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The Structure of Dipolar Colloidal Gels in the Dilute Regime
VERONICA I. MARCONI, FaMAF and Ifeg-Conicet, National University of Cordoba, Argentina, MARCELO A. CARIGNANO, Department of Biomedical Engineering, Northwestern University and Chemistry of Life Processes Institute, Evanston, IL, USA. — Dipolar colloidal systems are one of the simpler material presenting anisotropic interactions and are highly relevant for designing new soft materials easy to control. Using stochastic dynamics simulations we investigate the gelation process in a high dilute system of dipolar colloidal particles immerse in an implicit dielectric solvent. This system self assembles in a rich variety of structures, from open percolated networks or gels to short chains of particles that self cross. We perform simulations using a "continues model" for the dipolar particles interactions and we present a phase diagram, density vs temperature. Each phase is characterized in detail as a function of the spatial correlation (clusters) and response. Interestingly at this low density regime, it is possible to find, characterize and follow the dynamics of a clear and huge variety of short strings configurations (cross loops, triple pointed chains, bundles), mainly at very low temperature. In addition, studying the dynamics of gelation in detail we observe an increasing gelation time while density is decreased in good agreement with previous simulations and experiments on colloidal systems with directional interactions.

Veronica I. Marconi
National University of Cordoba, Argentina

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