

## **A new cubic perovskite in PbGeO<sub>3</sub> at high pressures**

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### **ABSTRACT**

A new cubic perovskite polymorph of PbGeO<sub>3</sub> (Phase II) was synthesized by laser heating in the diamond-anvil cell (DAC) at the pressure of 36 GPa. Fitting the Birch-Murnaghan equation of state against its observed  $P$ - $V$  data yields a bulk modulus  $K_0$  of 196(6) GPa and the volume  $V_0$  of 56.70(13) Å<sup>3</sup> when  $K_0'$  is assumed being 4. After the pressure is released, the PbGeO<sub>3</sub> Phase II changes gradually into an amorphous phase, which contains mainly fourfold-coordinated germanium. It indicates that the PbGeO<sub>3</sub> Phase II with a GeO<sub>6</sub> octahedron framework transforms to a GeO<sub>4</sub> tetrahedron network during the amorphization. The existence of PbGeO<sub>3</sub> cubic perovskite Phase II at high pressures indicates that the polarized character of the Pb<sup>2+</sup> ion induced by its 6s<sup>2</sup> lone pair electrons would be totally reduced in the environment of major silicate perovskites inside the lower mantle, and thus the Pb atom would substitute the Ca atom to enter the CaSiO<sub>3</sub> perovskite.

**Keywords:** Lead germanate, cubic perovskite, high pressure, amorphization