Poster Presentation

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New developments and operation of the MX beamline XALOC at ALBA synchrotron

J. Juanhuix[1], J. Nicolás[1], G. Cuní[1], C. Colldelram[1], A. Rubio[1], J. Ávila[1], N. González[1], A. Enrique[1], I. Ramos[1], G. Jover[1], D. Fullà[1], F. Gil[1], J. Benach[1]

[1]*Alba Synchrotron, Crta. BP1413, Cerdanyola del Vallès, Spain*

BL13-XALOC is a Macromolecular Crystallography beamline at the 3-GeV ALBA synchrotron near Barcelona, and is operating with users since 2012. Currently being the only MX beamline at the site, XALOC has been designed to deal not only with easily automatable x-ray diffraction experiments of medium-sized crystals, but also with more complex ones that include a variety of crystal sizes and unit-cell length dimensions, crystals with high mosaic spread, and/or poorly diffracting crystals. The aim for a reliable all-in-one beamline contrasts with the trend observed lately, i.e. MX beamlines target specific characteristics of the crystals (microcrystals, large unit cells), techniques (tunability, small or large wavelengths), or to the status of the MX projects (crystal screening). The flexibility of the beamline is achieved by providing a very stable photon beam in an enery range of 5-22 keV and by changing the beam size at the sample position without loosing flux through defocusing to accomodate the dimensions of the beam to those of the sample. The beam dimensions at the sample position range from 57×5.5 µm2 FWHM (H×V) when focused to ~300×300 µm2. The dimensions of the beam are changed without varying the beam path. The beamline optics that allows this flexibility is based on an in-vacuum undulator, a Si(111) channel-cut monochromator, and a pair of KB mirrors. The defocused beam is severely affected by the slope errors of the mirrors, which produce striations on the beam profile at the sample position, mainly in the vertical direction. To minimize these striations, we have developed a new method that corrects mirror profiles by using spring actuators. The process resulted in a 4-fold reduction of the mirror slope errors, and in striations of the beam that amount only for ~10% of the nominal defocused beam profile. We expect that this uniform, tailored beam will improve the estimation of the radiation dose onto the sample, and will help in establishing a better data collection strategy. The end station includes a high accuracy single-axis diffractometer, a removable mini-kappa stage, an automated sample mounting robot, and a Pilatus6M, photon-counting detector. A new TANGO-based beamline control system (Sardana) has also been developed. Statistics of usage of the beamline and some relevant examples will be given.

Keywords: Macromolecular crystallography, Beamline instrumentation, uniform defocused X-ray beam