ESRF	**Experiment title:** Equation of state of diamond at high pressures and temperatures	**Experiment number:** HS623
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Report:

We report here two series of X-ray diffraction experiments that have been carried out to determine the compression properties of synthetic diamond samples of different isotopic constitutions (^{12}C and ^{13}C). Angle dispersive X-ray diffraction experiments were carried out at the high-pressure beamline ID09 of the ESRF (Grenoble, France). X-ray beam at a wavelength 0.41259 Å was used in association with imaging plates to collect data over a 2-theta interval from 4 to 25°.

Several runs were carried out in a diamond-anvil cell on synthetic diamond powders of different isotopic compositions (^{12}C and ^{13}C). A mixture of methanol-ethanol-water 16 :4 :1 in volume was used up to 15 GPa to provide hydrostatic pressures around the samples , whereas nitrogen or argon were used to 20 GPa. Le Bail profile refinements were applied to the diffraction patterns, in order to obtain reliable high-pressure cell parameters for diamond as well for the pressure transmitting media. An example is given in Figure 1.

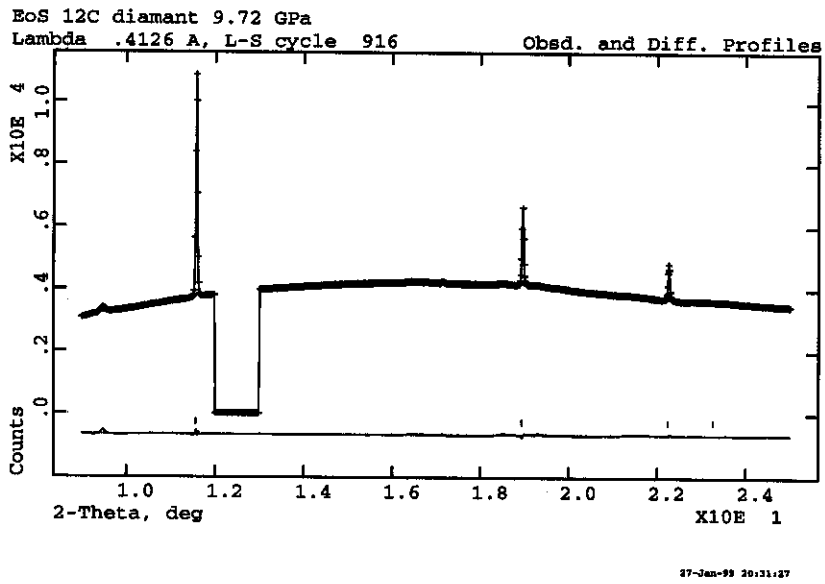
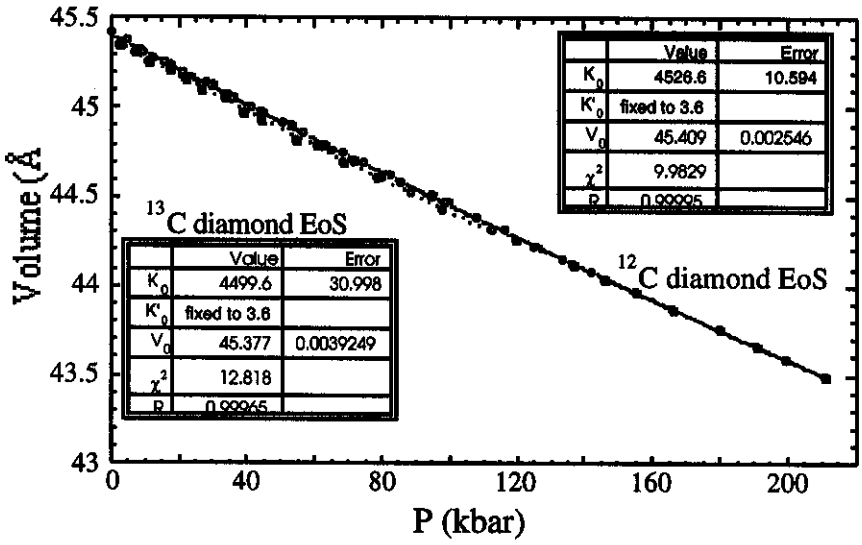


Figure 1 : X-ray diffraction pattern of ^{12}C diamond powder recorded at 9.7 GPa in a mixture of methanol -ethanol-water, 2 minutes exposure time.

As shown in Figure 2, compression behaviour is very similar for the two different diamond samples, which translates in comparable bulk moduli, i.e. 453±1 GPa and 450±3 GPa for ^{12}C and ^{13}C diamonds respectively.



These very similar compression properties for both compounds are in disagreement with ultrasonics and Brillouin scattering experiments which reported up to 17% increase in the bulk modulus of ^{13}C diamond with respect to ^{12}C diamond [Hurley et al., *J. Appl. Phys.*, 76, 12, 1994 ; Ramdas et al., *Phys. Rev. Lett.*, 71, 1, 1993].