

BL19B2 Engineering Science Research I

1. Introduction

BL19B2 is a bending magnet beamline dedicated to X-ray diffraction and scattering experiments for the industrial use of synchrotron radiation. To meet the diverse needs of industry, various experimental apparatuses are provided in this beamline. A versatile high-throughput powder diffractometer, *Polaris*, and a multi-axis diffractometer are installed in the first and second hutches, respectively. In the third hutch, an apparatus for small-angle X-ray scattering (SAXS) with a camera length of 0.7–40 m is installed. The detector of this apparatus is the two-dimensional detector PILATUS 2M. Furthermore, ultra-small-angle X-ray scattering (USAXS) with a camera length of 40 m is performed by setting the sample stage in the second hutch and utilizing PILATUS 2M in the third hutch as the detector. In order to provide automated measurements, sample changer robots are equipped at *Polaris* [1] and the apparatuses for SAXS/USAXS [2–3].

2. Triaxis oscillation–rotation sample stage available for *Polaris*

In order to improve the X-ray diffraction profile from polycrystalline samples with large grains, in FY2018, we developed an apparatus to rotate and oscillate rod/needle-shaped samples using the multi-axis diffractometer [4]. The apparatus is called the triaxis oscillation–rotation sample stage (TORS). The unique motion of this stage enables us to obtain suitable diffraction profiles for Rietveld analysis by averaging the X-ray diffraction signals from many large grains in

polycrystalline samples. In FY2020, we modified the sample stage of *Polaris* in the first hutch to enable the installation of TORS (Fig. 1). This modification expanded the scattering angle range of powder diffraction profiles in experiments utilizing TORS with *Polaris*.

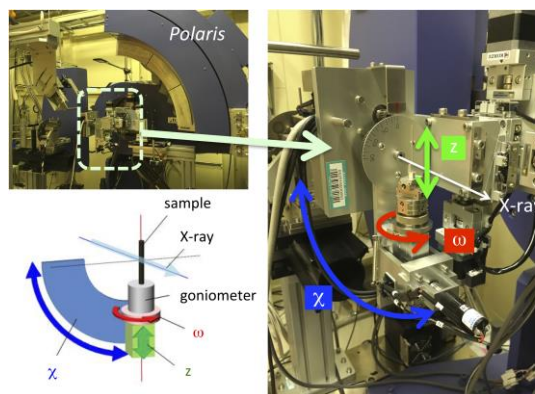


Fig. 1. TORS installed on *Polaris* in the first hutch.



Fig. 2. Expanding unit for *HummingBird* for SAXS measurement in the third hutch.

3. Expansion of sample changer robot for SAXS

The automated measurement system using a sample-changing robot, *HummingBird*^[2-3], was installed at each hutch for SAXS and USAXS measurements. *HummingBird* for SAXS, installed in the third hutch in FY2019^[3], was able to store 120 samples on its sample shelf. In FY2020, we installed an expanding unit to exchange the sample shelves, and *HummingBird* for SAXS can now store as many as 240 samples (Fig. 2).

4. Online workshop for beginners of SR experimentation

The "Measurement Training Workshops" mainly for beginners of synchrotron radiation experiments have been held to help in the planning of experiments through lectures and practical training. However, because human traffic was restricted to prevent COVID-19 infection, it became difficult to carry out on-site training. To overcome this inconvenience, we prepared online conference tools at the beamline to hold training workshops online (Fig. 3). Such online connections are expected to promote the familiarization of beginners with synchrotron radiation experiments by improving the accessibility to SPring-8.



Fig. 3. Training workshop using online conference tool.

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References:

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