

Tuning the depletion forces among colloidal particles using external magnetic fields

Joan J. Cerdà¹, Josep Batle², Carles Bona-Casas¹, Joan Massó¹, Tomàs Sintes³

¹ Departament de Física UIB i Institut d'Aplicacions Computacionals de Codi Comunitari (IAC3),
Campus UIB, 07122 Palma de Mallorca, Spain.

² Centre de Recerca Independent, Sa Pobla, Mallorca

³ Dpt. de Física UIB i Instituto de Física Interdisciplinar y Sistemas Complejos (IFISC),
Campus UIB, E-07122 Palma de Mallorca

Using Langevin Dynamics simulations the pair-depletion interactions between two non-magnetic soft colloidal particles immersed in a suspension of magnetic colloidal polymers have been studied. We have focused on systems corresponding to quasi-two dimensional geometries which are representative of interfaces between two fluids. The depletion force profiles obtained are observed to present magnetic field modulable regions of attraction and repulsion leading in some cases to the existence of stable points, i.e. local potential wells. It is observed that the use of an external magnetic field allows to shift the location of those regions

and enhance the attractive and repulsive regimes observed in the depletion profiles, as well as the number of stable points present in the force profiles. Our results show that these interfaces have the potential for allowing to control the distance between the two non-magnetic colloidal particles, which is a step forward to the creation of magnetic colloidal tweezers.

[1] J.J. Cerd, J. Batle, C. Bona-Casas, T. Sintes, J. Mass, Colloidal depletion interactions at interfaces induced by magnetic colloidal polymers, (submitted).