Perovskite $CaTiO_3$

Crystal Data: Orthorhombic, pseudocubic. *Point Group:* $2/m\ 2/m\ 2/m$. Commonly resemble distorted cubes, to 12 cm, striated ‖ [001] and [110], rarely cubo-octahedra or octahedra, with additional forms, skeletal, dendritic; reniform, granular massive. *Twinning:* 90°and 180° about [101], rarely 180° about [121], giving complex penetration twins; lamellar and sectored.

Physical Properties: *Cleavage:* {001}, imperfect. *Fracture:* Uneven to subconchoidal. *Tenacity:* Brittle. Hardness = 5.5 D(meas.) = 3.98–4.26 D(calc.) = 4.02 (synthetic).

Optical Properties: Opaque, transparent in thin fragments. *Color:* Iron-black, brown, reddish brown to yellow; colorless to dark brown in transmitted light; dark bluish gray in reflected light. *Streak:* White to grayish white. *Luster:* Adamantine to metallic; may be dull.
Optical Class: Biaxial (+); commonly isotropic. *Pleochroism:* Weak; $Z > X$. *Orientation:* $X = a$; $Y = c$; $Z = b$. *Dispersion:* $r > v$. $n = 2.34$–2.37 $2V(meas.) = 90°$
R: (400) 19.2, (420) 18.8, (440) 18.4, (460) 18.0, (480) 17.6, (500) 17.3, (520) 17.0, (540) 16.8, (560) 16.6, (580) 16.4, (600) 16.2, (620) 16.1, (640) 16.0, (660) 16.0, (680) 15.9, (700) 15.9

Cell Data: *Space Group: Pnma* (synthetic). $a = 5.447(1)$ $b = 7.654(1)$ $c = 5.388(1)$
Z = 4

X-ray Powder Pattern: Synthetic.
2.701 (100), 1.911 (50), 2.719 (40), 1.557 (25), 1.563 (16), 3.824 (14), 1.567 (14)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
Nb_2O_5		25.99		FeO		5.69	
SiO_2		0.33		MgO	trace		
TiO_2	58.67	38.70	58.75	CaO	40.69	23.51	41.25
Al_2O_3		0.82		Na_2O		1.72	
RE_2O_3		3.08		K_2O		0.44	
				Total	99.36	100.28	100.00

(1) Val d'Aosta, Italy. (2) Vogtsberg, Germany; corresponds to $(Ca_{0.61}Fe^{2+}_{0.12}Na_{0.08}RE_{0.03}K_{0.01})_{\Sigma=0.85}(Ti_{0.71}Nb_{0.29}Al_{0.02}Si_{0.01})_{\Sigma=1.03}O_3$. (3) $CaTiO_3$.

Mineral Group: Perovskite group; $Ca_A > 0.5$; $Ti_B > 0.5$.

Occurrence: An accessory mineral in alkaline mafic rocks, as nepheline syenites, kimberlites, carbonatites, commonly deuteric; in calcareous skarns. A common accessory in Ca–Al-rich inclusions in some carbonaceous chondrites.

Association: Åkermanite–gehlenite, nepheline, titanite, ilmenite, magnetite.

Distribution: Many localities. Large crystals at the Akhmatovsk mines, near Zlatoust, Ural Mountains, and from the Lovozero massif, Kola Peninsula, Russia. At Norrvik, and on Alnö Island, Sweden. From Zermatt, Valais, Switzerland. At Schelingen and Vogtsberg, Kaiserstuhl, Baden-Württemberg; Oberwiesenthal, Saxony; and in the Eifel district, Germany. In Italy, from St. Ambrogio and the Val di Susa, Piedmont, and in the Val Malenco, Lombardy. At the Jacupiranga mine, São Paulo, Brazil. Large crystals from the Gardiner complex, beyond the head of Kangerdlugssuaq Fjord, Greenland. At Oka, Quebec, Canada. In the USA, from the Crestmore quarry, Riverside Co., and near the Gem mine, San Benito Co., California; in a large deposit in the Iron Hill carbonatite, Gunnison Co., Colorado; at Magnet Cove, Hot Spring Co., Arkansas.

Name: To honor Count Lev Alekseevich Perovskii (1792–1856), Russian mineralogist, of St. Petersburg, Russia.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 730–735. (2) Deer, W.A., R.A. Howie, and J. Zussman (1962) Rock-forming minerals, v. 5, non-silicates, 48–55. (3) Keller, L.P. amd P.R. Buseck (1994) Twinning in meteoric and synthetic perovskite. Amer. Mineral., 79, 73–79. (4) Buttner, R.H. and E.N Maslen (1992) Electron difference density and structural parameters in $CaTiO_3$. Acta Cryst., 48, 644–649. (5) (1971) NBS Mono. 25, 9, 17.