

BL38B1

RIKEN Structural Biology I

1. Introduction

BL38B1, reclassified as a new RIKEN beamline in FY2019, is a beamline for small-angle X-ray scattering (SAXS) experiments using a bending magnet as a light source. The start-up of the SAXS system, which was relocated from BL45XU in FY2020, was completed, and in the first half of FY2021, SAXS system measurements were carried out. The beamline started to be used by RIKEN users and the AMED/BINDS project for the stable operation of SAXS. In addition, from FY2021B, the acceptance of public use proposals, mainly for biological samples, was resumed, and the system moved from the start-up and adjustment mode associated with the BL relocation to the regular operation mode.

2. Recent activities

The optics of BL38B1 utilizes asymmetric crystals for monochromators to increase the X-ray beam intensity and cylindrical mirrors with a length of 1 m to realize a focused beam near the detector and eliminate higher-order reflections from the monochromator crystals.

The SAXS camera at the experimental station employs an incidence optics system that combines two sets of scatterless slits 3 m upstream and just before the sample to reduce parasitic scattering in the small-angle region. The vacuum chamber of the SAXS camera and the PILATUS3X 2M two-dimensional detector make a fixed camera distance of 2.5 m the standard setup for Bio-SAXS.

The SEC (size exclusion chromatography)-SAXS system enables the measurement and

analysis of clean monodisperse samples without sample degradation due to aggregation, etc. by the direct SAXS measurement of proteins isolated and purified by gel filtration chromatography. BioSAXS, the main target of this beamline, shares the SEC-SAXS measurement and analysis environment with BioSAXS beamlines at KEK-PF, which is being promoted for collaboration and standardization with KEK-PF. BioSAXS users can now conduct experiments using the same experimental environment at both facilities.

The installed SEC-SAXS system allows UV/VIS monitoring during SEC-SAXS measurements to confirm the sample condition and real-time calculation of the origin scattering intensity I_0 and Guinier radius R_g (Figs. 1 and 2). In 2021, we started to support correlation structure analysis using this system in the BINDS (Basis for Supporting Innovative Drug Discovery and Life Science Research by AMED) project.

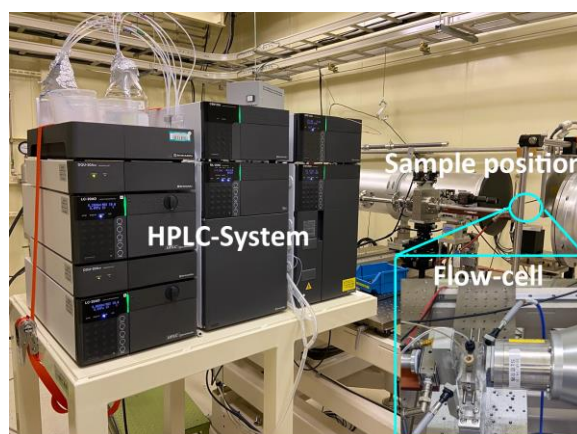


Fig. 1. SEC-SAXS system and flow cells for simultaneous X-ray and UV/VIS measurements in BL38B1.

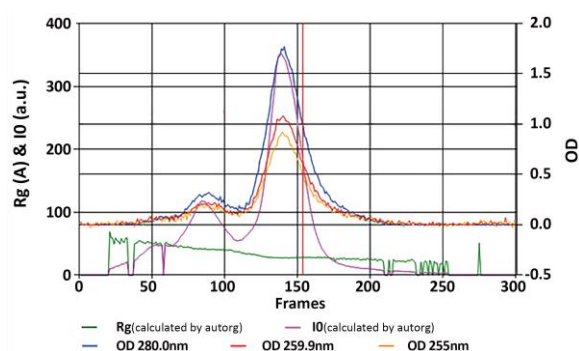


Fig. 2. UV/VIS monitoring during SEC-SAXS measurements and real-time calculation of origin scattering intensity I_0 and Guinier radius R_g .

In 2021, the system was also made available to RIKEN and some public SAXS users, including AMED/BINDS in the field of bio-SAXS, as well as to RIKEN researchers in materials science, such as polymer science, while the pilot operation of SAXS/WAXS measurements was promoted with researchers within RIKEN.

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