High-Resolution Powder Diffraction Experiments at BL02B1

H. Toraya* (3158)[1], H. Okudera (3161)[1], Y. Kubota (1269)[2], H. Hibino (3159)[1], H. Ishibashi (3984)[3], S. Hayashi (4104)[4], M. Yamakata[5] , and Y.Noda (3176)[6]

1) Nagoya Institute of Technology, 2) Osaka Women's University, 3) Osaka Prefectural University, 4) Mie Prifectural Ceramic Research Institute, 5) Spring-8, 6) Tohoku University

1. Introduction

Powder diffraction experiments were conducted at the beam line BL02B1, which has a bending magnet light source, a pair of mirrors, a water cooled two-crystal monochromator, and a seven-axis diffractometer for multi-purpose experiments. Aims of present experiments were to examine beam quality and instrumental resolution of the beam-line using the diffractometer presently available and to investigate a design of a future powder diffractometer.

2. Experiments

A flat-specimen reflection geometry was employed by using a rotating specimen of NIST SRM 640b Si powder in a glass specimen holder. Crystal planes of monochromator used were Si(111). A flat crystal was used for the second crystal of monochromator instead of a sagitally focused crystal in the previous experiment. The analyzer, mounted on a long detector arm of the diffractometer, was a Si(220) flat crystal. Mirrors were not used in the present experiments. Typical ring current was around 19mA. Wavelengths used were 0.5Å and 1.0Å. A θ-2θ step scan technique using a scintillation counter was employed. A profile fitting technique was used for data analysis.

3. Results and discussion

Fig. 1 shows the plots of the observed full-width at half-maximums (FWHM) of Si powder against 2θ for the data obtained with λ = 1.0Å. Results in the previous experiments are also presented together with calculated curves fitted by the least-squares method assuming the Caglioti et al. formula.

Beam-line optics is not fully optimized. Thus a direct comparison between the present and previous results is difficult. However, the use of flat Si(111) crystal for the second crystal of monochromator can be considered to have less induced the vertical beam divergence compared to that using a sagitally focused crystal: the angular resolution was well comparable to those obtained with Si(311) (sagitally focused) crystal for the monochromator (Fig. 1). On the other hand, diffracted peak intensity was increased about seven times for λ = 1.0Å and more than one order in magnitude for λ = 0.5Å without focusing compared to those obtained with sagitally focused Si(311).

Designs of beam-line optics and a diffractometer equipped with a multiple-detector system are now in progress.

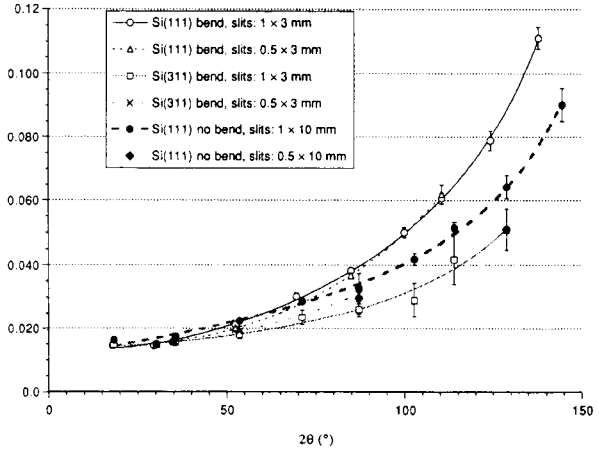

Fig. 1. Variations of the FWHM with 2θ (λ = 1.0Å).