Derbylite $(Ti, Fe^{3+}, Fe^{2+})_7Sb^{3+}O_{13}(OH)$

Crystal Data: Monoclinic. *Point Group:* $2/m$. As prismatic crystals, to 2 mm, elongate along [001], showing many forms, mostly $\{hk0\}$; in small grains. *Twinning:* On {011} or $\{\overline{1}53\}$, commonly as cruciform twins and trillings.

Physical Properties: *Fracture:* Conchoidal. *Tenacity:* Very brittle. Hardness = 5 VHN = 1033–1121 (100 g load). D(meas.) = 4.53–4.62 D(calc.) = [4.50]

Optical Properties: Opaque, translucent in small grains. *Color:* Pitch-black; dark brown when translucent; in reflected light, gray with bluish green internal reflections. *Luster:* Resinous to metallic.
Optical Class: Biaxial (+). *Orientation:* $X = a$; $Y = b$; $Z = c$. $\alpha = 2.45$ $\beta = 2.45$ $\gamma = 2.51$
2V(meas.) = $\sim 0°$
R_1–R_2: (400) 22.1–23.6, (420) 21.3–22.8, (440) 20.5–22.0, (460) 19.8–21.2, (480) 19.2–20.4, (500) 18.8–19.9, (520) 18.4–19.6, (540) 18.1–19.3, (560) 17.8–19.0, (580) 17.6–18.7, (600) 17.4–18.5, (620) 17.3–18.4, (640) 17.1–18.2, (660) 16.9–18.0, (680) 16.8–17.8, (700) 16.7–17.7

Cell Data: *Space Group:* $P2_1/m$. $a = 7.156$–7.160 $b = 14.347$–14.354 $c = 4.970$–4.980 $\beta = 104.61°$–$104.69°$ Z = 2

X-ray Powder Pattern: Buca della Vena mine, Italy.
2.853 (100), 2.674 (73), 3.186 (43), 3.118 (33), 2.479 (23), 2.393 (23), 3.997 (18)

Chemistry:

	(1)	(2)
TiO_2	36.6	40.20
Al_2O_3	3.8	
Fe_2O_3	36.0	31.83
Cr_2O_3	0.3	
Sb_2O_3	21.5	19.80
FeO		4.44
H_2O	[1.3]	[1.24]
Total	[99.5]	[97.51]

(1) Tripuhy, Brazil; by electron microprobe, H_2O calculated for one (OH). (2) Buca della Vena mine, Italy; by electron microprobe, Ti by AA, Fe^{2+}:Fe^{3+} separately determined, H_2O calculated for one (OH); corresponds to $(Ti_{3.66}Fe^{3+}_{2.90}Fe^{2+}_{0.45})_{\Sigma=7.01}Sb^{3+}_{0.99}O_{13.11}(OH)$.

Occurrence: In cinnabar-bearing placer gravels (Tripuhy, Brazil); in microcrystalline barite and in cavities within metasomatically mineralized dolostones (Buca della Vena mine, Italy).

Association: Roméite, tripuhyite, monazite, xenotime, zircon, rutile, hematite, muscovite (Tripuhy, Brazil); pyrite, sphalerite, bournonite, schafarzikite, versiliaite, apuanite, dolomite, barite (Buca della Vena mine, Italy).

Distribution: From around Tripuhy, near Ouro Preto, Minas Gerais, Brazil. In the Buca della Vena iron mine, north of Stazzema, Apuan Alps, Tuscany, Italy.

Name: For the American geologist Orville Adelbert Derby (1851–1915), at one time Director of the Brazilian Geological Survey.

Type Material: The Natural History Museum, London, England, 80143.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 1025–1026. (2) Moore, P.B. and T. Araki (1976) Derbylite, $Fe^{3+}_4Ti^{4+}_3Sb^{3+}O_{13}(OH)$, a novel close-packed oxide structure. Neues Jahrb. Mineral., Abh., 126, 292–303. (3) Mellini, M., P. Orlandi, and N. Perchiazzi (1983) Derbylite from Buca della Vena mine, Apuan Alps, Italy. Can. Mineral., 21, 513–516. (4) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 138.