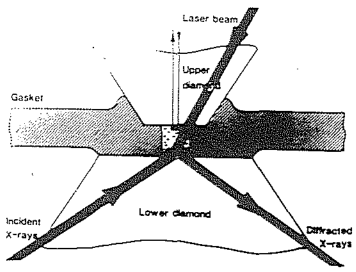
16.6–1 ESTIMATION OF UNIAXIAL STRESS COMPONENT IN DIAMOND ANVIL HIGH PRESSURE CELL. By S.Usha Devi and A.K.Singh, Materials Science Division, National Aeronautical Laboratory, Bangalore 560017, India.

The stress distribution in a solid specimen pressurized in a diamond anvil cell can be approximated to a superposition of hydrostatic component and an uniaxial stress component (USC). The USC vanishes only when fluid pressure transmitting medium is used. The USC of detectable magnitude can be present if no pressure transmitting medium is used or the solid specimen comes directly in contact with the anvils. The estimation of USC is important, because the presence of USC introduces systematic errors in x-ray diffraction data (A.K.Singh, High Temp-High Pressures, (1978), 10, 641). In this paper a method has been suggested of analysing the high pressure x-ray diffraction data to detect the presence of USC. In the present method, the theoretical expression for the lattice strains derived for the diamond-anvil geometry (A.K.Singh and C.Balasingh, J. Appl. Phys (1977) 48, 5338) is fitted to the measured lattice strains, and the magnitude of USC obtained. The method has been used to analyse the high pressure x-ray diffraction data on sodium chloride.

16.6–2 NEW CONSTRUCTED DIAMOND-ANVIL CELL FOR HIGH-PRESSURE X-RAY DIFFRACTION. By M. Malinowski, Institute for Low Temperature and Structure Research, Polish Academy of Sciences, Wroclaw, Poland.

A new diamond-anvil high-ressure cell has been developed for use on several types of commercial automatic four-circle diffractometers and precession cameras. This cell has repeatedly attained pressure of up to 100 kbar. The diffraction geometry of this cell is presented in the figure. It is a combination of the geometry presented by Schiferl (Schiferl,Rev.Sci.Instrum. (1977)48,24-30) and the geometry used in the majority of high-pressure cells (Merrill,Rev.Sci.Instrum. (1974)45,290-294). For this construction a very large area of the Ewald sphere is available and a continous range of 2Θ value is available from low to very high angles. This allows very accurate lattice constant determinations and facilitates more accurate determinations of atom positions from intensity measurements as well. Pressure calibratation is done by NaCl as the internal standard to calibrate. The pressure or can also be determined by using the fluorescence technique. High-pressure is generated by a bracket system, similar to presented by Keller (Keller,Rev.Sci.Instrum. (1975)46,973-979).



16.6–3 HIGH-PRESSURE STRUCTURAL STUDIES OF CERIUM METAL UP TO 30 GPa USING SYNCHROTRON RADIATION.
By U. Benedict[a], L. Gerward[b] and J. Staun Olsen[c].
a) Commission of the European Communities, Joint Research Centre, European Institute for Transuranium Elements, Karlsruhe, FRG, b) Lab. of Applied Physics III, Technical Univ. of Denmark, Lyngby, c) Physical Lab. II, H.C. Ørsted Institute, Univ. of Copenhagen, Denmark.

At 0.8 GPa there is an isosymmetric change from γ-Ce to α-Ce, both with the fcc structure. At 5 GPa we find a transition from α-Ce to monoclinic α"-Ce and at 12 GPa another transition from α"-Ce to tetragonal Ce. The high-pressure phases can be described as distorted fcc structures as shown by the following examples:

P (GPa)	a : b : c	β(°)	Structure
0 - 1	1 : 1 : $\sqrt{2}$	90.0	γ,α: fcc
6.9	1.001 : 1 : 1.52	92.0	α": monoclinic b.c.
17.1	1 : 1 : 1.67	90.0	tetragonal b.c.

α"-Ce has previously been observed by Zachariasen et al. (1) for 5 < P < 10 GPa, and tetragonal Ce by Endo et al. (2) for 12 < P < 17.5 GPa. We have compared our data with the equation of state calculated by Skriver (3) and found a good agreement between 5 and 20 GPa. At higher pressures deviations occur, probably because the theory works with a frozen core.

(1) W.H. Zachariasen and F.H. Ellinger, Acta Cryst. A33 (1977), 155-160.
(2) S. Endo, N. Fujioka and H. Sasaki, in High-Pressure Science and Technology, Vol. 1 (ed. by K.D. Timmerhaus and M.S. Barber), Plenum 1979, pp. 217-222.
(3) H.L. Skriver, in Systematics and Properties of the Lanthanides (ed. by F.P. Finka), Reidel 1982, pp. 213-254.

16.6–4 AN IMPROVED DIAMOND-ANVIL HIGH-PRESSURE CELL FOR SINGLE CRYSTAL WORK. By W. Dieterich, J. Glinnemann, J. Koepke, and H. Schulz, Max-Planck-Institut für Festkörperforschung, Stuttgart, FRG

A high pressure cell has been developed especially for single crystal X-ray diffraction (Malinowski, et. al., (1982), 159 (1-4), 93). The primary and secondary beams penetrate only one anvil (Fig. 2). This diffraction geometry has been used among others also by Schiferl et. al. (Rev. Sci. Instr., (1978), 49 (3), 359).

Work on quartz with this prototype cell (Glinnemann and Schulz, this meeting) led to a modified construction (Fig. 1). The main characteristics are:

(1) The proportion of measurable non-Friedel reflections for 2Θ< 90° increases from about 40% in usual cells to over 90% in our construction.

(2) No counterbearing is needed due to the weight of about 700g. Therefore the cell will work on diffractometers without full χ-circles.

(3) Size and diffraction geometry allow the use of Weißenberg cameras with double-radius film cylinders and adequately enlarged layer line screens.

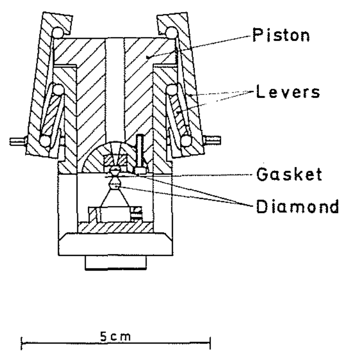


Fig. 1