

All Authors: D. Heinrich, A. R. Goñi, T. M. Osán, L. M. C. Cerioni, A. Smessaert, S. H. L. Klapp, J. Faraudo, D. J.

Pusiol, C. Thomsen

Title: Effect of magnetic field gradients on the aggregation dynamics of colloidal magnetic nanoparticles

Description: Both videos show the molecular-dynamics (MD) simulation results at different times of evolution with respect to the state of aggregation of the ferrofluid. The video labeled ShortScaleDyn contains the results at the initial stage of evolution, when the formation of chainlike structures occurs. In contrast, the video LongScaleDyn displays the aggregation dynamics at a later stage for which the appearance of the zipped-chain hexagonal superstructures sets in. For the occurrence of the latter the Van-der Waals (VdW) interaction due to charge fluctuations at the magnetic nanoparticles becomes crucial. In fact, the MD simulations performed without considering VdW interactions do not show any sign of bundle formation. Please notice that the MD simulations were all performed in the presence of a HOMOGENEOUS magnetic field. Additionally, the file "suppleminfoV05.pdf" contains a brief report providing further details regarding the employed ferrofluid samples and Derjaguin--Landau--Verwey--Overbeek (DLVO) calculations supporting their colloidal stability. This report clearly shows that electrostatically-stabilized colloidal suspensions of nanoparticle agglomerates with sizes ranging from 70 to 140 nm (approx.) are readily obtained. These colloids are fully stable at least for periods of time longer than three months.

Contact information: Alejandro R. Goñi ICMA-B-CSIC Esfera UAB

08193 Bellaterra Spain Phone: 011+34-93-580-1853 ext.272 FAX:

011+34-93-580-5729 Email: goni@icmab.es