Research at high pressure is very much dependent upon techniques, and every advance in the latter has resulted in a phenomenal expansion in our knowledge concerning the behavior of matter at high pressures.

To combine high pressures and large sample volumes, a different approach is needed one that dictates the use of hard materials as anvils. Recently, synthetic single crystal moissanite (hexagonal SiC) has been introduced as a kind of high hardness gem. The material has high hardness (Knoop scale 3000, compared with 2000 for sapphire and 1500 for cubic zirconia) and excellent optical properties: transparent to visible light and therefore colorless [1]. These features make moissanite an ideal candidate as an anvil material. Thus, the moissanite anvil cell has become a potentially important device for achieving both high-pressure and large sample volume.

The moissanite anvils are normally cut along the c axis of the crystal. We used large-volume cell anvils, where diameters is 10 mm and height is 7 mm. The culet diameter is 2 mm. The WC supports was used. We used hardness steel gasket for experiments. The both moissanite anvils was placed in Mao–Bell type [2] high pressure cell, which developed in HASYLAB (Figure 1). The pressure between two moissanite anvils is applied by turning six screws. The sample volume is 1 mm³. The sodium chlorite was placed with sample for pressure value measurement.

Diffraction patterns were recorded in an energy dispersive mode using white synchrotron X-rays from the storage ring DORIS III at F3 beamline. The ring operated at 4.5 GeV and a positron current of 80-150 mA. The incident X-ray beam was collimated to 150 × 150 µm with a divergence smaller than 0.3 mrad. Spectra were recorded by a Ge solid-state detector with a resolution of 153 eV at 5.9 keV resulting in a resolution of diffraction patterns of ∆d / d ≈ 1%. The Bragg angle 2θ was fixed at 5.00°, counting times for each diffraction pattern was 3600 seconds.

![Figure 1. The high pressure cell with moissanite anvils, which was used in high pressure experiments at F3 station.](image)

The manganites with chemical formula is (Nd₀.₅₄₄Tb₀.₄₅₆)₀.₅₅Sr₀.₄₅MnO₃ with oxygen isotope substitution was used test sample. The max pressure value was 2.5 GPa. The diffraction pattern of this manganite are shown at figure 2. The strong isotopic effect was occurred.
Figure 2. The energy dispersive X-ray patterns of the (Nd$_{0.544}$Tb$_{0.456}$)$_{0.55}$Sr$_{0.45}$MnO$_3$ manganite measured at high pressure P=2.5 GPa and processed by the profile matching method. Experimental points, calculated profiles and difference curve are shown. The tick rows indicate the calculated diffraction peaks positions.