

The high pressure diffraction beamline "XPRESS" at Elettra

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The opening of the Xpress beamline [1] in 2016 has provided the high-pressure diffraction user community of the Elettra synchrotron facility a dedicated experimental set up at their disposal. This new beamline is part of a scientific partnership between India and Italy under a project administered through the Indian Institute of Sciences (IISc) Bangalore, for the development of a macromolecular and a high-pressure x-ray diffraction facilities, respectively XRD2 [2] and Xpress. A multipole superconducting wiggler (SCW) is the source of these two beamlines. A liquid nitrogen cooled silicon single crystal (cut along the (111) direction) hosted in the splitter chamber in the Front-End section intercepts the beam from the source (SCW) and directs it to the focusing mirror of the Xpress at a fixed energy of 25 keV. At this energy, the SCW provides a factor of 14 higher photon flux compared to the permanent magnet wiggler of XRD1, the existing diffraction beamline. The beam is focused using a toroidal mirror of 1.4 m long and 2.9 mrad grazing angle with a Pt coating to achieve 80% reflectivity at 25 keV. The focused beam from the mirror is further optimized by collimators (presently 80 micron diameter) to have intense and well defined monochromatic beam required for the high-pressure x-ray diffraction experiments. On-line pressure monitoring is achieved through a ruby fluorescence microscope connected side-by-side to the final beam collimator stage. The present experimental stage is equipped to host room temperature - high-pressure powder diffraction measurements using various kinds of Diamond Anvil Cells (DAC) in the pressure range 0-50 GPa. An image plate MAR345, with a controllable linear movement along the beam direction at two fixed vertical positions, is available for recording the diffraction pattern from both powder and single crystal samples. A Gas loading system is under commissioning, while variable temperature (300 - 100 K) capillary powder diffraction stage and limited range low-temperature high-pressure measurements using a specialized DAC and liquid nitrogen cryocooler system are also planned to be added in the near future.

[1] <http://www.elettra.eu/elettra-beamlines/xpress.html>

[2] <http://www.elettra.eu/elettra-beamlines/xrd2.html>



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