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Static compression of B2 KCl to 230 GPa and its *P-V-T* equation of state

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Abstract

The pressure-volume-temperature (*P-V-T*) measurements of the B2 (CsCl-type) phase of KCl were performed at 9–61 GPa/1500–2600 K and up to 229 GPa at room temperature, based on synchrotron X-ray diffraction measurements in a laser-heated diamond-anvil cell (DAC). The nonhydrostatic stress conditions inside the sample chamber were critically evaluated based on the platinum pressure marker. With thermal annealing by laser after each pressure increment, the deviatoric stress was reduced to less than 1% of the sample pressure even at the multi-megabar pressure range. The obtained *P-V-T* data were fitted to the Vinet equation of state with the Mie-Grüneisen-Debye model for thermal pressure. The thermal pressure of KCl was found to be as small as ~10 GPa even at 3000 K at any given volume, which is only half of that of common pressure markers (i.e. Pt, Au, or MgO). Such a low-thermal pressure validates the use of a KCl pressure medium as a pressure marker at high temperatures.

Keywords: KCl, equation of state, high pressure, DAC