

« The high pressure crystallography beamline ID15B »

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ID09A [1] was a state of the art high pressure diffraction beamline at the ESRF, carrying out monochromatic diffraction experiments with large area detectors. Powder and single crystal diffraction experiments could be performed at high pressures in diamond anvil cells, permitting accurate determination of crystallographic properties of the investigated samples. After more than 20 years of successful operation, ID09A has been closed in November 2015. It has been replaced by a new and vastly improved beamline, ID15B, which started operation in November 2016.

On ID15 two beamlines with a canted straight section have been constructed. The first one (ID15A) is for materials chemistry and engineering applications, the second one (ID15B) for monochromatic high pressure diffraction with large area detectors, replacing ID09A. Due to canting the two beamlines can be operated independently.

X-ray source for ID15B is the U20 in vacuum undulator from ID09A. The monochromator is a horizontally diffracting nitrogen cooled Si (111) single bounce Bragg monochromator. ID15B operates at a fixed angle with an energy of 30 keV. Experience with ID09A has shown, that 30 keV is well matched for high pressure diffraction experiments in DACs. Two transfocators with 200 μm diameter linear (1-D) beryllium compound refractive lenses for vertical and horizontal focusing, respectively, provide a highly variable and very clean beam with a minimum spot size on the sample of approximately $7 \times 7 \mu\text{m}^2$. The flux is comparable to ID09A and will increase by a factor 20 after the EBS upgrade. The experimental setup is located on an extremely stable granite table. Data are collected with the MAR555 flat panel detector, which will be replaced by an Eiger 2, 9M, CdTe detector after the upgrade. A X-ray camera for high resolution X-ray transmission microscopy can be installed behind the optical table about 5m from the sample (see figure).

ID15B offers similar possibilities for data collection as ID09A, powder and single crystal diffraction with high resolution well into the megabar pressure range, with, if requested, variable temperatures from a few to several hundred Kelvin.

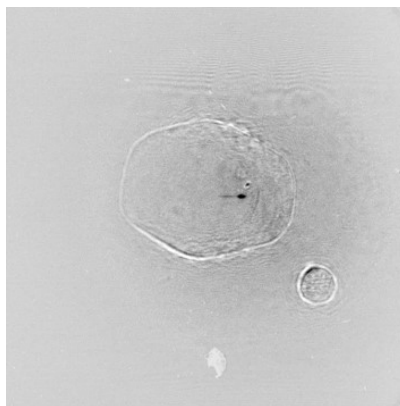


Figure: High resolution X-ray transmission image of a Sulphur crystal in a diamond anvil cell.

References

[1] - M. Merlini, and M. Hanfland, Single-crystal diffraction at megabar conditions by synchrotron radiation. High Pressure Research, 33, 511–522 (2013).
