MS17-01 New opportunities with the large-volume device at ID06, ESRF. Wilson Crichton[a] [a]*European Synchrotron Radiation Facility, B.P. 220, 38043 Grenoble cedex France*
E-mail: crichton@esrf.fr

A 2000 tonf load-frame equipped with modified cubic tooling has been installed at ID06 and is now open for limited User operation at the ESRF. The device has been designed for operation in angle-dispersive mode and will operate as such until its eventual location for full User operation at a high energy ID port, whereupon EDX and ADX will be supported. The tooling supports the use of lab-standard 32 mm cube-sets, and has optional primaries for use of semi-transparent 14 mm secondary stages. The device can be run on- or offline for synthesis, and ex situ characterisation techniques are available onsite for this purpose. Modification of the standard cubic geometry has allowed the introduction of independent upper and lower anvils which allow, on one hand, fine control of the state of triaxiality of one- and two-stage compression and, on the other hand, deformation of samples under load in single-stage operation. The press is mounted on a nine-axis motorised stage which includes sample-centring upon a rotation axis. This axis can itself be located in lab-space for coupling with focusing devices. The combination of rotation and the design of primaries and tooling blocks afford a down-stream solid angle limited by the angular acceptance upstream of +/- 16° (h) x 50° (v) and a independent detector table has been built to intercept data at these angles. Access is also available through the 90° anvil gaps for fluorescence studies. Here we further outline the full specification of the device and a resume of its operation to date. We outline results from the recent calibration programme and highlight research oppportunities that are currently ava ilable, as well as those that will be in the near future. We further demonstrate the incorporation of diverse investigative techniques, used in conjuction with imaging and diffraction studies, and will draw upon our recent results of applying ultrasonic studies to the beamline portfolio.

Keywords: high-pressure; synchrotron; diffraction

MS17-02 The Large Volume Press Beamline at the extension of PETRA. Norimasa Nishiyama,[a] Tomoo Katsura,[b] Wolfgng Drube,[a] Edgar Weckert,[a] Hanns-Peter Liemann,[a] [a]*Deutsches Elektronen-Synchrotron DESY, Germany,* [b]*Bayerisches Geoinstitut, Universität Bayreuth, Germany*
E-mail: norimasa.nishiyama@desy.de

PETRA III is currently the brightest 3rd generation storage ring in the world. DESY decided to build a new experimental station dedicated to a combination of large volume press (LVP) technique and synchrotron radiation in the PETRA III extension project. This experimental hutch will be located at one of the 100 m long damping wiggler section of the storage ring. It offers the unique opportunity to study materials under high pressure and temperature conditions using high energy X-rays which allow us to study samples surrounded by pressure media and in sample capsules. Construction of the experimental halls will start in 2013 and beamline constructions are scheduled to begin in 2014. Here we report the conceptual design of this new beamline. X-rays from the damping wiggler will be filtered by exchangeable absorbers to cut X-rays below 40 keV and to adjust flux of X-rays depending on the beam size (0.01 - 10 mm) because the power and heat of the damping wiggler beam will be too high for optical components. The pink beam will be used for energy dispersive X-ray diffraction experiments under high pressure. We are planning to perform time-resolved X-ray diffraction study to observe nucleation and grain growth process separately under high PT conditions, which might give us useful information to design materials synthesized under extreme conditions. We will install double crystal monochromator in Laue configuration to obtain mono-beam with 45-120 keV. The combination of the high energy mono-beam and use of area detector allows us to observe whole Debye rings of polycrystalline samples under high PT conditions. Distortion analysis of the Debye rings and radiographic imaging of the sample to measure sample-length enables us to draw stress-strain curves of deforming samples under confining pressure. We are also planning to install a multi-channel collimator system for powder X-ray diffraction studies. This technique will enable us to perform structure refinement using the Rietveld method in order to refine atomic positions of materials in wide range of pressures and temperatures. We believe that the instrumentation of the new LVP beamline will be very powerful for geosciences and material sciences.

Keywords: large volume press; petra iii; high energy x-rays