01-Instrumentation and Experimental Techniques (X-rays, Neutrons, Electrons)

peak-to-background ratios and an almost constant resolution of 2.5 × 10^{-3} down to sin θ = 0.04 Å^{-1} (25 Å
neutrons). The contributions to the resolution are given. The performance has enabled us to determine the
incommensurate magnetic propagation vector in the thiocarbamate antiferromagnet Fe_{2}O_{3} and to study its
temperature dependence in the range from 4 K to its Neel point at 21 K. Other examples include the magnetic
scattering from the two magnetic antiferromagnetic phases of MnS_{2} and the pressure dependence of their
magnetic structures. The design of a purpose-built cold neutron diffractometer is described.

PS-01.04.07 CIRCULAR MAGNETIC X-RAY DICHROISM AT FE K EDGE AND GD L2,3 EDGES IN Fe/Gd MULTILAYERED FILMS
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Fe/Gd multilayered film is known to have interesting properties such as spin flop and temperature compensation phenomena which sensitively depend upon artificial period of the multilayer. In this paper, we report measurements of circular magnetic x-ray dichroism (CMXD) at Fe K-edge and Gd L2,3 edges of Fe/Gd multilayered films as a function of artificial period of the film, using circularly polarized x-rays at AR-NE-1 of KEK.

It is shown that the CMXD spectra of Fe K-edge in samples with longer period than 10 Å is similar to that in pure Fe while the CMXD spectra from Gd L2,3 edges are opposite in sign to that in pure Gd. In samples with shorter period than 5 Å, on the other hand, spectra of Fe K-edge and Gd L2,3 edges are completely reversed compared to those in samples with longer period. This means that Fe moments are dominantly in samples with longer period than 10 Å, while Gd moments become dominant in samples with shorter period than 5 Å, keeping both Fe and Gd moments anti-ferromagnetic. A L2,3 separation of Gd moment was tried based on the same rule, showing clear change of both components against the artificial period of the multilayered film.

References

PS-01.04.06 MAGNETIC X-RAY DIFFRACTION FROM FERROMAGNETIC MATERIALS
P. Collins and D. Lautery and R. Coombs, SERC Daresbury Laboratory, Warrington, UK

This poster describes the simple White-beam technique developed at the SRS to measure non-magnetic x-ray diffraction from ferromagnetic crystals with synchrotron radiation. The results of several experiments are presented. Early work on iron,[1,2] has demonstrated the feasibility of the X-ray technique, and produced data which are in excellent agreement with, and of similar quality to, the data obtained by neutron measurements.

More recent data have highlighted the complementarity between X-ray and neutron diffraction in two important respects. First, X-ray diffraction has been adopted to determine the spin of iron atoms, and the magnetic structure of the iron chain in the ferrimagnetic rare earth compound, [11] a measurement which can be made directly with neutron diffraction.

PS-01.04.09 EXCITATIONS OF CONDENSED MATTER STUDIED BY INELASTIC X-RAY SCATTERING WITH HIGH ENERGY RESOLUTION
By E. Berkel, Section Physik, University of Munich, Munich, Germany

Very high energy resolution measurements using X-rays can be achieved by extreme backreflection (Bragg angle close to 90°) from perfect crystals. This technique allowed the development of the instrument INELAX for inelastic scattering experiments at the HAB1 wigglers at DORIS, DESY Hamburg. As present, an energy resolution of 9 meV is achieved and the present instrument is the only tool to investigate collective excitations in condensed matter. Energy transfers from 10 meV to 5 eV and wavevectors up to 13 Å^{-1} are accessible.

Longitudinal and transverse dispersion curves of aluminums and diamond were extracted from measurements of phonons in single crystals of these materials. The method was also applied to single crystals of tie and to superconductors. Furthermore, collective excitations of liquid lithium were studied and the dispersion of these excitations could be detected. An important application of inelastic X-ray scattering is the study of electronic excitations in solids. Measurements of such excitations in single crystals of lithium were performed up to energy transfers of 5 eV with an energy resolution of 35 meV. They provided information on the dispersion of excitations which can be described as zone boundary collective states. The measurements revealed a fine structure which was not observed before.

01.05 – X-ray and Neutron Powder Diffraction

MS-01.05.01 MODELING AS A COMPLEMENT TO POWDER DIFFRACTION EXPERIMENTS IN STUDYING INORGANIC AND ORGANIC SOLIDS. By C. M. Freeman and J. M. Newsam, BICYSM Technologies Inc. 9685 Scranion Road, San Diego CA 92130, USA

Dramatic improvements in analytical instrumentation have been paralleled by equally impressive advances in computer hardware and in modeling and theoretical methods. Computer modeling has in fact become established as a key complement to diffraction experiments, aiding in the evaluation of experimental results and in the interpretation of analytical data in terms of atomic-level behavior. A suite of modeling methods appropriate for