15.6-3 INELASTIC X-RAY SCATTERING FROM PHONONS

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In extreme back reflection from perfect crystals a high energy resolution of about 10 meV can be achieved. Even with the high x-ray intensity of a bending magnet of DORIS (DESY, Hamburg) focussing elements are necessary. We have built an instrument using almost back reflection from monochromator and analyzer. A triangle shaped, vertically grooved Si crystal is used as monochromator and a spherically bent, crosswise grooved Si crystal disc serves as analyzer. The first measurements of inelastic scattering of x-rays performed with this instrument are presented. These are optical phonons in pyrolytic graphite at an energy transfer of (171 ± 10)meV as well as an optical phonon in a Be single crystal (79 ± 10) meV.

15.6-4 AN X-RAY MULTIPLE DIFFRACTION STUDY OF GaAs AND GaAs-AlAs SUPER LATTICE BY SR. By

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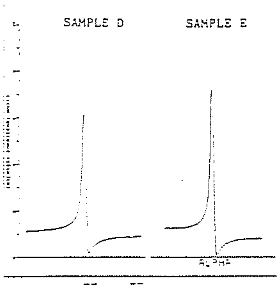
The X-ray multiple diffraction has been long regarded as an undesirable complication in the measurement of diffraction intensities from single crystals. Recently, however, great concerns are focused on multiple diffraction studies mainly because it could provide a practical solution to the phase problem. The method is based on the fact that the line profile of multiple diffraction is very asymmetric when the dynamical effects are observed. For example, the interaction among the diffracted beams generates not only peaks but also dips even for the Umweganregung. Since the profile should be affected by the quality of a specimen, it could be possible to characterise high quality crystals by investigating line profiles. In this study such characterisation is examined by using SR. In order to observe detail of line profiles, high resolution experiment is necessary. In this point SR has great advantages. The result for GaAs is given in the Figure where better sample(E) shows stronger dynamical effects. This proves that the characterisation by multiple diffraction is possible in some extent.



15.6-5 X-RAY DIFFRACTION STUDIES USING SYNCHROTRON RADIATION AT DARESBURY LABORATORY. By

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The unique properties of synchrotron radiation offer many advantages for the study of crystalline powders, amorphous alloys, liquids and single crystals. The experiments described here were all carried out on the wiggler beam line at Daresbury Laboratory. The radiation from this port has a maximum intensity at 0.93 Å with an effective cut off below 0.1 Å.

The experimental station 9.1 was used in monochromatic Debye-Scherrer mode to collect data of excellent quality suitable for Rietveld refinement from zeolite specimens (Glazer, McCusker) and from Li V Ge oxide (Bruce).

The hexagonal to orthohombic phase transition of synthetic Mg corderite was also studied by measuring the spontaneous strain associated with the transitions (Salje, Redfern).

An experimental technique is being developed to study amorphous binary alloys. The tunability of synchrotron radiation is used to observe the scattering close to an absorption edge (Finney, Bushnell-Wye).

A novel study of the structure of electrode surfaces was also undertaken; the 111 reflection from a thin film of gold was studied as a function of the deposition of iodine ions in a reversible electrochemical reaction (Rayment).

The hydration of Portland cement was studied as a function of time using a linear position-sensitive detector (Barnes et al.). The dynamic changes in the diffraction pattern were recorded at 30 s intervals. The energy dispersive technique was used to study a sample of $Ga_xIn_{1-x}As_yP_{1-y}$ in a diamond anvil cell. The bulk compressibility was measured as a function of alloy composition (Hatton et al.).

An attempt was made to determine the internal strain parameter in diamond structure materials. This parameter describes how the two sublattices move with respect to each other when the crystal is subjected to a uniaxial stress, and is deduced from the stress dependence of the structure factors of reflections that are forbidden in the unstressed crystal (Cousins et al.).

During June and July 1986 the suitability of station 9.7 was tested for a dedicated energy dispersive station. The experiments included the real-time energy-dispersive powder diffraction of hydrating cement (Barnes et al.), high pressure studies of TiB_2 using a Drickamer cell (Hausermann) and a study of the precipitation of n-alkanes from solution (Roberts et al.).

An experiment was carried out in September 1986 to determine the suitability of station 8.3 as a dedicated high resolution powder diffraction station (Cernik and Fitch). This produced encouraging results and we hope a powder diffraction data collection service will be implemented shortly.