Magnetorheology from surface coverage of spin-coated colloidal films.

Supplementary information

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1 Characterization of superparamagnetic particles

Magnetic characterization of the superparamagnetic colloidal particles (SiO_2–MAG) is performed with a SQUID magnetometer (Lot-Oriel n. MPMS-XL). The magnetization curve is shown (Figure 1), with a small coercive field strength ($H_c < 20$ Oe). The mass magnetization at a moderate field (1.2 kOe) is about 9.8 emu/g. Field cooled–Zero field cooled plot measured at a magnetic field of 50 Oe is shown in Figure 2. Blocking temperature is around 108 K. This indicates that the particles are superparamagnetic. We acknowledge C. Gómez–Polo for her generous loan of SQUID and fruitful discussions, and J.M. Pastor and M.A. Miranda for the magnetic characterization of the superparamagnetic colloidal particles.

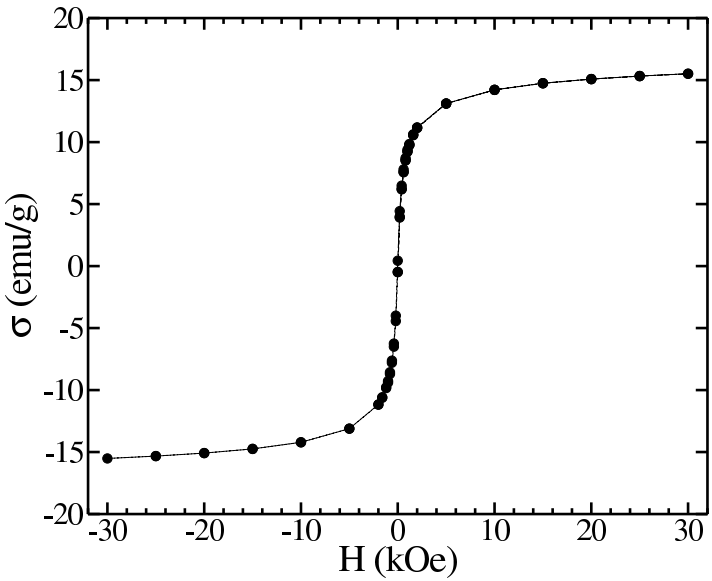

Fig. 1 Magnetization curve for the superparamagnetic colloidal particles (SiO_2–MAG). Solid line interpolates the data points from the measurement.

2 Film thickness profiles

From [1], a subset of the mean occupation factor values for PS–MAG (polystyrene coated magnetite particles) is scaled to obtain the film thickness, h_{scaled}. Mean film thickness is compared and it shows a decreasing

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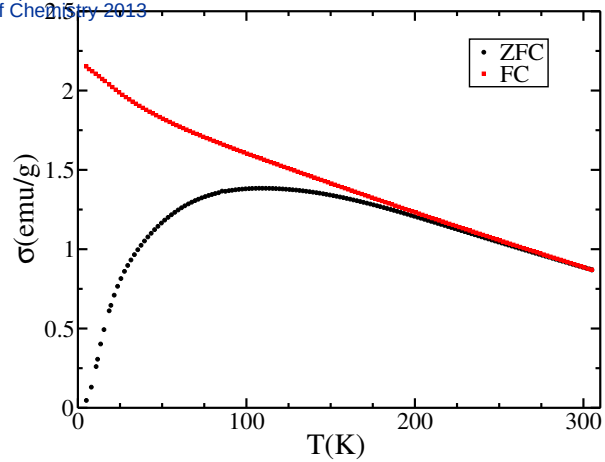

Fig. 2 Induced FC-ZFC curves at 50 Oe. Blocking temperature is around 108 K.

tendency, that is similar to other kind of dispersions (SiO_2–NM and SiO_2–MAG) as shown in Figure 3. The standard deviation for PS–MAG suspension comes from the polydispersity of the superparamagnetic particles.

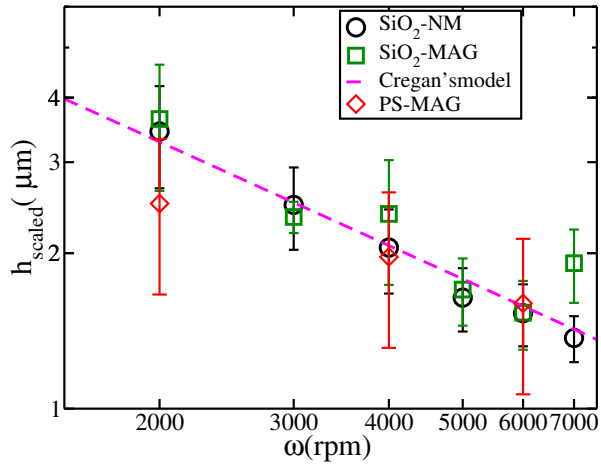

Fig. 3 Comparison of the film thickness profiles for different colloids. Squares: SiO_2–MAG (silica coated magnetite); Circles: SiO_2–NM (non magnetic silica particles); Diamond: PS–MAG (polystyrene coated magnetite). Data are compared with the model proposed by Cregan *et al.*[2]. The mean occupation factor values for PS–MAG are obtained from[1]. For circles, the information is extracted from fig. 4a of the reported[3] reference experiment by doing a spatial average.

References

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