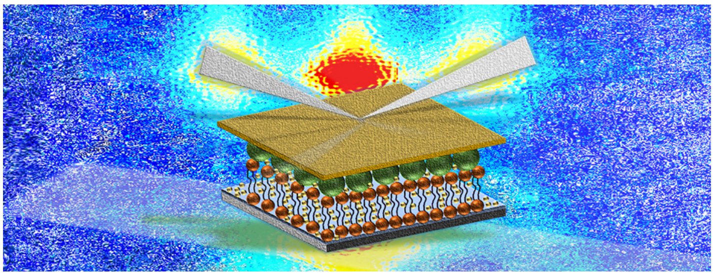

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Spin Correlations in Assemblies of Iron Oxide Nanoparticles

Donnerstag, 10. Oktober 2024 09:30 (15 Minuten)

In recent decades, analyzing complex, disordered systems posed a challenging yet highly rewarding endeavor in the field of physics [1]. One intriguing area of investigation involves spin disorder [2], particularly in the context of magnetic nanoparticles. They exhibit a reduced saturation magnetization compared to their bulk counterparts that is the result of a substantial degree of spin disorder occurring close to the particle surface. Polarized SANS with longitudinal polarization analysis (POLARIS) is a powerful technique to distinguish between spin configurations in nanoscale materials [3]. Whereas correlated spin canting near the particle surface was revealed in arrangements of nanoparticles [4,5], non-correlated spin disorder has been reported throughout non-interacting nanoparticles [6,7]. These observations indicate that interparticle interactions might play a pivotal role for the formation of correlated surface spin canting.

In this contribution, we will present our work on the effect of decreasing interparticle distances, correlated with increasing dipolar interactions, on the magnetic morphology of iron oxide nanoparticles. By pyrolysis treatment of self-organized nanoparticle arrangements, a systematic increase of packing densities in nanoparticle assemblies was achieved and related to increased superparamagnetic blocking temperatures. We will present the results of a POLARIS experiment (D33/ILL) on the magnetic morphology of nanoparticles with varying interparticle interactions.

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