Macedonite $PbTiO_3$

Crystal Data: Tetragonal. *Point Group:* $4/m\ 2/m\ 2/m$. As equant to prismatic crystals, to 0.2 mm, showing {100}, {001}, {110}, {101}, and {111}; more commonly as irregular grains.

Physical Properties: *Tenacity:* Very brittle. Hardness = 5.5–6 VHN = 477–537, 606–681 (100 g load). D(meas.) = 7.82(6) D(calc.) = 8.09

Optical Properties: Opaque; transparent in extremely thin sections. *Color:* Black with a weak brownish tint; brownish yellow with a greenish tint in thin section; grayish white in reflected light, with yellow-brown to dark brownish green internal reflections. *Luster:* Vitreous.
Optical Class: Uniaxial, sensibly isotropic. *Anisotropism:* Very weak.
R: (470) 22.5, (490) 22.2, (510) 21.8, (530) 21.2, (546) 21.0, (570) 20.9, (589) 20.8, (610) 20.6, (630) 20.4, (650) 20.2

Cell Data: *Space Group:* $[P4/nmm]$ (by analogy to synthetic material). $a = 3.89$–3.91 $c = 4.16$–4.21 Z = [1]

X-ray Powder Pattern: Crni Kamen, Macedonia.
2.843 (10), 1.603 (9), 2.728 (8), 2.284 (7), 1.954 (7), 3.836 (6), 1.370 (5)

Chemistry:

	(1)	(2)	(3)
TiO_2	25.07	24.5	26.36
Bi_2O_3	2.20		
FeO	2.69	1.0	
PbO	70.55	74.5	73.64
Total	100.51	100.0	100.00

(1) Crni Kamen, Macedonia. (2) Långban, Sweden; by electron microprobe, average of 20 analyses; total Fe as FeO; corresponding to $(Pb_{1.04}Fe_{0.04})_{\Sigma=1.08}Ti_{0.96}O_3$. (3) $PbTiO_3$.

Occurrence: As a rare accessory mineral in microcline-quartz syenite pegmatite veins cutting pyroxene amphibole schist (Crni Kamen, Macedonia); as inclusions in hematite and magnetoplumbite in a metamorphosed Fe–Mn orebody (Långban, Sweden).

Association: Microcline, quartz, aegirine, arfvedsonite, rutile, zircon (Crni Kamen, Macedonia); hematite, magnetoplumbite, manganoan phlogopite, calcian mimetite, manganoan kentrolite (Långban, Sweden); ganomalite, tephroite, lead, jacobsite, calcite, phlogopite, hancockite, melanotekite, hematite (Jakobsberg, Sweden).

Distribution: From Crni Kamen, near Prilep, Macedonia. At Långban and Jakobsberg, Värmland, Sweden.

Name: For Macedonia, where the mineral was discovered.

Type Material: Institute for Nuclear Raw Materials, Belgrade, Serbia (Yugoslavia); National Museum of Natural History, Washington, D.C., USA, 122391.

References: (1) Radusinović, D. and C. Markov (1971) Macedonite - lead titanate: a new mineral. Amer. Mineral., 56, 387–394. (2) Burke, E.A.J. and C. Kieft (1971) Second occurrence of makedonite [macedonite], $PbTiO_3$, Langban, Sweden. Lithos, 4, 101–104.