in domains") are revealed by X-PEEM on a sample with t_n = 1.3nm. More compact domains with a few μm in size were imaged by XM-1 on a sample with t_n = 1.6nm. Their growth was recorded during magnetization reversal under near-coercive magnetic fields.

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MA 32.7 Thu 16:45 HSZ 401

Preparation and characterisation of L10-FePt nanoparticles in the gas phase. — •Olga Dmitrieva, Günter Dumpich, Jöchen Kästner, and Mehmet Acet — Experimentalphysik, AG Farle, Universität Duisburg-Essen, 47048 Duisburg

FePt nanoparticles with sizes between 5-10 nm are prepared by inert gas condensation using DC sputtering and subsequent flight-annealing through a furnace set to temperatures in the range 600°C 1200°C. Morphology and structure of the obtained nanoparticles depend on the nucleation pressure and annealing temperature. The process at a nucleation pressure of 0.5 mbar yields multiply twinned icosahedral particles, whereas at 1.0 mbar, polycrystalline nanoparticles are observed. The desired chemically ordered L10-phase with high magneto-crystalline anisotropy in some particles was detected using high resolution transmission electron microscopy (HRTEM). With the addition of nitrogen to the sputtering gas, the formation of the icosahedral structure is suppressed, predominantly single crystalline L10-ordered nanoparticles are formed. To verify the incorporation of nitrogen into the atomic structure, we use electron energy loss spectroscopy (EELS) and X-Ray absorption spectroscopy (XAS). Work supported by DPG (SFB445).

MA 32.8 Thu 17:00 HSZ 401

Enhanced orbital magnetism in oxide-free FePt nanoparticles — •C. Antoniak[1], K. Fauth[2,3], H.-G. Boyen[4], U. Wiedwald[4], F. Wilhelm[5], A. Rogalev[5], M. Spasova[1], J. Lindner[1], M. Acet[1], and M. Farle[1] — [1]Fachbereich Pysik, Universität Duisburg-Essen, Lotharstr. 1, D-47048 Duisburg — [2]MPI für Metallforschung, Heisenbergstr. 3, D-70689 Stuttgart — [3]Experimentelle Physik IV, Universität Würzburg, Am Hubland, D-97074 Würzburg — [4]Abteilung Festkörperphysik, Universität Ulm, Albert-Einstein-Allee 11, D-89069 Ulm — [5]European Synchrotron Radiation Facility, 6 Rue Jules Horowitz, B.P. 220, F-38043 Grenoble

Wet chemically synthesised $Fe_{50}Pt_{50}$ particles with a mean diameter of 6.3 nm deposited on a naturally oxidised Si substrate have been structurally and magnetically characterised. By a soft hydrogen plasma treatment, the oxide shell and the organic ligands surrounding the chemically disordered particles in the as prepared state were removed and pure metallic x-ray absorption and magnetic circular dichroism spectra were measured at both the Fe and Pt $L_{3,2}$ edges. After annealing for 30min at 600°C in a hydrogen atmosphere of 5 Pa, the coercive field increased by a factor of 6. This indicates the formation of the chemically ordered $L1_0$ phase and is accompanied by an enhancement of the orbital magnetic moment at the Fe sites by more than 300%, whereas the magnetic moments at the Pt sites remain largely unchanged.
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MA 32.9 Thu 17:15 HSZ 401

Phase transformation of FePt nanoparticles from fcc to fct as probed by XMCD — •Ulf Wiedwald[1], Birgit Kern[1], Kai Fauth[2], Andreas Klimmer[1], Luyang Han[1], Hans-Gerd Boyen[1], and Paul Ziemann[1] — [1]Abteilung Festkörperphysik, Universität Ulm, Albert-Einstein-Allee 11, 89069 Ulm, Germany — [2]Max-Planck-Institut für Metallforschung, Heisenbergstrasse 3, 70569 Stuttgart, Germany

FePt alloy nanoparticles show huge magnetic anisotropy energy in the chemically ordered $L1_0$ phase. The ordered phase is typically obtained by annealing at 600-800°C starting from fcc, chemically disordered FePt nanoparticles. Nowadays, wet-chemical approaches like the synthesis of ligand-stabilized colloidal particles or the plasma-induced nucleation of metal salt loaded reverse micelles allow the self-organized formation in regular arrays onto various substrates. Hereby, the colloidal approach gives short interparticle spacing of 2-3 nm and the heat treatment at elevated temperatures is likely to form unwanted larger agglomerates of particles. By employing the micellar preparation route, the particle separation can be tuned between 20-100 nm. These larger distances permit us to study the phase transformation towards $L1_0$ ordered particles without any agglomeration, loss of the array quality or magnetostatic coupling between particles. We investigated FePt nanoparticles (4 nm and 9 nm) with spacing of 28 nm and 64 nm by XMCD. The phase transformation is tracked by hysteresis loops at various temperatures. In case of 9 nm particles we observe a coercive field of μ_0H = 0.2 T at 340 K. The magnetic anisotropy rises by more than one order of magnitude due to annealing, while the total magnetic moment remains nearly constant.

MA 32.10 Thu 17:30 HSZ 401

Charge Transfer Controlled Magnetism of FePt Nanoparticles — •Balaji Gopalan[1], Christophe Stroh[1], Keir Foster[1], Christian Lemier[1], Raghavan Viswanath[1], Jörg Weissmüller[1,2], and Stefan Mangold[3] — [1]Institut für Nanotechnologie, Forschungszentrum Karlsruhe GmbH, Hermann-von-Helmholtz-Platz 1, D-76344 Eggenstein-Leopoldshafen, Germany — [2]Fachrichtung Technische Physik, Universität des Saarlandes, 66041 Saarbrücken, Germany — [3]Institut für Synchrotronstrahlung, Forschungszentrum Karlsruhe GmbH, Hermann-von-Helmholtz-Platz 1, D-76344 Eggenstein-Leopoldshafen, Germany

The effect of charge transfer between ligand and nanoparticles on the magnetic properties of monodispersed 2.0 nm FePt nanoparticles is studied. For this purpose, we have synthesized FePt nanoparticles covered by high fatty acid ligand (FePtCL), octadecanethiol (FePtSH), and oleic acid/oleylamine mixture (FePtOAc) as a series and the magnetic properties are compared. The superparamagnetic blocking temperature (T_B) are found to be 14, 11 and 7.5 K for FePtCL, FePtSH and FePtOAC samples respectively. The coercivity (H_c) values measured at 5 K are 3880, 4800 and 4000 Oe for FePtCL, FePtSH, and FePtOAC respectively. These differences suggest that the effective magnetic anisotropy constant (K_{eff}) is different for these samples. XANES Fe K pre-edge values of 7114.6 and 7115.4 eV are observed for FePtCL and FePtSH (reference Fe value is 7112.1 eV) indicating that Fe in 2(+) and 3(+) oxidation states respectively in these samples. A correlation between the observed oxidation states and the magnetic properties will be attempted.

MA 32.11 Thu 17:45 HSZ 401

Synthesis of magnetic nanoparticles with pronounced shape anisotropy and characterization via small angle X-ray scattering (SAXS) — •Frank Döbrich, Andreas Michels, Andreas Tschöpe, and Rainer Birringer — Universität des Saarlandes, Technische Physik, Geb. D2 2, 66041 Saarbrücken, Germany

Ferrofluids (FF) are stable colloidal suspensions of magnetic particles in a nonmagnetic carrier fluid. This fact renders a FF sensitive to an external magnetic field, which leads to a coupling of magnetic and rheological properties. For instance, it is expected that a dispersion of highly anisometric particles such as rods or chains reveals a large enhancement (compared to spherical particles) of the magnetoviscous effect, i.e. the increase of the FF's viscosity due to an externally applied magnetic field. This contribution reports on the synthesis of a highly anisometric FF containing stable chains of iron nanoparticles and on the microstructural characterization by means of transmission electron microscopy (TEM) and small angle X-ray scattering (SAXS). The SAXS measurements develop a pronounced anisotropy of the scattering pattern as a function of increasing external magnetic field. Evaluation of the radially averaged SAXS curves in terms of basic scattering functions is discussed.

MA 32.12 Thu 18:00 HSZ 401

Magnetoviscous behaviour of nanorod ferrofluids — •Dörte Junk, Christian Lang, Andreas Tschöpe, and Rainer Birringer — Universität des Saarlandes, 66123 Saarbrücken, Germany

We prepare shape-anisotropic iron particles in a magnetic-field-assisted forced flux aerosol reactor. On their way downstream the particles are coated with oleic acid and dispersed in a carrier fluid. As in conventional ferrofluids these rod-like particles behave as Brownian particles. Their morphology has been characterized by TEM and ac susceptibility measurements in a dc bias field. We find an average aspect ratio lying between 10 and 15; we will call such a complex fluid nanorod ferrofluid (nrod FF). The magnetoviscous effect of the nrod FF has been studied using a squeeze flow viscometer (piezoelectric axial vibrator) in the presence of a homogenous magnetic field. The comparison with conventional FF reveals a giant magnetoviscous effect.