MS15.02.05 HIGH ENERGY X-RAY MAGNETIC SCATTERING: A NEW TECHNIQUE. Th. Brückel, Hamburger Synchrotron-Strahlungslabor HASYLAB at Deutsches Elektronen-Synchrotron DESY, D-22603 Hamburg, Germany

Magnetic x-ray scattering owes some of it's success to the resonance enhancements observed at the L_{II},L_{III},-edges of Lanthanides and the M_{IV},M_V-edges of Actinides. For transition metal compounds at most very weak resonance phenomena are observed in the hard x-ray range and one is left with the small non-resonant magnetic scattering cross section. In this situation, the use of high energy x-rays with energies above 100 keV might provide a possible remedy. At these energies transition metal compounds become virtually transparent to x-rays. Penetrations depths amount to several millimetres. This leads to a volume enhancement of the signal, independent of the material under consideration. True bulk properties become accessible, which can be of importance in the study of magnetic disorder phenomena. In the limit of very high energies, x-rays become sensitive to the spin momentum only, which should allow a separation of spin and orbital angular momentum without polarisation analysis.

In the present contribution, the principles of the new technique are discussed and results of first experiments on simple magnetic model systems are presented.

MS15.02.06 STUDY OF ORBITAL AND SPIN MAGNETIZATION DENSITIES IN MAGNETIC MATERIALS. Gerhard Grübel, European Synchrotron Radiation Facility, 38043 Grenoble, France

The element specific determination of orbital and spin magnetization densities remains a challenging task which is adressed experimentally by both magnetic x-ray scattering (XMS) and x-ray magnetic circular dichroism (XCMD). XMS experiments performed at high brilliance synchrotron radiation sources allow a quantitative polarization analysis of the magnetic scattering cross-section in both the resonant and non-resonant regimes. This permits the determination of orbital- and spin magnetization densities either via the polarization dependence of the non-resonant cross-section or through the application of magneto-optical sum rules to the dipolar contributions of the resonant magnetic cross-section obtained at two absorption edges. The same sum rules allow to deduce element-specific orbital and spin magnetic moments from x-ray absorption spectroscopy (XAS) and its associated magnetic circular dichroism data.

PS15.02.07 THE FIRST MEASUREMENTS OF A PURE MAGNETIC POWDER REFLECTION WITH X-RAYS. R J Cernik, S P Collins, D Laundy and C C Tang, Synchrotron Department, Daresbury Laboratory, Warrington, Cheshire, WA4 4AD, UK

We report the first successful measurements of magnetic x-ray powder diffraction from an antiferromagnet, performed at the uranium M4 edge in UO_2. For some time, magnetic x-ray diffraction measurements on antiferromagnetic crystals have utilised the huge M-edge resonant enhancements to good effect, routinely providing intensities and resolution superior to those more traditionally associated with neutron scattering [1]. However, competition between the relatively weak Bragg intensities, and a combination of diffuse scattering and strong fluorescence signals has made powder measurements difficult.

Our experiment [2], carried out on SRS station 8.4, was configured for maximum count-rates and low background. The resulting (102) magnetic diffraction intensity was found to vanish above the magnetic ordering temperature and exhibit the anticipated resonance response. Moreover, the integrated intensity agreed remarkably well with a simple calculation of the magnetic cross-section.

We anticipate that measurements performed with high flux insertion devices on third-generation synchrotrons, such as the ESRF, should provide data of extremely high quality, and could be extended to less pronounced magnetic resonances, such as the L-edges of magnetic lanthanide compounds.

References

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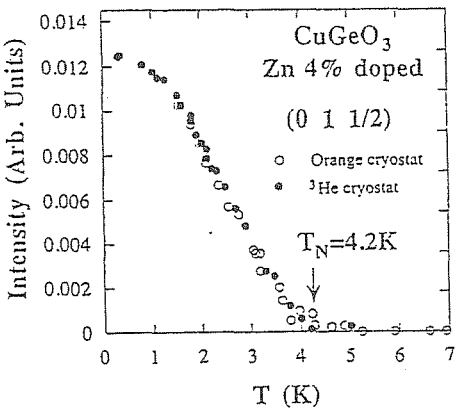
PS15.02.08 CHARACTERISATION OF THE NÉEL STATE IN Zn AND Ni DOPED $CuGeO_3$ S. Coad[1], J.-G. Lussier[2], D. McK. Paul[1] and D. F. McMorrow[2] [1]Dept. of Physics, Univ. of Warwick, Coventry, CV4 7AL, UK [2]Dept. of Solid State Physics, Riso National Lab, DK-4000 Roskilde, Denmark.

Single crystal derivatives of the spin-Peierls (S-P) system, $CuGeO_3$, doped with concentrations of Zn (0.5% to 2.4%) and Ni (1.7% to 6%) have been studied using neutron scattering and SQUID magnetometry. Our study confirms that the presence of impurities generally suppresses the S-P state and leads to the onset of a Néel state at low temperatures. Although the effect of doping is fundamentally similar for Zn and Ni doped crystals, neutron scattering measurements of several magnetic reflections in the b*-c* plane reveal that the preferred spin orientation of the Cu^{2+} moments is along the c* axis for the Zn doped crystals and along the a* axis in the Ni doped material. In contrast to a recent report about the lack of saturation in the ordered moment in a Zn doped crystal, our measurements show the expected saturation of the magnetic intensity at low temperatures.



PS15.02.09 ANTIFERROMAGNETISM IN THE TERNARY CARBIDES $Tb_2Cr_2C_3$, $Ho_2Cr_2C_3$ and $Er_2Cr_2C_3$. By M. Reehuis, N. Stüßer, K. Zeppenfeld and W. Jeitschko, Hahn-Meitner-Institut, Berlin and Anorganisch-Chemisches Institut, Münster, Germany

The magnetic properties of the compounds $R_2Cr_2C_3$ (R = Y, Gd - Lu) with $Ho_2Cr_2C_3$ structure (C2/m) were determined with a SQUID magnetometer and by neutron powder diffraction. The chromium atoms do not carry a magnetic moment as is shown by the Pauli paramagnetism of the yttrium and lutetium compounds. The lanthanoid sublattices show antiferromagnetic order below the Néel temperatures T_N = 50 K ($Tb_2Cr_2C_3$), T_N = 14 K ($Ho_2Cr_2C_3$) and T_N = 7 K ($Er_2Cr_2C_3$) (K. Zeppenfeld, R. Pöttgen, M. Reehuis, W. Jeitschko and R. K. Behrens, J. Phys. Chem. Solids 54(1993)257). In the 2 K neutron powder patterns of $Tb_2Cr_2C_3$ and $Er_2Cr_2C_3$ the magnetic reflections could be indexed with the