

Crystal Data: Tetragonal. *Point Group:* 4/m 2/m 2/m. As irregular grains to 8 μm .

Physical Properties: *Cleavage:* n.d. *Fracture:* n.d. *Tenacity:* n.d. *Hardness* = n.d.
D(meas.) = n.d. D(calc.) = 7.62

Optical Properties: Opaque. *Color:* n.d. *Streak:* n.d. *Luster:* n.d.
Optical Class: n.d.

Cell Data: Space Group: *I4/mmm*. $a = 3.65$ $c = 18.14$ $Z = 2$

X-ray Powder Pattern: Calculated pattern.

4.535 (100), 1.825 (38), 1.693 (30), 1.963 (14), 3.024 (12), 1.291 (12), 1.241 (11)

| Chemistry: | (1) | (2) |
|------------|------|--------|
| Ni | 62.1 | 65.83 |
| S | 8.9 | 11.99 |
| Ge | 5.3 | |
| Te | 10.3 | |
| Sn | 11.1 | 22.18 |
| Fe | 1.3 | |
| Total | 99.1 | 100.00 |

(1) Allende CV3 carbonaceous chondrite meteorite; average of 4 electron microprobe analyses; corresponds to (Ni_{5.93}Fe_{0.13}) $\Sigma=6.06$ (Sn_{0.52}Ge_{0.41}) $\Sigma=0.93$ (S_{1.56}Te_{0.45}) $\Sigma=2.01$. (2) Ni₆SnS₂.

Occurrence: Very late-stage, vapor-deposited, alteration product in veins and as mono-mineralic crack-filling material in igneous diopside in the Type B1 Ca-Al-rich inclusion (CAI) ACM-2 from the Allende CV3 carbonaceous chondrite.

Association: Al-Ti-rich diopside, nuwaite, heazlewoodite, Ge-bearing Ni-Fe alloy, possibly monticellite.

Distribution: From the Allende CV3 carbonaceous chondrite meteorite.

Name: After the Chinese words “Bu Tian,” meaning *patching the sky*, in allusion to this secondary mineral filling cracks in a primitive refractory inclusion in the early solar system.

Type Material: National Museum of Natural History, Washington, D.C., USA (7616).

References: (1) Ma, C. and J.R. Beckett (2018) Nuwaite (Ni₆GeS₂) and butianite (Ni₆SnS₂), two new minerals from the Allende meteorite: Alteration products in the early solar system. *Amer. Mineral.*, 103(12), 1918-1924.