

SACADA Database Code: 700

Topology: 4<sup>4</sup>T7-CA

# of independent nodes (IN): 4  
Transitivity: [4994]  
Space Group: P21/n  
Pearson: mP16  
Coordination Number (CN): 4

Year: 2023

Data

| Name                               | Pressure, GPa | Density, g/cm <sup>3</sup> | Gap, eV | Relative energy, eV/atom | Bulk, GPa | Shear, GPa | Vickers, GPa | Refs                                                                                   |
|------------------------------------|---------------|----------------------------|---------|--------------------------|-----------|------------|--------------|----------------------------------------------------------------------------------------|
| 4 <sup>4</sup> T7-CA (SACADA #700) |               | 3.509                      |         | 0.446                    | 422.9     | 481.4      | 90.5         | SACADA <sup>1</sup>                                                                    |
| 4 <sup>4</sup> T7-CA               |               |                            |         |                          |           |            |              | doi: <a href="https://doi.org/10.1107/S205252062300255X">10.1107/S205252062300255X</a> |

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

|            |            |            |           |           |           |
|------------|------------|------------|-----------|-----------|-----------|
| 12455.7764 | 480.2899   | 701.9788   | 0.0000    | 0.0000    | 356.9921  |
| 480.2899   | 10236.1651 | 916.6348   | -0.0000   | 0.0000    | 207.9308  |
| 701.9788   | 916.6348   | 11266.3781 | 0.0000    | -0.0000   | 352.3322  |
| 0.0000     | -0.0000    | -0.0000    | 4419.7082 | 682.0903  | 0.0000    |
| 0.0000     | 0.0000     | -0.0000    | 682.0903  | 4122.9001 | 0.0000    |
| 356.9921   | 207.9308   | 352.3322   | 0.0000    | 0.0000    | 5072.8800 |

<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].