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| | Structural properties and phase transformations in SiC at high pressure | Experiment number: HS2376 |
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Report:

Silicon carbide is a very hard compound with an extremely rich polytypism: there are at least 170 different crystals, with one (3C), 2 (2H) ... SiC "molecules" in the unit cell. We studied the most abundant, 15R SiC single crystals under very high pressure by angular dispersive X-ray diffraction, in the 100 GPa range. The ambient temperature equation of state was obtained up to around 105 GPa, pressure at which a NaCl like structure appears¹.

The sample was a single crystal with the c-axis perpendicular to the diamond anvils axis. The anvils were beveled with a culet of 100 μm , and the bevel was 300 μm in diameter, respectively. The gasket was stainless steel, preindented to 30 μm in thickness, and the sample chamber was 50 μm . We used neon as a pressure transmitting medium, and the pressure was measured with a ruby sphere, 5 μm in diameter.

We worked with an X ray energy of 33 keV and an image plate as a detector.

The main result is presented in Fig. 1, where our results are compared with a preceding equation of state obtained in Moscow. We see that there is a very good agreement between both sets of measurements. In Fig. 2, we compare the present results with those obtained of other polytypes, the 3C and the 6H^[1] measured up to the transition using an ethanol-methanol-water mixture as a pressure transmitting medium. In this study,

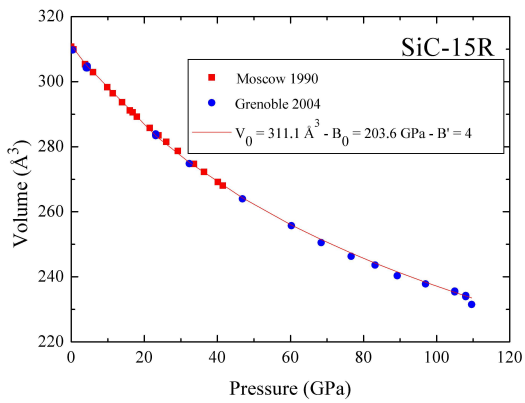


Figure 1 Equation of state of SiC with preceding measurements

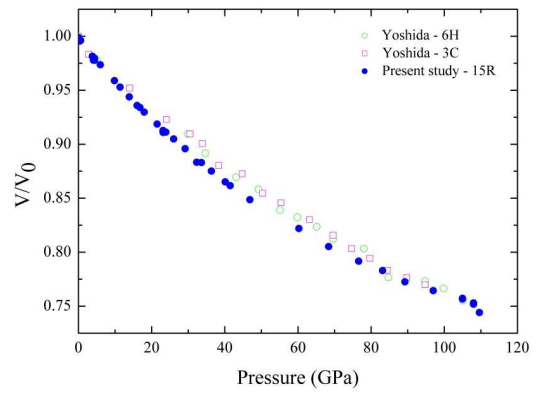


Figure 2 Comparison of the equation of state of the 15R polytype with that of 3C and 6H-SiC

the authors find the same value for the bulk modulus of both polytypes, *i.e.* $B_0 = 260 \pm 9$ GPa, with $B' = 2.9 \pm 0.3$. In our study of the 15R polytype, we find $B_0 = 203.6 \pm 5$ GPa with B' fixed at 4.

These results were presented at the 22nd European Crystallographic Meeting, in Budapest²

1 M. Yoshida, A. Onodera, M. Ueno, K. Takemura, O Shimomura, Phys. Rev. **B 48**, 10587 (1993)

2 E.V. Yakovenko, J.C. Chervin, M. Gauthier, J.P. Itié, A. Polian and M. Mezouar, Poster at the 22nd European Crystallographic Meeting, Budapest 26-31, August 2004