easy to consider important higher order interactions—corrections to dipole-dipole energies—in systems of interacting particles, where the interparticle distance is of the order of the particle size [2].

[1] M. Schult, N. Mikuszeit, E. Y. Vedmedenko, and R. Wiesendanger, 2007, J. Phys. A, *accepted*

[2] E. Y. Vedmedenko, N. Mikuszeit, H. P. Oepen, and R. Wiesendanger, 2005, Phys. Rev. Lett. **95**, 207202

MA 18.46 Tue 15:15 Poster E

Preparation of anti-vortex configurations in Permalloy micromagnets — •Christian Dietrich, Christian Back, and Josef Zweck — Institut für Experimentelle und Angewandte Physik der Universität Regensburg, Germany

Permalloy magnets with lateral dimensions in the micron range or below show several (quasi)-stable magnetic configurations depending on thickness, precise shape and size. The static and dynamic properties of single-domain and vortex configurations are numerously published. On the way to do current-induced anti-vortex excitations we investigate how to experimentally prepare a preferably single anti-vortex. In general anti-vortex configurations in patterned magnetic films are characterised by a local energy minimum and only for specific shapes or dimensions these configurations reach an absolute energy minimum. The energy landscapes were studied by micromagnetic simulations. Rectangles with a particular aspect ratio and thickness show an anti-vortex configuration as most stable state in remanence. Micromagnetic simulations were also used to optimize the shape of the micromagnets to enhance the probability for the creation of an anti-vortex in remanent state for a given direction of the saturating magnetic field. To verify the simulations we investigated Permalloy rectangles with a constant width of 1 micron and different thicknesses and lengths by Lorentz transmission electron microscopy using the Fresnel mode, which allows a fast and simultaneous evaluation of many rectangles. Different magnetic configurations can be observed, with their frequency related to the energy distribution.

MA 18.47 Tue 15:15 Poster E

Hall micromagnetometry of magnetic vortices and single domain walls — •Lena Breitenstein, Peter Lendecke, René Eiselt, Ulrich Merkt, and Guido Meier — Institut für Angewandte Physik und Zentrum für Mikrostrukturforschung, Universität Hamburg, Jungiusstrasse 11, 20355 Hamburg, Germany

Hall micromagnetometry is a powerful tool for the investigation of the magnetization of nanostructures. We apply the technique to study magnetic vortices [1] and domain-wall depinning [2] in Permalloy squares and wires. Both sample geometries are investigated in the temperature range between 1.6 and 50 K. In the square elements the vortex core is nucleated and driven through the sample by an external magnetic field. Because of the high sensitivity of the Hall sensor to the local stray fields we identify vortex core nucleation and displacement as well as minor loops. Thus the vortex state can be separated from other micromagnetic configurations. Furthermore we investigate the temperature dependence of the vortex core nucleation and displacement. In the wire geometry we examine the temperature dependence of depinning fields of single domain walls to gain knowledge about the pinning potential. The observations are well described by a model with a single energy barrier. Magnetic-force microscopy and micromagnetic simulations round out the low temperature experiments.

[1] M. Rahm, J. Stahl, W. Wegscheider, and D. Weiss, Appl. Phys. Lett. **85**, 1553 (2004).

[2] P. Lendecke, R. Eiselt, U. Merkt, and G. Meier, submitted.

MA 18.48 Tue 15:15 Poster E

Understanding the behaviour of mesoporous Co3O4 using TRM-IRM curves as fingerprints of magnetic systems — •María José Benítez Romero[1], Oleg Petracic[1], Yuriy Yanson[1], Elena Lorena Salabas[2], Ferdi Schüth[2], and Hartmut Zabel[1] — [1]Institut für Experimentalphysik/Festkörperphysik, Ruhr-Universität, Bochum, Germany — [2]Max-Planck Institut für Kohlenforschung, Mülheim an der Ruhr, Germany

Antiferromagnetic mesoporous Co3O4 exhibits interesting magnetic properties at low temperatures: bifurcation of the FC and ZFC susceptibilities at 30 K and shifted hysteresis loops after field cooling. This anomalous behavior originates due to the exchange interaction between the AFM core and the surface spins. To understand the nature of the surface spins in the nanostructured Co3O4 we propose to study the thermoremanent magnetization (TRM) and isothermal remanent magnetization (IRM) curves in this AFM as well as in other magnetic systems. The ordered mesoporous Co3O4 has been synthesized using the nanocasting method. The nanowires were characterized using X-ray diffraction, N2 adsorption-desorption isotherms, transmission electron microscopy and a superconducting quantum interference device magnetometer. We report measurements of thermoremanent moments and isothermal remanent moments in spin glass, exchange bias, superparamagnetic and antiferromagnetic systems. The analysis of thermal and isothermal remanence curves suggest that the mesoporous Co3O4 consists of antiferromagnetically aligned core spins and a spin-glass-like surface layer.

MA 18.49 Tue 15:15 Poster E

XMCD studies of FePt nanocrystals — •Daniela Nolle[1], Eberhard Goering[1], Liberato Manna[2], Albert Figuerola[2], Thomas Tietze[1], Sebastian Brück[1], and Gisela Schütz[1] — [1]Max-Planck-Institute for Metal Research, Heisenbergstr. 3, 70569 Stuttgart, Germany — [2]National Nanotechnology Laboratory of CNR-INFM, Unità di Ricerca IIT, Distretto Tecnologico ISUFI, via per Arnesano km. 5, I-73100 Lecce, Italy

We have investigated bi-magnetic FePt hybrid nanocrystals, prepared in a "one-pot" technique, using X-ray magnetic circular dicroism (XMCD). These hybrid nano crystals consist of a metallic FePt core with fcc structure and an iron oxide shell with inverse spinell crystal structure, which is a mixture of magnetite (Fe3O4) and maghemite (γ-Fe2O3). The investigations were performed both surface-sensitive in total electron yield mode (TEY) and bulk-sensitive in transmission.

These spectra have been analysed in terms of a linear superposition of suitable reference data. So we could determine the radial composition of the nanocrystals and the contributions of the constituents to the overall magnetic moment. A comparison between TEY and transmission measurements shows that the iron oxide shell is mainly maghemite like, while the surface magnetisation has predominantly magnetite character. With decreasing temperature the XMCD transmission results are in perfect agreement to bulk sensitive SQUID-measurements, while the surface exhibits a stronger increased magnetic moment at low temperatures.

MA 18.50 Tue 15:15 Poster E

Structure and magnetic properties of iron-platinum particles with iron oxide shell. — •Lubna Basit[1], Ibrahim Shukoor[1], Vadim Ksenofontov[1], Wolfgang Tremel[1], Gerhard H. Fecher[1], Claudia Felser[1], Sergei A. Nepijko[2], Gerd Schönhense[2], and Michael Klimenkov[3] — [1]Institut of Inorganic and Analytical Chemistry, Johannes Gutenberg - University, 55099 Mainz — [2]Institut of Physics, Johannes Gutenberg - University, 55099 Mainz — [3]Institut of Materials Research I, Forschungszentrum Karlsruhe, 76021 Karlsruhe

Nanoparticles of solid solution Fe_xPt_{1-x}, where $0.25 \geq x \geq 0$ with Fe_2O_3 shell were synthesized and characterized by high-resolution transmission electron microscopy, energy dispersive X-ray analysis, electron energy loss spectroscopy, Mößbauer spectroscopy and magnetometry. The magnetic properties, of such two-phase particles are interesting because their core is antiferromagnetic or paramagnetic (at very small values of x) whereas the shell is ferrimagnetic. The size of the particles was in the range of several nanometers. ^{57}Fe Mößbauer spectroscopy revealed a blocking temperature of about 100 K above which the particles are superparamagnetic. Towards lower temperatures, the magnetic characteristics showed an increase of magnetic rigidity. The saturation magnetization increases by a factor of 1.4 between room temperature and 5 K.

MA 18.51 Tue 15:15 Poster E

Investigations of confined domain walls in nanoscale constrictions — •Jan Rhensius[1,2], Dirk Backes[1,2], Laura Heyderman[1], Christian David[1], Mathias Kläui[2], Christine Schieback[2], Peter Nielaba[2], Friederike Junginger[2,3], Henri Ehrke[2,3], Ulrich Rüdiger[2], Takeshi Kasama[3], and Rafal Dunin-Borkowski[3] — [1]Laboratory for Micro- and Nanotechnology, Paul Scherrer Institut, Switzerland — [2]FB Physik, Universität Konstanz — [3]Department of Materials Science and Metallurgy, University of Cambridge, UK

Magnetic domain walls in curved-line elements can exhibit a vortex or transverse wall spin structure. A notch forms a constriction, which pins TW inside the constriction and the VW adjacent to the notch [1]. Such elements were fabricated on membranes with constrictions as narrow as 30 nm [2]. Electron holography is used to study the spin-structure around the constriction with a spatial resolution below 5 nm. The shape of the walls depends on the geometry which we characterize systematically. In total three different spin configurations were found,