

## SACADA Database Code: 623

Topology: sqc5570

# of independent nodes (IN): 2

Transitivity: [2453]

Space Group: I4/mmm

Pearson: tI24

Coordination Number (CN): 4

Year: 2021

## Data

Name	Pressure, GPa	Density, g/cm <sup>3</sup>	Gap, eV	Relative energy, eV/atom	Bulk, GPa	Shear, GPa	Vickers, GPa	Refs
sqc5570 (SACADA #623)		2.474		1.230	209.4	155.0	19.4	SACADA <sup>1</sup>
sqc5570								doi: <a href="https://doi.org/10.1038/s41524-021-00491-y">10.1038/s41524-021-00491-y</a>

### Elasticity tensor (kBar)<sup>1</sup>

2707.5823	1042.4805	1723.3121	0.0000	-0.0000	-0.0000
1042.4805	2707.5823	1723.3121	-0.0000	0.0000	0.0000
1723.3121	1723.3121	6477.9841	0.0000	0.0000	0.0000
-0.0000	-0.0000	0.0000	1777.9970	0.0000	0.0000
-0.0000	0.0000	0.0000	0.0000	2051.0895	0.0000
-0.0000	0.0000	0.0000	0.0000	0.0000	2051.0894

<sup>1</sup> We apply the density functional theory (DFT) approach by using the Vienna Ab Initio Simulation Package (VASP) to calculate the total energy and properties of carbon allotropes.

## DFT calculations

We apply the density functional theory (DFT) approach by using the Vienna Ab Initio Simulation Package (VASP) package [6] to calculate the total energy of carbon allotropes. The Generalized Gradient Approximation [7] (GGA) for exchange-correlational functional is used everywhere. The energy cutoff set to 600 eV. Fully automatic  $\Gamma$ -centered k-points mesh with a reciprocal-space resolution of  $2\pi \times 0.025 \text{ \AA}^{-1}$  is applied. We used tetrahedron method with Blöchl corrections to perform the k-point integration. The convergence thresholds are set at  $10^{-6}$  eV for energy and  $10^{-5}$  eV  $\text{\AA}^{-1}$  for ionic forces. Polycrystalline elastic moduli — the bulk modulus, the shear modulus, Young's modulus, and the Poisson's ratio  $\nu$  — have been calculated within the Voigt-Reuss-Hill [8] approximation. The Vicker's hardness  $H_v$  has been estimated according to Oganov's model [9].