M Miscellaneous crystals

M15 SnTe group

No. M15-i GeTe, Germanium telluride

(M = 200.21)

1a GeTe is a semiconductor with a narrow band gap. In 1966, Pawley et al. suggested that GeTe is a diatomic ferroelectric. 66Paw

b

phase	II	I
state	(F) [a])	(P) [a])
crystal system	rhombohedral [b])	cubic [b])
Θ [°C]	422 [c])	

[a]) 66Paw
[b]) 51Sch, 53Sch, 58Abr, 61Kre, 63Bie
[c]) 87Cha

Phase II was reported to be orthorhombic in the Te rich crystals. 77Abr, 81Big

Phase diagram of the $Ge_{1-x}Te_{1+x}$ system in the region of x = –0.02...0.06, see 77Abr

Polar axis || [111]. 66Gol

T_{melt} ≈ 725(3) °C. 58Han

2 Crystal growth: a modified Czochralski technique [a]) and vapor transport method with iodine [b]).
[a]) 69Bau
[b]) 72Wie

3a Unit cell parameters: a = 5.988 Å, α = 88.25° (rhombohedral) at 300 K. 63Bie
Temperature variation of the unit cell parameters: Table M15-i-001.

b Z = 4 (phases I and II). 66Gol
Crystal structure:
phase I: f.c.c. NaCl structure; 51Sch, 61Kre, 63Bie

phase II: distorted NaCl type. 53Sch, 61Kre, 63Bie

Polar structure was proposed by Goldak et al.: take the origin of coordinates as midway between the Ge and Te ions in the cubic NaCl structure (Ge and Te are on face centered lattices with origins at (1/4,1/4,1/4) and (–1/4,–1/4,–1/4), respectively). The distorted structure is obtained by displacing two f.c.c. lattices to (u,u,u) and (–u,–u,–u), with u = 0.237(2) and expanding the lattice along [111] to make the interaxial angle α = 88.18° at 300 K. 66Gol
Temperature variation of the crystal structure: Table M15-i-002.

4 Thermal expansion: see 70Nov, 71Nov, 87Cha

Lattice distortion due to p: see 90Leg

5a Dielectric constant and phonon frequency: see 69All

6a	Heat capacity: see	74Lew, 76Bev
9	Optical properties: see	67Tsu, 71Sob
10a	Raman scattering: see	70Ste
11	Conduction, superconductivity: see	67Tsu, 64Hei, 69All, 70Lew
13c	Mössbauer effect: see	71Ser
15a	Domain structure: see	77Sny