

1-3 weeks at 873-1273 K. Discs were cut from the bulk samples resulting in surfaces with different orientation compared to the direction of the cooling gradient. After polishing, the surfaces of the discs were etched with different acids in order to colour different crystallites differently. The best results were obtained with a solution of 2 mol/L  $\text{Fe}_2\text{Cl}_3$  in 12% to 8% concentrated HCl. This particular concentrations tinted different crystallites in a different tone while the surface of the sample was not destroyed very deep. Using this approach, different types of crystallites were found: needle-like ones for the Si-rich compounds and block-like for the Al-rich compounds.

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**X-ray Diffraction studies on  $\text{RFe}_3(\text{BO}_3)_4$**  — ●JORGE HAMANN BORRERO<sup>1</sup>, MARTIN PHILIPP<sup>1</sup>, OLGA KATAEVA<sup>2</sup>, RÜDIGER KLINGELER<sup>1</sup>, CHRISTIAN HESS<sup>1</sup>, BERND BÜCHNER<sup>1</sup>, MARTIN VON ZIMMERMANN<sup>3</sup>, ALEXANDER VASILIEV<sup>4</sup>, and LEONARD BEZMATERNYKH<sup>5</sup> — <sup>1</sup>Leibniz Institute for Solid State and Materials Research IFW Dresden, 01171 Dresden — <sup>2</sup>A.E.Arbutov Institute of Organic and Physical Chemistry of the Russian Academy of Sciences, Arbutov Str. 8, Kazan, 420088, Russia — <sup>3</sup>HASYLAB@DESY, Notzkestr. 85, 22603 Hamburg — <sup>4</sup>Faculty of Physics, Moscow State University, Moscow, 119992 Russia — <sup>5</sup>Institute of Physics, Siberian Division, Russian Academy of Sciences, Krasnoyarsk, 660036 Russia

Mo X-ray radiation and hard X-rays diffraction experiments, with and without external magnetic field, were made on single crystalline  $\text{RFe}_3(\text{BO}_3)_4$  compounds (R = Tb, Gd, Nd, Dy and Y) in order to elucidate the various interesting crystal structures and phase transitions, with a special focus on  $\text{TbFe}_3(\text{BO}_3)_4$ . The crystal structure of this compound is of space group  $R\bar{3}2$  at room temperature and undergoes a symmetry reduction at  $T < 192\text{ K}$  to space group  $P3_121$  involving slight distortions of the  $\text{TbO}_6$  prisms and  $\text{FeO}_6$  octahedra. Distinct field dependent structural features were observed on  $\text{TbFe}_3(\text{BO}_3)_4$  when applying a magnetic field parallel to the  $c$  axis at  $T=2\text{ K}$ . At fields higher than around 3T, a superstructure peak (001.5) appears as an indication of a new field induced structure which involves doubling of the unit cell along the  $c$  axis. These results are compared with the structures of the other rare earth and Y compounds.

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**Evolution of the crystal structure of  $\text{YMn}_{2-x}\text{Fe}_x\text{O}_5$  due to iron doping and DFT calculations for the  $x=1$  compound** — ●TORSTEN WEISSBACH<sup>1</sup>, DMITRI SOUPT<sup>2</sup>, GÜNTER BEHR<sup>2</sup>, THOMAS FÜHRICH<sup>1</sup>, FALK WUNDERLICH<sup>1</sup>, DIRK C. MEYER<sup>1</sup> und SIBYLLE GEMMING<sup>3</sup> — <sup>1</sup>Institut für Strukturphysik der TU, Dresden, Germany — <sup>2</sup>Institut für Festkörper- und Werkstofforschung (IFW), Dresden, Germany — <sup>3</sup>FZ Dresden-Rossendorf, Dresden, Germany

$\text{YMnFeO}_5$  is a ferrimagnet below 165 K[1]. Its crystal structure is derived from that of the ferromagnetic and low-temperature ferroelectric  $\text{YMn}_2\text{O}_5$  by occupation of the Mn position possessing pyramidal oxygen environment with Fe; the other Mn site is coordinated by oxygen in an octahedral manner. Powder samples for  $x = 0, 0.25, 0.5, 1$  [2] were inspected by X-ray powder diffraction and EXAFS, single crystals ( $x = 0.07, 0.25$ ) by single-crystal X-ray diffraction methods. The structure data show a significant displacement of Fe within the oxygen pyramid, while the Mn position remains nearly constant with respect to the surrounding oxygen atoms. All-electron density-functional calculations in the LSDA+U approximation for the  $x = 1$  compound [3] are in good agreement with the collinear, commensurate ferrimagnetic ordering of the magnetic moments as proposed in [1].

[1] Munoz, A. et al., Chem. Mater. 16, 4087 (2004); [2] all materials prepared by D. Souptel at IFW Dresden; [3] FPLO: Koepnik, K. et al., Phys. Rev. B 59, 1743 (1999)

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**Investigation of the electronic structure of  $\text{LuFe}_2\text{O}_4$  by means of XPS, XAS, XES and calculations** — ●MICHAEL RAEKERS<sup>1</sup>, CHRISTIAN TAUBITZ<sup>1</sup>, KARSTEN KUEPPER<sup>2</sup>, STEPHEN J. BLUNDELL<sup>3</sup>, DHARMALINGAM PRABHAKARAN<sup>3</sup>, and MANFRED NEUMANN<sup>1</sup> — <sup>1</sup>Universität Osnabrück, FB Physik, Barbarastr.7, 49069 Osnabrück, Germany — <sup>2</sup>FZ Dresden-Rossendorf, Dresden, Germany — <sup>3</sup>Clarendon Laboratory, University of Oxford, Oxford, UK

The use of magneto electric coupling and multi ferroics in spintronics has led to an intense interest in ferro electric magnets. The spinel  $\text{LuFe}_2\text{O}_4$  is a very promising candidate for such applications because

of its giant room temperature magneto dielectric response, which suggests a strong coupling between spin moment and electric dipole. The resulting giant magneto capacitance is due to charge ordering of iron ions. A complex two dimensional ferri magnetism plays an important role for the multi ferroic properties of  $\text{LuFe}_2\text{O}_4$ . We determine the electronic structure by means of XPS, XAS and XES. Experimental data is compared with multiplet calculations, which are performed with the TT multiplet program taking into account charge transfer and the crystal field. The comparison with the experiment shows the occupation of tetrahedral and octahedral sites of the crystal.

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**Raman study of FeSi under high pressures up to 15 GPa** — ●IVAN JURISIC, ANA MARIA RACU, DIRK MENZEL, and JOACHIM SCHOENES — Institut für Physik der Kondensierten Materie, TU Braunschweig, Mendelssohnstr. 3, 38106 Braunschweig, Germany

Single crystals of FeSi which were grown by the Czochralski technique have been investigated by Raman spectroscopy up to pressures of 15 GPa. The measurements were performed at room temperature in a diamond anvil cell (DAC) using Daphne7373 oil as a pressure transmitting medium.

FeSi crystallizes in the B20 structure for which the factor group analysis predicts 9 Raman active modes. Measurements on larger crystals outside of the DAC allowed the assignment of all vibrations.[1] In the DAC only the stronger E-mode vibrations at  $182\text{ cm}^{-1}$  and  $313\text{ cm}^{-1}$  and the T-mode vibration at  $310\text{ cm}^{-1}$  could be observed.

With increasing pressure the frequencies of the vibrations shift to higher wave numbers. For all the observed modes the Grüneisen parameters are calculated and compared to the values from temperature dependent measurements at ambient pressure. The data are discussed in terms of both localized and itinerant models of FeSi.

[1]A.-M. Racu et. al., Phys. Rev. B 76, 115103(2007)

MA 18.37 Tue 15:15 Poster E

**Modification of magnetic order in  $\text{Mn}_5\text{Si}_3$  and  $\text{Mn}_5\text{Ge}_3$  by C ion implantation** — ●CHRISTOPH SÜRGER<sup>1</sup>, NIRAJ JOSHI<sup>1</sup>, RICHARD MONTBRUN<sup>1</sup>, HILBERT V. LÖHNESEN<sup>1,2</sup>, KAY POTZGER<sup>3</sup>, and WOLFHARD MÖLLER<sup>3</sup> — <sup>1</sup>Physikalisches Institut and Center for Functional Nanostructures, Universität Karlsruhe, D-76128 Karlsruhe — <sup>2</sup>Forschungszentrum Karlsruhe, Institut für Festkörperphysik, D-76021 Karlsruhe — <sup>3</sup>Institute for Ion Beam Physics and Materials Research, Forschungszentrum Dresden-Rossendorf, Bautzner Landstraße 128, D-01328 Dresden

Antiferromagnetically ordered  $\text{Mn}_5\text{Si}_3$  can be driven ferromagnetic by incorporation of carbon into the voids of Mn octahedra of the hexagonal structure. While for  $\text{Mn}_5\text{Si}_3\text{C}_x$  polycrystals the Curie temperature saturates for  $x > 0.22$  at  $T_C = 152\text{ K}$  [1], sputtered  $\text{Mn}_5\text{Si}_3\text{C}_{0.8}$  films exhibit a  $T_C$  above room temperature [2]. An enhancement of  $T_C$  is also found after C doping of the isostructural compound  $\text{Mn}_5\text{Ge}_3$  which is currently in the focus of possible spintronic applications. In an alternative approach,  $\text{Mn}_5\text{Si}_3\text{C}_x$  and  $\text{Mn}_5\text{Ge}_3\text{C}_x$  films were prepared by implantation of 45 - 195 keV  $\text{C}^+$  ions into  $\text{Mn}_5\text{Si}_3$  or  $\text{Mn}_5\text{Ge}_3$  films at elevated temperatures. The carbon-implanted samples exhibit magnetic properties very similar to their respective magnetron-sputtered counterparts as inferred from magnetization and resistivity measurements.

[1] J. P. Sénateur et al., Bull. Soc. Fr. Mineral. Cristallogr. 90, 537 (1967)

[2] C. Sürger et al., Phys. Rev. B 68, 174423 (2003)

MA 18.38 Tue 15:15 Poster E

**Local measurement of magnetic anisotropy in  $(\text{Ga,Mn})\text{As}$**  — ●FRANK HOFFMANN, MATTHIAS SPERL, GEORG WOLTERS DORF, URSULA WURSTBAUER, and CHRISTIAN BACK — University Regensburg, Germany

The magnetic properties of the ferromagnetic and semi-conducting material  $(\text{Ga,Mn})\text{As}$  can be accessed by means of static and dynamic experimental approaches (e.g. SQUID, FMR). In contrast to these integrative methods we present a dynamic approach which combines FMR and Kerr microscopy. This local technique enables us to investigate magnetic anisotropies within the laser spot diameter (submicron resolution). Microwaves in the GHz range which are synchronized to the laser probe pulses are used for the excitation of the magnetization. The magnitude of the precessional motion of the magnetization is measured by means of the magneto-optic Kerr effect. By sweeping the magnetic bias field at a fixed excitation frequency both resonance field and linewidth can be obtained. From the angular dependence of