MS15.01.04 COMPOSITE GERMANIUM CRYSTALS WITH ANISOTROPIC MOSAIC AS A FOCUSSING MONOCHROMATOR FOR NEUTRON POWDER DIFFRACTION. T. Vogt, Physics Department, Brookhaven National Laboratory New York, 11973-5000, USA

The High Resolution Neutron Powder Diffractometer has now been operating for over 2 years at the High Flux Beam Reactor at Brookhaven National Laboratories. Its unique and innovative feature is a neutron monochromator made out of stacks of deformed Ge(115) wafers. A process to create a spatially homogeneous but anisotropic mosaic structure in thin germanium wafers was developed. The individual wafers were then recombined to wafer stacks which allow the construction of large focusing monochromators which yield symmetric reflection profiles. The presentation will describe the construction of this wafer stack monochromator and its performance when used in high-resolution neutron powder diffraction.

[1] T. Vogt, L.Passell, S. Cheung, J.D. Axe. *Nucl. Instr. Meth.* **A338**, 71-77 (1994)
[2] J.D. Axe, S. Cheung, D.E. Cox, L.Passell, T. Vogt, S. Bar-Ziv. *Journal of Neutron Research* **2**(3), 85-95 (1994)
[3] T. Vogt, U. Wildgruber, L. Passell, S. Cheung. *Journal of Neutron Research* in press

MS15.01.05 NEUTRON LAUE DIFFRACTION WITH LASER READ IMAGE PLATES. C. Wilkinson[a], F. Cipriani[a], J. C. Castagna[a], P. Oleinek[b], M. Keller[b], C. Bon[c], M. S. Lehmann[c], [a]EMBL Grenoble, Av. des Martyrs, F38042 Grenoble, [b]Technische Universtat Munchen, D-85748 Garching, [c]Instiut Laue Langevin, Av. des Martyrs, F38042 Grenoble

The diffraction patterns from protein crystals contain many thousands of reflections, which in the case of Laue experiments are simultaneously active. In order to profit from this, these detectors must be large. Neutron-sensitive image plates provide a good solution as they are relatively cheap, capable of high resolution and can be made to subtend large angles at the specimen. These neutron-sensitive plates are based on the same phosphor (BaFBr doped with Eu^{2+} ions) which is used for the Xray image plates, but with Gd_2O_3 added to enable the Gd nuclei to act as neutron scintillators by creating a cascade of γ-rays and conversion electrons.

An on-line cylindrical neutron image plate diffractometer has been constructed which has the crystal mounted on a goniometer head on the cylinder axis. The white neutron beam, which enters and leaves via opposed holes in the cylinder, produces Bragg reflections which pass through the aluminium wall and are recorded on the image plates mounted on the outside cylinder surface. The detector, which has a radius of 159.2 mm and a length of 400 mm, is read out by tracking a laser and photomultiplier tube read head parallel to the axis of the cylinder. The readout time is five minutes, giving an image of the pattern recorded on the plates comprising 4000 x 2000 square pixels 200µ on edge.

Data sets have been collected for triclinic lysozyme (hen egg-white), tetragonal lysozyme (collaboration with N Niimura of JAERI) and for concanavalin-A (collaboration with J. Helliwell, G. Habash, University of Manchester) using a full white beam with wavelengths between 2Å and 8Å. Due to the high background arising mainly from the incoherent scattering from hydrogen atoms, it is necessary to limit the width of the waveband in order to collect data beyond a resolution limit of d=3Å. Data have been extended to d=2.1Å on these samples using a waveband between 3Å and 4Å. In the case of triclinic lysozyme, an internal agreement factor of 11% has been obtained on 12,000 (4700 independent) reflections, and currently an R factor of 0.18 has been obtained by fitting the positions of water molecules in the structure.

MS15.01.06 TRANSMISSION POLARIZER FOR NEUTRON DIFFRACTION. V.Nunez, Department of Physics, Clarendon Laboratory, Parks Road, Oxford OX1 3PU, UK and C.F.Majkrzak, Materials Science and Engineering Laboratory, National Institute of Standards and Technology, Gaithersburg, MD 20899, USA

The performance of a transmission polarizer for neutron diffraction applications is described. The polarizer consists of multiple plates of single crystalline Si on which are deposited Fe/Si supermirrors having a critical angle of reflection for one neutron spin state that is approximately three times that of an ordinary Ni film. A stack of 100 Si wafers, alternating plates having supermirror coating on both sides and uncoated plates, is then curved mechanically to a radius of about 2.5 meters. The resulting assembly is 2.5 cm wide x 7.5 cm high and 5.0 cm in length along the incident beam direction. At the proper angle of inclination, one spin state is effectively reflected out of the incident beam direction and subsequently absorbed in a downstream Soller collimator. The other, desired, spin state passes through undeviated. For neutron diffraction measurements performed on single crystals, at 4.15 Å wavelength with 40 min. collimation and 25 min. mosaic monochromator and analyser, transmissions of the desired spin state greater than 0.80 and polarization efficiencies greater than 0.90 have been obtained using these devices.

PS15.01.07 RAPID SUPPRESSION AND MODULATION OF THE DIFFRACTED BEAM IN SINGLE CRYSTAL EXCITED BY ULTRASOUND. E.M.Iolin, Institute of Physical Energetic, Riga, LV-1006, Latvia

The influence of the acoustic waves (AW) on the diffraction of X-rays and Synchrotron radiation was considered by many authors. We report the results of a theoretical analysis of the high-frequency AW influence on the intensity I(q) of a diffracted beam in a perfect crystal for the Laue case (q is the impulse along the surface of a crystal). It is known that I(q) contains many phonon satellites. Kohler, Mohling and Peibst (1974) observed the intensity I(q) decrease of the zeroth order satellite ($q<<1$) due to AW. Their analysis is limited by the case of moving AW when I(q) shows no time dependence. We are considering I(q) decrease of the zeroth order satellite for the case of a standing AW. A strong time dependence of the I(q) has been found in this case. For example, suppose that at the moment $t=t_0$ the standing AW amplitude $W=W_0$ and $I_{(0)}=0$. At the next moment $t=t_0+dt$, $W=W_0+dW$, $|dW|<<|W_0|$. A coherent addition of amplitudes of scattering between the layers of the crystal will be realized. Therefore, for the case of a thick crystal ($n>>1$) the intensity will be rapidly increasing, $I(q)\sim|dW|$ (the thickness of the crystal $T=n^*Ls$, Ls - the wave length of the AW). For the case of a thin crystal (n=1) the intensity will be slowly increasing, $I(q)\sim(dW)^2$. $I(q)\sim q^4$ when $q<<1$ and $t=t_0$. Therefore a rapid suppression of I(q) may be observed at the central part ($q<1$) of the main Laue diffraction peak for a very short time dt (for an example, at an f=100 MHz a suppression by a factor 1/50 - 1/100 will exist during dt=50-100 ps). The transfer-matrix method [1] is very useful for the calculation I(q) due to the space periodicity of the AW. It is not necessary to find numerically a solution of the Takagi-Taupin equations for a thick crystal, it is enough to solve TTE for a thin crystal (T=Ls) and then to find the transfer-matrix and analytically calculate I(q) for a thick crystal.

1. E.Iolin. Acta Cryst. (1995), A51, 897-902.