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

The newly developed equipment for micro-region analysis was designed to be installed with a micro-pinhole and with an imaging plate(IP;Fuji Co.Ltd.) readout system. Even though the equipment is placed in a vacuum chamber to avoid air scattering, a diffraction pattern at different crystal orientations can be obtained without opening the chamber. Micropinholes with diameters of 5 and 10 μm were prepared and set just after the collimator. The distance between the pinhole and the sample is 7 mm, and the detector using IP covers from -30 to 165 degrees in two-theta range with camera radius of 100mm. This appratus with a 10μm pinhole was initially applied to olivine(Mg_2SiO_4) included in a thin section of meteorite, and also to micrometer-sized aluminum grains on a semiconductor material.

PS-01.03.08 COMPUTER-AIDED CRYSTAL ORIENTATION

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There are many methods for adjiustment of the single crystals. Among them, the Laue method is the most general one for the determination of orientation and symmetry of crystals (Wood, Crystal Orientation Manuel,Columbia University, New York, 1963). In order to reduce the time required for conventional Laue back-reflection method, we have developed COMPUTER-AIDED CRYSTAL ORIENTATION(CACO).

Procedure and main points of CACO are briefly described in the following.

1. Mount the crystal to be oriented on a goniometer, take a Laue photograph.
2. According to the spatial arrangment and intensity of spots on Laue photograph, select a major spot (X', Y') which is not only a strong reflection but one through which many zones pass,predefine the corresponding Miller indices to be (h'k'l'). Move (X', Y') to the centre of Laue photograph, transform other spots. Display the transformed Laue photograph on screen.
3. Calculate positions and intensities of Laue spots,simulated a Laue back-reflection pattern.

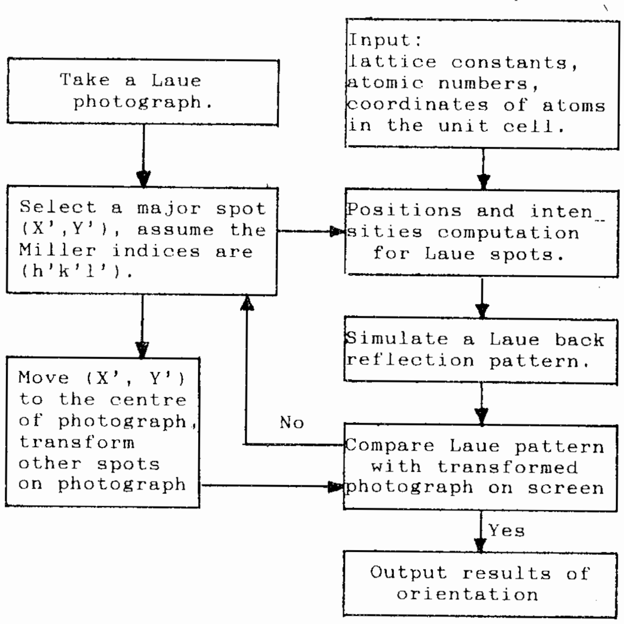

Fig. 1 Schematic flow chart of CACO.

The relative intensity of each reflection is calculated by using the structure factor F, the Lorentz factor L, the absorption correction,the geometric factor and Kramer's formula (Preuss, Laue Atlas, John Wiley, 1973).

4. Compare the Laue back-reflection pattern with the transformed photograph on screen.
5. If the simulated Laue pattern coincides with photograph,the assumption in step 2 is correct, the crystal orientation is finished; otherwise the predefinition is wrong, go to step 2.

The computer program of CACO is written in BASICA and designed to run on IBM-PC/AT or compatible computers. It can be used not only for orienting single crystals, but also for plotting Laue back-reflection diagrams and stereographic projections of any crystal structure. By changing some details, CACO can also be applied to transmission Laue method.

PS-01.03.09 A HIGHLY PARALLEL IMAGING GAS COUNTER FOR SYNCHROTRON RADIATION DIFFRACTION

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Multiwire Gas Proportional Counters (MWPCs) currently in use for synchrotron radiation diffraction offer unrivalled dynamic range and detection efficiency. Unfortunately they have until recently been somewhat limited in count rate performance and suffer from parallax problems at high angles of incidence. We report here on the design of a new fast area detection system currently under construction for the Daresbury SRS. It utilises a highly parallel data acquisition system in order to achieve photon counting rates in excess of 10^6 counts per second, coupled to a pressurised proportional counter to reduce parallax. The detector will be 200mm x 200mm and the system will have a real spatial resolution of ~ 200μm.

Recent test results from functioning parts of the system are shown and an evaluation of the merits of using Microgap versus conventional detector designs are reported.

PS-01.03.10 AN IMAGING-PLATE (IP) AREA DETECTOR SYSTEM DEVELOPED FOR HIGH SPEED DATA COLLECTION FROM LARGE-UNIT CELL CRYSTALS USING A ROTATING ANODE GENERATOR.

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The imaging plate area detector system (R-AXIS IIC) using a rotating anode X-ray generator was developed for high-speed data-collection from large-unit-cell crystals (Sato *et al.*, J. Appl. Cryst., 1992, 25, 348-357) It is a fully automatic data aquisition system without manual intervention. The diffraction geometry is based on an Arndt-Wonacott oscillation camera, except that the crystal is rotated around a vertical spindle axis. A double-focusing X-ray optics that uses Ni-coated mirrors polished like an arc is employed to avoid unfavorable curvatures arising from conventional mechanisms to bend flat mirrors. It is quite suitable for collecting data from large-unit-crystals. Two kinds of software packages are provided: one controls