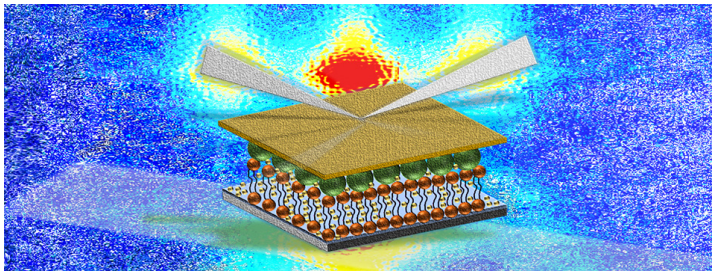

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Correlation of the Structural and Magnetic Morphology of Nanoparticles

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Tailoring magnetic nanoparticles (MNPs) involves selecting the right combination of size, shape, and material, which is essential for creating various technological [1], biomedical [2], or environmental applications. To achieve optimal performance in a specific application, it is crucial to understand how the macroscopic characteristics of MNPs and their ensembles are related to their structural and magnetic properties. Despite the significant interest in MNPS, the magnetic morphology and spin structure pose pivotal challenges due to their inaccessibility by conventional macroscopic techniques. Nevertheless, the magnetic small-angle neutron scattering technique with incident beam polarization (SANSPOL) is a powerful technique for resolving magnetization distribution at the nm-length scale and thus disentangling the contribution of the spin disorder [3-4] or magnetization contribution from core and shell part of core@shell NPs [5].
In this contribution, we will show the impact of the chemical composition on the resulting magnetic structure of manganese (Mn)-doped ferrite MNPs. To do so, different doping levels of Mn into cubically shaped CoFe2O4 NPs with the same particle size ($\sigma_{log} < 10$ %) were perfectly achieved by the thermal decomposition method. Using SANSPOL experiments, we reveal the chemical homogeneity and magnetic morphology of the resulting NPs and show the dependence of the surface spin disorder on the chemical composition of nanoparticles.

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