

Poster Presentation

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In-situ diffraction experiments at the Photon Factory MX beamlines

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Crystallization trial is one of the most important but time-consuming steps in macromolecular crystallography. Once a crystal appears in a certain crystallization condition, the crystal is typically harvested from the crystallization drop, soaked into a cryoprotection buffer, flash-cooled with a liquid nitrogen or cold gas flow and finally evaluated its diffraction quality by an X-ray beam. During these long process, crystal may be damaged and the result from the diffraction experiment does not necessarily reflect a nature of the crystal. On in-situ diffraction experiment, where a crystal in a crystallization drop is directly irradiated to an X-ray beam, a diffraction image from a crystal without any external factors such as harvesting and cryoprotection and, as a result, a nature of crystal can be evaluated quickly. In the Photon Factory, a new table-top diffractometer for in-situ diffraction experiments has been developed. It consists of XYZ translation stages with a plate handler, on-axis viewing system with a large numeric aperture and a plate rack where ten crystallization plates can be placed. These components sit on a common plate and it is placed on the existing diffractometer table in the beamline endstation. The CCD detector with a large active area and a pixel array detector with a small active area are used for acquiring diffraction images from crystals. Dedicated control software and user interface were also developed. Since 2014, user operation of the new diffractometer was started and in-situ diffraction experiments were mainly performed for evaluations of crystallization plates from a large crystallization screening project in our facility. BL-17A [1], one of micro-focus beamlines at the Photon Factory, is planned to be upgraded in March 2015. With this upgrade, a new diffractometer, which has a capability to handle a crystallization plate, will be installed so that diffraction data sets from crystals in crystallization drop can be collected.

[1] N. Igarashi, N. Matsugaki, Y. Yamada, et al., *AIP Conf. Proc.*, 2007, 879, 812-815

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