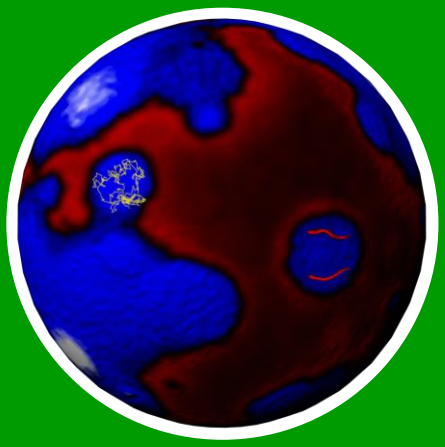

Sächsische Forschergruppe
"From Local Constraints to Macroscopic Transport"

Field-induced percolation and anomalous diffusion in systems of dipolar colloids

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Colloidal suspensions involving dipolar interactions are prime examples of soft matter systems displaying self-assembly and percolation. Moreover, these structures can be manipulated by external fields. In the present talk we discuss recent computer simulation results for two examples of such systems, focussing on the interplay of self-assembly, percolation and the (translational) dynamics of the particles. In the first part we consider ferromagnetic particles in static magnetic fields, which display aggregation into chains. Using Molecular Dynamics and Brownian Dynamics [1] we demonstrate that the anisotropic, yet normal diffusive behavior seen in weakly coupled systems and finite fields becomes anomalous both parallel and perpendicular to the field at sufficiently high dipolar coupling and field strength. The second part deals with gold-patched dielectric particles, in which an external (electric) field can induce multipolar interactions. Consistent with experiments, we find our model system to self-assemble via a two-step scenario involving first percolation along the field, followed by a percolation transition in the transverse direction [2]. The resulting two-dimensional networks are again characterized by strongly hindered translational dynamics.

[1] J. Jordanovic, S. Jäger, and S.H.L. Klapp, *Phys. Rev. Lett.* **106**, 038301 (2011)

[2] H. Schmidle, S. Jäger, C.K. Hall, O.D. Velev, and S.H.L. Klapp, *Soft Matter* **9**, 2518 (2013)

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