

BL14B2

Engineering Science Research II

1. Introduction

BL14B2 is a bending magnet beamline at SPring-8 dedicated to research by industrial users conducting X-ray absorption spectroscopy (XAS) measurements. Various measurement systems have been developed to realize easy and high-throughput operations of XAS measurements. In FY2019, the auto sample changer was renewed and the system for handling data was updated.

2. Auto sample changer

Since FY2009, the auto sample changer has been widely used by industrial users [1]. In FY2019, it was replaced due to frequent malfunctions and deteriorating conditions. Figure 1 schematically depicts the new auto sample changer. This design is

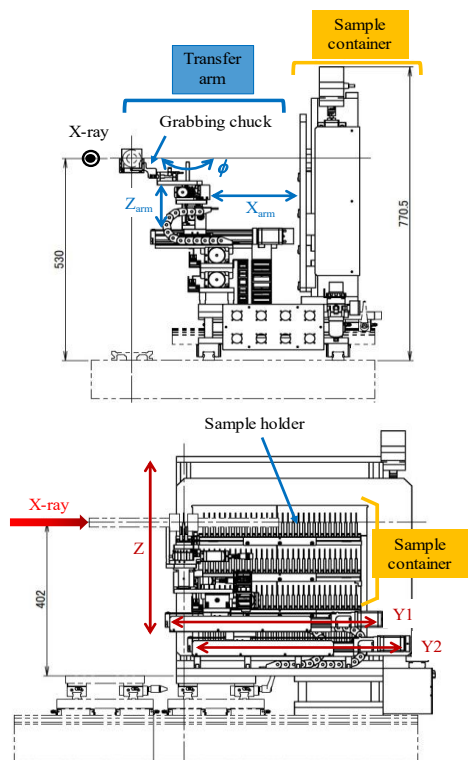


Fig. 1. Schematic of the renewed auto sample changer for XAS measurements.

based on that of the auto sample changer for small-angle X-ray scattering measurements at BL19B2 [2]. The new apparatus consists of two parts: the transfer arm and the sample container. To control the sample positions, the transfer arm is set on X_{arm} , Z_{arm} linear stages, and a ϕ rotation stage. The sample container is set on three linear stages ($Y1$, $Y2$, and Z) indicated by the red arrows in Fig. 1. Combining these six alterations can change the sample in less than 10 sec. The sample container can hold up to 120 samples, which is 40 samples larger than that of the previous auto sample changer.

Figure 2 shows photographs of the sample changer, the grabbing chuck of the transfer arm, the sample holder, and the sample cartridge. A measurement sample attached to a conventional slide mount can be mounted on a sample holder. The sample holders are set on the sample cartridge by magnets. Each cartridge has a maximum capacity of 40 samples.

The incident angles of the X-ray to sample surfaces can be changed in the horizontal plane of the measurements using ϕ rotation stage. Therefore,

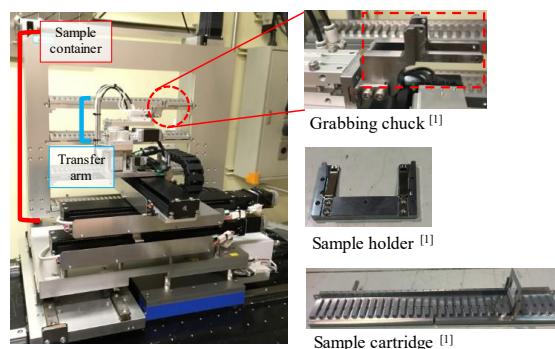


Fig. 2. Photographs of the auto sample changer, grabbing chuck of the transfer arm, sample holder, and sample cartridge.

both transmission and fluorescence XAS measurements can be performed automatically.

3. Utilization of data transfer system BENTEN

In FY2019, we utilized the data transfer system BENTEN, which was newly developed at SPring-8 [2], for the XAS measurement system and XAS standard spectral database at beamline BL14B2. BENTEN provides flexible and unified data access from both inside and outside SPring-8 for data analysis (<http://benten.spring8.or.jp>).

A system to upload measurement data to BENTEN was developed. This system transfers measured data from the local data server of BL14B2 to BENTEN automatically during an experiment. Because data are linked with the proposal number of the experiment, users can download their experimental data from BENTEN after returning to their home institution without collecting their results at the end of the experiment.

it contained 1042 spectra at the end of FY2019 (Fig. 3). This new system allows users to browse experimental data and metadata about standard samples in a directory format. Anyone with a SPring-8 user account can access the database. Details of the new XAS standard sample database can be found on the following website (http://support.spring8.or.jp/xafs/standardDB_02/standardDB.html).

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References:

- [1] K. Osaka et al., *AIP Conf. Proc.* 1741, 030003 (2016).
- [2] T. Matsumoto et al., *AIP Conf. Proc.* 2054, 060076 (2019).
- [3] M. Takagaki et al., *SPring-8 • SACLA Annual Report FY2016*, 52 (2017).

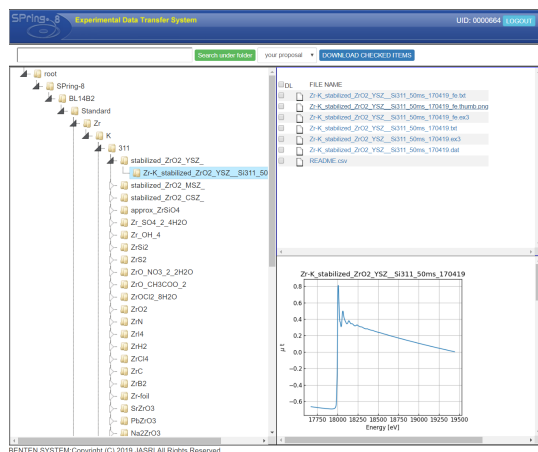


Fig. 3. New XAS standard spectral database.

Beginning FY2016, the XAS standard spectral database was published [3]. In FY2019, a new system was constructed for publishing this XAS standard spectral database utilizing BENTEN, and