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Magnetic Nanoparticle Spin Structures

Tuesday, 10 December 2019 17:00 (30 minutes)

Magnetic nanoparticles reveal unique magnetic properties which make them relevant for data storage, electronic and mechanical engineering, and biomedical applications. Whereas the implementation of nanomagnetic properties into technological applications is progressing rapidly, understanding the microscopic origin of phenomena such as size-dependent magnetization and magnetic anisotropy is fundamentally challenging and needs intensive research.

In this talk, I will present recent examples of our research into the spin structure of nanoparticles on different scales. First, the nanoscale spin structure of ferrite nanoparticles will be addressed as obtained from polarized SANS. Longitudinal polarization analysis reveals the existence of spin disorder or spin canting, responsible for the low magnetization in nanoparticles as compared to the bulk material. The second focus will be on the size evolution of atomic scale, spin spiral magnetic ordering in cobalt chromite nanoparticles [1,2]. Using polarized neutron diffraction with XYZ polarization analysis, we have established critical coherent domain sizes for the formation of the spin spiral and ferrimagnetic structure and revealed the evolution of the incommensurate spin spiral vector with particle size.

[1] D. Zákutná, S. Disch et al., Phys. Rev. B 98 (2018) 064407.

[2] D. Zákutná, S. Disch et al., arXiv:1908.10582 (2019).

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