Performance of a new soft X-ray double crystal monochromator beamline, BL13

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A new soft X-ray double crystal monochromator beamline has been designed and constructed at BL-13 in SR center. Fig.1 shows the layout of the new beamline BL-13. This beamline has been constructed with three concepts, 1) all components of the beamline, focusing mirrors, double crystal monochromator and XAFS chamber should be set between 2.2m and 8m from the source point, 2) it has better performance than the similar beamline, BL-10, 3) the monochromatized beam should be focused into a spot of $1mm^{H}$ x $1mm^{V}$ at the sample position. In order to realize these concepts, we have installed two toroidal mirrors. By using two toroidal mirrors, we can produce nearly parallel beam and can expect high resolution. Furthermore, the whole beamline is designed as short as 7m by using a quasi-parallel beam.

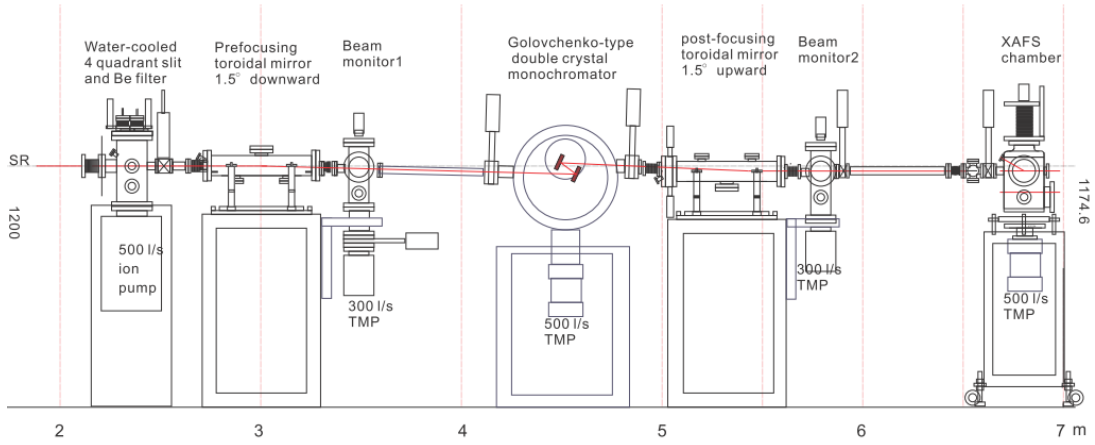

Fig.1 The layout of the new soft X-ray double crystal beamline, BL-13

Preliminary measurements of Si K-edge XAFS spectra of a Si(111) wafer have been performed without post-focusing mirror, as shown in Fig. 2. Obtained spectra (red lines) are compared with those taken in BL-10 (black lines). All the spectra were taken with the total electron yield mode, by using a pair of InSb(111) crystals as a monochromatizing element. The SR beam was incident normal to the sample. In the

XANES region shown in Fig.2(b), the main peak is split into a doublet at BL-13, while that taken at BL-10 is a broad peak. A distinct feature is observed around 1980 eV, as shown in Fig. 2(a), which is known as a standing wave profile caused by the interference between the incident and diffracted X-rays normal to (111) net plane. A closer look shown in Fig. 2(c) indicates that the standing wave profile observed at BL-13 is more enhanced than that at BL-10. These results demonstrate that XAFS spectra with higher energy resolution can be obtained at BL-13, possibly because we introduced quasi-parallel beam optics for the monochromatizing crystals.

This beamline is still under construction, but will be open to users by this summer.

The financial support by NEDO is highly appreciated.

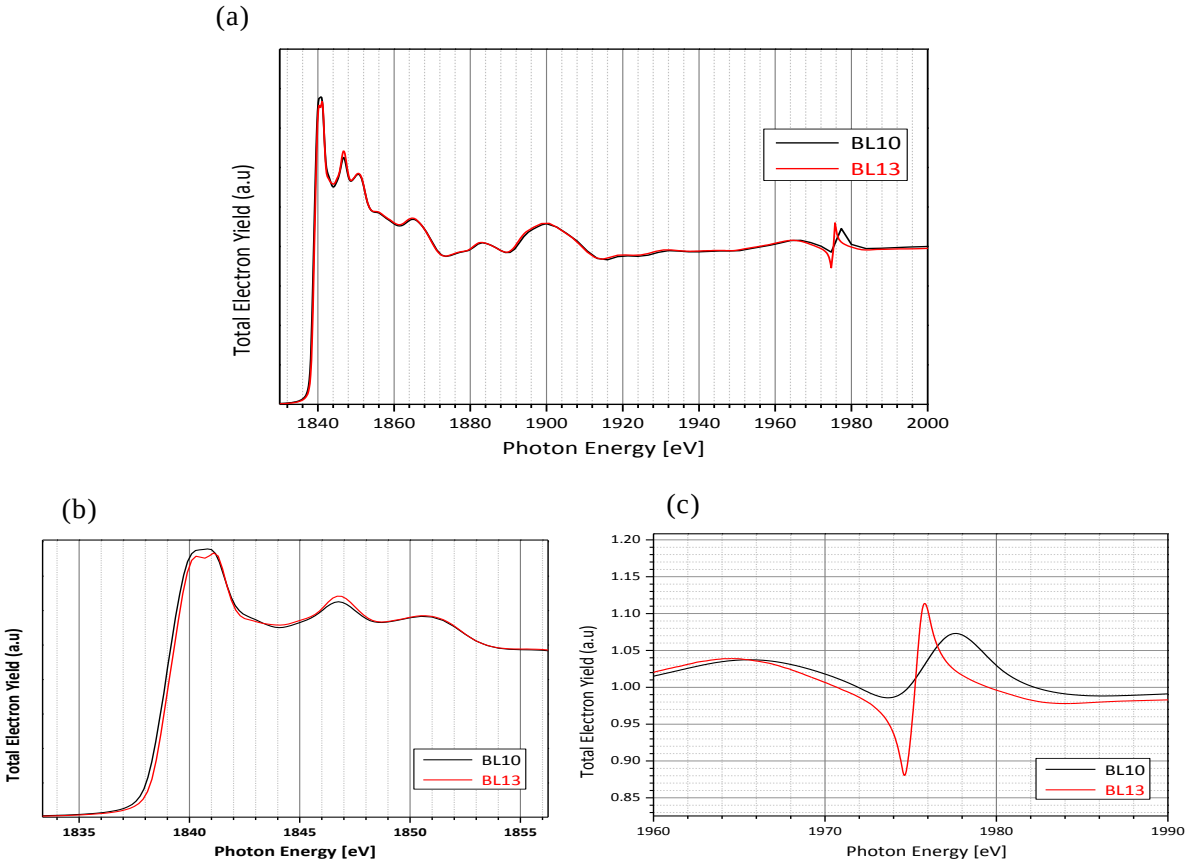

Fig.2 Si K-edge XAFS spectra of a Si(111) wafer taken at BL-13 (red line), compared with those at BL-10(black line) with the total electron yield mode. (a) XAFS spectra in a wide energy range. (b) Si K-edge XANES region, and (c) standing wave profiles of the Si(111).