



Spin Correlations in Assemblies of Iron Oxide Nanoparticles

Dienstag, 17. September 2024 22:40 (20 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. 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 correlated spin canting.

In this contribution, we will present the effect of decreasing interparticle distances, correlated with increasing dipolar interactions, on the magnetic SANS by 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.

References

- [1] Giorgio Parisi wins the 2021 Nobel Prize in Physics <https://doi.org/10.1038/d43978-021-00122-6>
- [2] D. A. Keen et al. *Nature* 521, 303-309 (2015)
- [3] S. Mühlbauer et al. *Rev. Mod. Phys.* 91, 015004 (2019)
- [4] K. L. Krycka et al. *Phys. Rev. Lett.* 104, 207203 (2010)
- [5] K. L. Krycka et al. *Phys. Rev. Lett.* 113, 147203 (2014)
- [6] S. Disch et al. *New J. Phys.* 14, 013025 (2012)
- [7] D. Zákutná et al. *Phys. Rev. X* 10, 031019 (2020)

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Sitzung Einordnung: Mounting Posters, Beer and light Dinner

Track Klassifizierung: Magnetism & Superconductivity