MA 17: Micro- and Nanostructured Magnetic Materials

Time: Tuesday 14:00–15:00 Location: H18

MA 17.1 Tue 14:00 H18

Thin films of a dinuclear Fe^{2+} complex on HOPG: Spin-crossover studies using X-ray absorption spectroscopy — •Marcel Walter[1], Sebastien Elie Hadjadj[1], Clara Trommer[2], Jorge Torres[1], Jendrik Gördes[1], David Swerev[1], Christian Lotze[1], Chen Luo[3], Florin Radu[3], Felix Tuczek[2], Sangeeta Thakur[1], and Wolfgang Kuch[1] — [1]Institut für Experimentalphysik, Freie Universität Berlin — [2]Institut für Anorganische Chemie, Christian-Albrechts Universität zu Kiel — [3]Helmholtz Zentrum Berlin for Materialien und Energie

The spin-crossover (SCO) properties of the dinuclear complex $[\{Fe(H_2B(pz)_2)_2\}_2\mu-(ac(bipy)_2)]$ deposited as (sub)-monolayer and thin film by an ultra-high-vacuum liquid-jet deposition technique on highly oriented pyrolytic graphite (HOPG) were studied by X-ray absorption spectroscopy. A comparison of the SCO properties of thin films and a dropcast sample indicates that the spin-switching capability of the thin films is lower due to substrate*molecule interactions. The similar switching properties of the dropcast sample as of a bulk powder sample confirm that the SCO properties are not affected by the presence of solvent necessary for deposition. The soft-X-ray-induced excited spin-state trapping (SOXIESST) effect is pronounced in all samples, although the light-induced high-spin (HS) fractions of the dropcast and the thin-film samples on HOPG are higher as compared to the HS fraction attained by SOXIESST, which confirms the sensitivity of the complex to light.

MA 17.2 Tue 14:15 H18

Magnetic Characterization of Antidot Arrays in NiFe Thin Films: Insights from Ferromagnetic Resonance and Micromagnetic Simulations — •Zeynep Reyhan Ozturk[1] and Fikret Yildiz[2] — [1]SESAME, Amman, Jordan — [2]Gebze Technical University, Kocaeli, Türkiye

Antidot arrays, patterned magnetic films with regular nonmagnetic holes, are gaining attention for their unique behaviors and applications in data storage and sensors [1]. These arrays modify magnetic properties by introducing stray field energy, enabling control over magnetic anisotropy and magnetization reversal [2].

Optimizing antidot size, spacing, and lattice symmetry allows precise control of switching fields, magnetoresistance, and spin-wave modes, making them ideal for advanced technologies [3]. Their dynamic behavior, particularly localized spin-wave modes, sets them apart from continuous films.

This study combines ferromagnetic resonance (FMR) and micromagnetic simulations to reveal the influence of antidot geometry on magnetic performance. Insights gained optimize thin-film properties for next-generation devices.

References:

1.Kwon et al., Phys. Rev. B, 2013.
2.Duine et al., Phys. Rev. B, 2007.
3.Park et al., J. Appl. Phys., 2015.

MA 17.3 Tue 14:30 H18

Effect of Ag addition on structure, morphology and magnetism of CoCrFeMnNi micro powders prepared by HEBM — •Emmanouil Kasotakis, Ivan Tarasov, Tatiana Smoliarova, Michael Farle, and Natalia Shkodich — Faculty of Physics and Center of Nanointegration (CENIDE), University of Duisburg-Essen, Duisburg, 47057 Germany

We fabricated (CoCrFeMnNi)-Agx (x=0; 2; 5; 10 wt.%) high entropy alloy nanocrystalline (~10 nm) microparticles which are paramagnetic at room temperature (Tc = 80 K) by a two-step high energy ball milling (HEBM) [1] process in Argon at 700/1400 rpm. An elemental powder blend of Co, Cr, Fe, Mn, Ni was milled for 60 min to produce single phase FCC Cantor alloy with a homogeneous distribution of the principal elements, followed by 10 min of HEBM with the addition of Ag. By varying the Ag concentration, we modified the morphology. For 2 and 5 wt.% Ag (Cantor + Ag) we find flake-like core shell particles, and for 10 wt.% Ag, we obtain round homogeneous particles, with a lattice expansion of the FCC phase. Annealing cycles up to 700 K in a magnetic field of 1 T magnetic field increased M at 9 T up to 2.5-fold (14 Am^2/kg) for homogeneous particles (x = 10 wt.%) and Hc up to 5-fold (41 kA/m) for core shell particles (x = 2 wt.%) at 310 K. We acknowledge DFG financial support (project ID: FA209/27-1).

[1] N.F. Shkodich, M. Spasova, M. Farle, et al. J. Alloys Compd. 816, 152611 (2020).

MA 17.4 Tue 14:45 H18

Fabrication and characterization of freestanding magnetic nanostructures for microwave to photon transduction — •Matthias Grammer[1,2], Jonny Qiu[3], Sebastian Sailler[4], Sebastian T. B. Goennenwein[4], Matthias Althammer[1,2], Stephan Geprägs[1,2], Michaela Lammel[4], Eva Weig[3], and Hans Huebl[1,2] — [1]Walther-Meißner-Institut, BAdW, Garching, Germany — [2]School of Natural Sciences, TUM, Garching, Germany — [3]School of Computation, Information and Technology, TUM, Garching, Germany — [4]Department of Physics, University of Konstanz, Konstanz, Germany

Efficient transduction between microwave and optical photons is critical for quantum network applications. Engelhard et al. [1] proposed a trasduction scheme based on collective magnetic and elastic excitations as mediators between the microwave and the optical regime. Implementing this concept requires co-localization of microwave, magnetic and elastic excitations within a suspended microstructure resembling an optomechanical crystal (OMC). In this presentation we present our progress towards the fabrication of a OMC based on the ferrimagnetic insulator yttrium iron garnet (YIG). To realize freely suspendend structures we explore two fabrication strategies: (i) the structuring of grown YIG/SiO_x/GGG heterostructures and (ii) the integration of YIG on semiconductor substrates. We will report on fabrication aspects and the characterization of the resulting devices using e.g. scanning electron microscopy and magneto-optical Kerr effect measurements.

[1] F. Engelhardt et al., Phys. Rev. Applied 18, 044059 (2022).