

## BL-4B1 Polychromatic/monochromatic X-ray diffraction station for sub-micrometer sized crystal/micro-

This station is dedicated to obtaining diffraction data for crystallographic studies of materials using polychromatic/monochromatic X-ray from a bending magnet. The diffraction equipment and optical system installed in a beamline are designed especially for sub-micrometer sized specimen/micro-area of a larger sample. In order to obtain a thin collimated beam making background level low, a pair of pinholes is installed in the beamline at 16,500 and 19,000mm from the source point. Two sizes of the pinholes, 50 and 100 $\mu\text{m}\phi$ , are available. Weissenberg type camera is installed in a vacuum chamber for suppressing air scattering. Diffraction system is controlled by a workstation.

Diffraction pattern is recorded on an imaging plate with a size of 200  $\times$  400mm (Fuji Film Co.,Ltd.) set in a cylindrical cassette with radius of 100mm covering  $-60$  to  $165$  degrees in two-theta range on an equator, and read-out by He-Ne laser system equipped in the camera just after the exposure, and transmitted to and stored in the workstation. Then, obtained pattern can be viewed on the monitor without opening the vacuum chamber, and primary analysis can be carried out immediately.

### Area of Research

- (1) sub-micron specimen (i.e. interplanetary dust particles etc.):  
Diffraction data are obtained by a Laue method with polychromatic X-ray.
- (2) a few micron specimen (i.e. new industrial materials etc.):  
Oscillation/Weissenberg method are available using monochromatic X-ray from a double Si(111) monochromator installed in the beamline.
- (3) micro-area in a larger specimen  
(i.e. micro minerals in thin section/new materials on substrate etc.):  
Back Laue method with polychromatic X-ray is used. Micro-beam at the sample position is obtained with a micro-pinhole set up-stream of the sample. Micro-pinholes with sizes of 1.6, 6.0 and 10 $\mu\text{m}$  at the sample position are available.  
The irradiated micro-area in the sample can be chosen by an optical micro-scope set on the incident X-ray beam. Image of the irradiated micro-area in a larger sample is recorded as jpg file.

### Light Source

Bending magnet

### Photons at sample

Energy range: polychromatic: 6 - 31KeV,  
monochromatic: 7 - 18 KeV  
Beam size: polychromatic: 1.6, 6.0, 10 $\mu\text{m}$ ,  
monochromatic: 50-500 $\mu\text{m}$

### Facilities in Experimental Station

- Hutch dimension: 2.3  $\times$  3.5 m
- X-ray CCD (4.8  $\times$  6.4 mm) for beam alignment
- Sample stages with micrometer for micro-area experiment (i.e. thin section, block sample)

- Optical microscope on an incident X-ray beam
- Imaging plate set in a cylindrical cassette with diameter of 100mm
- Imaging plate read-out system
- Table (40 x 115 mm) with an optical bench for general purpose

### Devices for Experiment

- Manipulator with optical microscope to mount a micro sample on a thin glass fiber
- Apparatus for making micrometer sized glass fiber

### References

- (1)K.Ohsumi, K.Hagiya and M.Ohmasa: Journ. Appl. Cryst.,24,340,1991.
- (2)K.Ohsumi, K.Hagiya, M.Uchida, N.Suda, M.Miyamoto, M.Kitamura and M.Ohmasa: Rev. Sci. Instrum.,66,1448,1995.

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(Jan. 2001)