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Hysteresis Design of Magnetic Materials for Efficient Energy Conversion

Tuesday, 01 March 2022, 9:00 s.t., UDE, Zoom + in person UDE, Campus Duisburg, MG 272



Prof. Dr. Carolin Schmitz-Antoniak

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Technische Hochschule Wildau**

Zoom information: <https://uni-due.zoom.us/j/2253496215>

Improving the magnetic heating of theranostic CoFe₂O₄ nanoparticles by Pd decoration

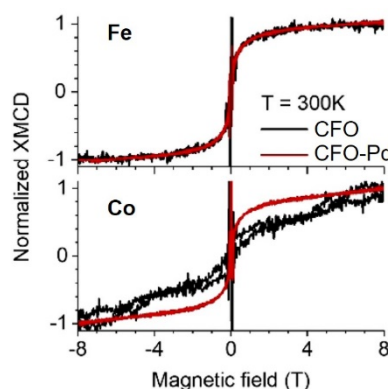
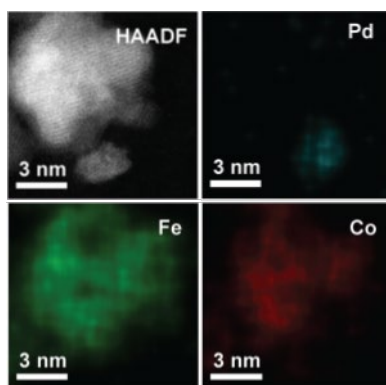
Abstract:

Due to their physicochemical stability, cobalt ferrite (CoFe₂O₄, CFO) nanoparticles and other ferrites are widely used in biomedical theranostics, such as magnetic resonance imaging, smart drug delivery, and hyperthermia cancer treatment. In hyperthermia experiments, decoration with ultrasmall (~2nm) Pd clusters increased the magnetic heating ability of cobalt ferrite (CFO) nanoparticles with diameters between 7 nm and 24 nm [1] by a factor of two. This improved heating outperforms commercially available ferrites and is accompanied by an increased magnetic susceptibility in the technically relevant magnetic fields below 1 T as well as reduced spin canting in the high-field regime.

Element-specific X-ray absorption spectroscopy (XAS) and magnetic circular dichroism (XMCD) combined with atomic multiplet simulations and density functional theory (DFT) calculations suggest that the common origin of changes in magnetic response upon decoration with Pd should be a reduced superexchange between particular ions in close vicinity of Pd [2].

[1] S.F. Shams et al., Phys. Chem. Chem. Phys. 22, 26728 (2020)

[2] S.F. Shams et al., Scientific Reports 11, 15843 (2021)



About the speaker:

Carolin Schmitz-Antoniak is currently professor of Instrumental Analytics and Applied Surface Physics at the TH Wildau – University of Applied Sciences. Prior to that position, she was leader of a Helmholtz Young Investigator Group at Jülich Research Center and lecturer (“Privatdozentin”) at the FU Berlin and the University of Duisburg-Essen. Her research focusses on the mutual influence of structure, electronic states, and magnetic properties in nanoparticles, nanostructured materials, and molecules and was awarded several prizes.

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