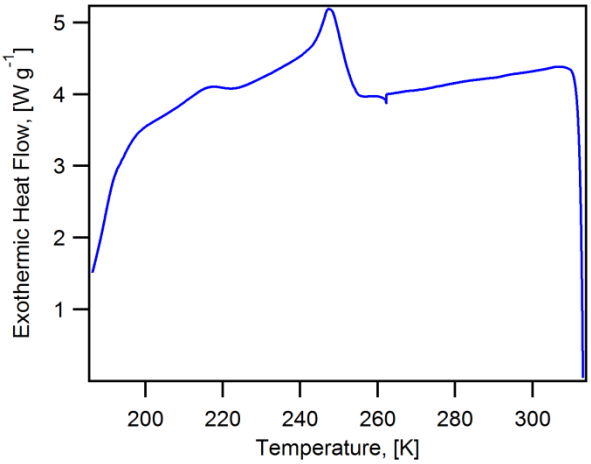

Figure 3: Differential scanning calorimetry of mineral oil at a cooling rate of 5 K min^{-1}.