

# **The lattice Boltzmann simulations of magnetic colloids in a single fluid**

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We have done the LB simulation of colloidal ferrofluids to see the effect of fully hydrodynamic interactions among magnetic colloids. The main focus is on how the hydrodynamic interaction affects both the equilibrium dynamics of these dipolar systems and also their transient dynamics to form clusters. To check the effect of fully hydrodynamic interactions, Brownian dynamics without any hydrodynamic interaction has been done for comparison: Monte Carlo results are also reported. As a result, we confirm that our LB generates the Boltzmann distribution for static equilibrium properties, by comparison with these methods. However, in the equilibrium dynamics, hydrodynamic interactions make the structural relaxations slower in both the short-time and the long-time regime. This slow relaxation rate is also found for transient motions.

Reference: E. Kim, K. Stratford, P. J. Camp and M. E. Cates. Hydrodynamic interactions in colloidal ferrofluids: A lattice Boltzmann study. *Journal of Physical Chemistry B*, 113: 3681-3693, 2009.