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Product of rotated-inclined focusing monochromator with simultaneous tuning of asymmetry factor and radius of curvature over a wide wavelength range

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Introduction

The optical system of a bending magnet beamline at the PF is very important for protein crystallography, because the brightness of the beam is not enough for the high-throughput data collection or for the time-resolved protein crystallography. In order to overcome the problem, a rotated-inclined focusing monochromator with simultaneous tuning of asymmetry factor and radius of curvature over a wide wavelength range (1) was made and settled it with fully automatic data collection system called Galaxy in the BL6C. This monochromator can cover 0.87 -1.90 Å range using only one crystal in the best condition.

Experimental

This monochromator was manufactured in Mac-Science Company and completed in our laboratory. Evaluation of the carving of the monochromator base was carried out using a micrometer by laser coupled with XY stage shown in photo 1. Here we describe in figures about the results measured using the instrument in every steps (Fig. 1-3) from the manufacture product to the final one.

Figure 3 shows the flatness of the monochromator. This result about surface roughness is enough for the monochromator. The monochromator thus obtained has been installed in BL6C and it has worked at well-balanced condition for these two years.

Conclusion

We succeeded to make a product of the single-crystal focusing monochromator covered 0.87~1.9Å wavelength range for protein crystallography.

Photo. 1. A micrometer by laser coupled with XY stage.

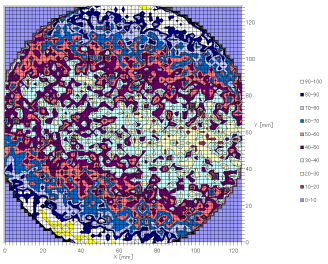

Fig.1 Base of the monochromator
The monochromator base was made from copper. It was carved by Numerical Control machine (NC) and polished by hand with careful measurement with the micrometer by laser coupled with XY stage shown in Photo 1. The difference between each colour corresponds to the depth of 10-micron meters.

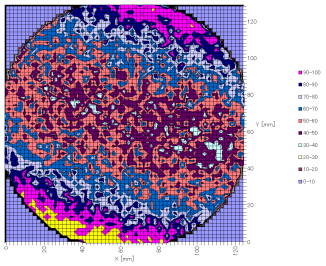

Fig. 2 After Ni-coating of the base
To fix the Si(111) monochromator to the base by using In (25%)-Ga, the base was coated by Ni. The difference between each colour corresponds to the depth of 10-micron meters.

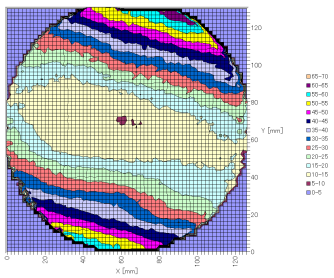

Fig.3 The Si(111) crystal was fixed on to the base.
The difference between each colour corresponds to the depth of 5-micron meters.

References

(1) N. Watanabe, M. Suzuki, Y. Higashi and N. Sakabe (1999) J. Synchrotron Rad. 6, 64-68