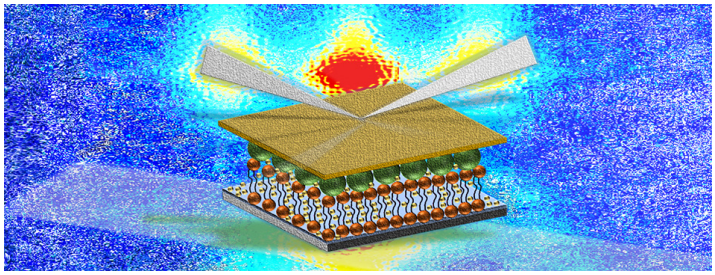

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# Disentangling anisotropy contributions in Mn-mixed ferrite nanoparticles

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The macroscopic physical properties of magnetic nanoparticles rely on magnetic anisotropy, and their understanding is fundamental to the design of magnetic materials for different applications[1]. Magnetic anisotropy is influenced by the shape, crystal structure, surface effects, and interactions. Macroscopic magnetic measurements, such as DC magnetization and AC susceptibility, allow us to overview the macroscopic physical properties and gain knowledge on the total effective magnetic anisotropy[2]. The investigation of all the contributions to the total effective anisotropy is challenging but extremely important for the design of the material and the deep comprehension of all the microscopic phenomena that drive the resulting macroscopic properties. Due to the sub-atomic resolution, small-angle polarised neutron scattering (SANSPOL) is a powerful tool for investigating surface anisotropy and microscopic phenomena[3]. In this contribution, we will show the impact of the Mn-doping level in cobalt ferrite nanoparticles (10(1) nm) on their magnetic properties. Nevertheless, the macroscopic magnetic responses of the Mn-mixed cobalt ferrite nanoparticles were inconclusive and inconsistent with changing Mn content[2]. However, I will demonstrate the versatility of SANSPOL and disentangle all anisotropy contributions of the total magnetic anisotropy of a series of Mn-mixed Cobalt ferrite nanoparticles with different Mn content but the same shape, size, and surfactant and correlate it with their macroscopic response. Ultimately, our work aims to clarify the complicated picture of magnetic anisotropy and offer insights into the design of magnetic materials.

[1] D. Lisjak et al., Progress in Material Science, 95, 286 (2018).
[2] M. Sanna Angotzi et al., J. Phys. Chem. C, 125, 20626 (2021).
[3] S. Mühlbauer et al., Rev. Mod. Phys., 91, 015004 (2019).

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