

Self-assembly in a colloidal system with tunable magnetic interactions

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We present a colloidal system with tunable magnetic particle interactions. The dipole interactions are realized by dispersing magnetic and non-magnetic microbeads in a ferrofluid, which is a suspension of magnetic nanoparticles in water. In the ferrofluid both types of microbeads show magnetic behaviour with effective magnetic susceptibilities, which are depending on the particle concentration of the ferrofluid.

By varying the ferrofluid concentration the dipole interactions are tuned. The resulting self assembled structures in a 2D system are observed by transition light microscopy. Image analysis is used to extract the bead positions. This allows to detect colloidal crystals, branching chains and local variables like density and bead composition.

The goal of this study is to understand self assembly as a result of the driving particle interactions. Possible applications are magnetically tunable photonic crystals or novel magneto-rheological fluids.

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