ture generation. 3)quasi-hydrostaticity, 4) simple x-ray diffraction geometry. By use of sintered diamond anvils with 3mm truncation, the DIA can generate pressures up to 20GPa.

Recently, the octahedral compression system with sintered diamond anvils has made great progress. This system has now reached pressures over 30GPa and temperatures up to 2000C in a sample volume of about 1mm3. In situ x-ray observation using this system have been successfully made, and various experimental results have been obtained. In this system, sintered diamond is used as an x-ray window. The fact that high energy x-ray can pass through the sintered diamond made this technique possible.

Although it might not be called multi-anvil, the simple opposed anvil type apparatus still has some advantages. Taking a Drickamer type sintered diamond anvil cell for example, it can generate more than 50GPa, and in situ observation has been successfully made at high P-T condition. There are some unreliability of the data because of the small sample volume and strong deviatric stress, but the opposed anvil devices are also very useful when they are used properly depending on the purpose and condition of the experiment.

In my talk, I will review the current status on the technical development in multianvil apparatus, and show a conception design of a new high pressure apparatus for the third generation synchrotron radiation (SPring-8).

MS18.04.02 T-CUP: A NEW HIGH-PRESSURE APPARATUS FOR X-RAY STUDIES D. J. Weidner, Y. B. Wang, M. T. Vaughan, C. C. Koleda (CHiPR and USB), I. C. Getting (CHiPR and U Colorado at Boulder)

We have designed and tested a new apparatus for *in-situ* X-ray diffraction studies under high pressures and temperatures. The system is a 6-8 two stage system, designed for a 200 ton load, with the possibility of sintered diamond second stage anvils. The first stage is a steel cylinder split into six parts and fastened onto the upper and lower guide blocks, enclosing a cubic cavity (19.5 mm edge length and the [111] axis of the cube stays vertical). The hydraulic press used for SAM-85 DIA guideblocks is used to apply up to 200 ton load. The second stage is assembled outside the press and consists of eight WC cubes each with 10 mm edge lengths.

The cell assembly is an octahedron made of semi-sintered MgO or boron-epoxy. The incident x-ray beam passes through the gaps between WC cubes in the [110] direction of the eight-cube assembly and diffracts in one of the (100) planes, through gaps between the WC anvils, with a diffraction vector 35.3° from the vertical plane. A special holder is built for a solid-state detector for energy dispersive mode at several 2q angles up to 7.5°We compressed NaCl at room temperature to 160 ton force and generated 18+ GPa pressure with 2mm truncations. Decker's equation of state for NaCl was used to determine pressures in the cell assembly.

MS18.04.03 NEW APPLICATIONS OF THE PARIS-EDINBURGH CELL: NEUTRONS AND X-RAYS S. Klotz, Physique des Milieux Condensés, Université P&M Curie, 4 Place Jussieu, B77, F-75252 Paris.

Until recently, the devices needed to compress large volume samples to pressures beyond 10 GPa were large and cumbersome. The development of the Paris-Edinburgh cell, which provides a thrust of 250 tonnes and has a mass of only 50 kg, thus represents a considerable reduction in size over comparable large-volume pressure cells. Equipped with two opposed anvils made of either tungten carbide or sintered diamond it will compress samples of up to ~ 300 mm^3 in volume to 6 GPa or ~ 30 mm^3 to 25 GPa. Originally designed for high pressure neutron powder diffraction, its compact size gives it advantages for a wide range of applications in both crystallography and solid state sciences. We give an overview of experiments which illustrates the potential of these techniques, covering: (1) Neutron powder diffraction to 25 GPa on solid, liquid and gaseous samples at ambient and low temperature on spallation sources, (2) inelastic neutron scattering on single crystals to 10 GPa on reactor sources, (3) in-situ x-ray powder diffraction at high temperatures to 1000 °C and 6 GPa, (4) in-situ EXAFS on solid and molten semiconductors at high temperatures and high pressures (5) density measurements by x-ray absorption experiments. We will also discuss current developments of cells with larger/smaller capacity and its future applications.

MS18.04.04 SAPPHIRE-ANVIL CELLS FOR NEUTRON SCATTERING STUDIES AT HIGH PRESSURES. A.S. Ivanov, Russian Research Center "Kurchatov Institute", Moscow 123182, RUSSIA

Recent progress on instrumentation for neutron scattering investigations of condensed matter at high pressures is reported. A set of high-pressure cells with maximal load up to 25 tons and ancillary equipment was constructed to conduct measurements of crystal structure and lattice dynamics at pressures of few dozens kbar and at different temperatures with sample volumes up to few cubic millimeters. Different size anvils (as a rule sapphire and sometimes diamond) in combination with various metallic gaskets serve to clamp a powder sample or a single crystal in liquid pressure-transmitting medium. A new type time-of-flight neutron scattering instrument with a full Debye-cone analysis was created and installed at the pulsed reactor in collaboration with Joint Institute for Nuclear Research, Dubna, Moscow Region. The instrument is dedicated to studies of microsamples and is adopted to measurements of both elastic and inelastic (using analyser ring) neutron scattering. The working abilities of the equipment are illustrated by examples of neutron scattering spectra registered at a number of fixed pressure values in the studied pressure range. The examples include measurements of pressure changes of crystal structure in ammonium halides and different mercury superconductors. Some data on phonon density of states, phonon dispersion and small-angle scattering are presented.

MS18.04.05 SINGLE CRYSTAL STUDIES IN THE Mbar RANGE. P.Loubeyre and R.LeToullec, PMC, Universite Paris 6, Paris, France

Single-crystal x-ray diffraction at Mbar pressure has been a major goal of high pressure physics. It is the essential technique to obtain diffracion from low -Z elements and can provide the most accurate structural data possible. But taking any single-crystals to very high pressures is extremely difficult as they usuallly break beyond use. Also, the diamond anvil cell should have an x-ray viewing angle of both sides of the sample as large as 80°, that is a mechanical challenge.

We will present a new x-ray cell with boron seats of half-sphere geometry that can hold the massive support on the diamond for the Mbar presures. The use of a soft hydrostatic cushion (helium at best and gold when it is impossible to load) will be shown to prevent the break up of the crystal. Already, single crystals of H_2, He, LiH, H_2O, $Ar(H_2)_2$, $Ne(He)_2$ have been studied in the Mbar range.

H_2 and H_2O will be selected as the most illustrative examples. Hydrogen because it is considered as the utmost difficult system for x-ray study at high pressure. H_2O because our single-cystal measurements can be compared to various powder x-ray diffraction works.