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P-V-T equation of state of SiC-3C: implications for primary pressure scale KIRILL ZHURAVLEV, University of Chicago, ALEXANDER F. GONCHAROV, Carnegie Institution for Science, SERGEY TKACHEV, PRZEMYSLAW DERA[1], VITALI PRAKAPENKA, University of Chicago, GEOPHYSICAL LABORATORY, CARNEGIE INSTITUTION FOR SCIENCE COLLABORATION —
We present a new primary pressure scale based on concomitant measurements of the density and elastic parameters of the single crystal samples of cubic silicon carbide (3C-SiC) under quasi-hydrostatic pressures up to 65 GPa and 773 K. The established pressure scale has precision of 2%–4% up to 65 GPa and will allow more accurate pressure determination in that range than the previously used pressure scales. We also report x-ray diffraction data and Raman spectroscopy on 3C-SiC up to 75 GPa. We determined the P-V-T equation of state (EOS) of 3C-SiC and pressure and temperature dependencies of the zone-center phonons, elastic tensor, and mode Gruneisen parameters. Cubic SiC lattice was found to be stable up to 75 GPa, but there is a tendency for destabilization above 40 GPa, based on softening of a transverse sound velocity. We proposed corrections to the existing ruby and neon pressure scales, and also calibrated cubic SiC as an optical pressure marker using Raman spectroscopy.

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