Piemontite $Ca_2(Al,Mn^{3+},Fe^{3+})_3(SiO_4)(Si_2O_7)O(OH)$

Crystal Data: Monoclinic. *Point Group:* $2/m$. In prismatic, bladed or acicular crystals, to 8 cm; in clusters of radiating crystals; as anhedral grains and grain aggregates. *Twinning:* {100}, lamellar, uncommon.

Physical Properties: *Cleavage:* {001}, perfect; {100}, poor. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 6–6.5 D(meas.) = 3.46–3.54 D(calc.) = [3.45]

Optical Properties: Translucent to nearly opaque. *Color:* Reddish brown, deep red, purplish red to almost black; in thin section, yellow, pink, violet to deep red. *Streak:* Reddish. *Luster:* Vitreous.
Optical Class: Biaxial (+). *Pleochroism:* Strong; X = light yellow, orange to pink; Y = pale violet to deep lavender; Z = pink to deep red. *Orientation:* $Y = b$; $X \wedge c = 2°–9°$. *Dispersion:* $r > v$, strong; less commonly $r < v$. *Absorption:* $Z > Y > X$. $\alpha = 1.730–1.794$ $\beta = 1.740–1.807$ $\gamma = 1.762–1.829$ 2V(meas.) = 64°–106°

Cell Data: *Space Group:* $P2_1/m$. a = 8.878(10) $b = 5.692(5)$ $c = 10.201(10)$ $\beta = 115.40(20)°$ Z = 2

X-ray Powder Pattern: Sörhårås, Sweden.
2.91 (FFb), 3.50 (F), 2.84 (F), 2.698 (F), 2.677 (F), 2.602 (F), 2.415 (F)

Chemistry:

	(1)		(1)
SiO_2	37.31	MgO	0.00
TiO_2	0.06	CaO	20.64
Al_2O_3	18.20	Na_2O	0.67
Fe_2O_3	8.46	K_2O	0.30
Mn_2O_3	12.33	H_2O^+	0.14
FeO	0.00	H_2O^-	0.00
MnO	1.89	Total	100.00

(1) St. Marcel, Italy; corresponds to $(Ca_{1.78}Mn^{2+}_{0.13}Na_{0.10}K_{0.03})_{\Sigma=2.04}(Al_{1.73}Mn^{3+}_{0.76}Fe^{3+}_{0.51})_{\Sigma=3.00}Si_{3.00}O_{12}[O_{0.45}(OH)_{0.08}]_{\Sigma=0.53}$.

Mineral Group: Epidote group.

Occurrence: In regionally metamorphosed rocks of the greenschist to amphibolite facies; in metasomatized manganese deposits; in low-temperature hydrothermal veins in altered rhyolites, andesites, and diorites.

Association: Epidote, tremolite, glaucophane, orthoclase, quartz, calcite.

Distribution: Many localities. In the Praborna mine, south of St. Marcel, Val d'Aosta, Piedmont, Italy. In Sweden, on Sörhårås and Rakten, Ultevis, Norrbotten, and at Jakobsberg and Långban, Värmland. At Tachgagalt, Anti-Atlas Mountains, Morocco. In the USA, at Garnet Lake and in the Agnew Meadow mine, Madera Co., and in the Braito mine, Plumas Co., California; in the Tucson Mountains, Pima Co., Arizona; at the Idarado mine, Ouray Co., Colorado; in Yuba Canyon, Peavine Mountain, Washoe Co., Nevada; and on Pine Mountain, Adams Co., Pennsylvania. In the Wessels mine, near Kuruman, Cape Province, South Africa. At the Kajlidongri mine, Jhabua district, Madhya Pradesh, India. From Otakiyama, Tokushima Prefecture, and other places in Japan. Large crystals from eight km northeast of Old Boolcoomata, South Australia.

Name: After the Piemonte (Piedmont) region in northwestern Italy.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 521–522. (2) Deer, W.A., R.A. Howie, and J. Zussman (1986) Rock-forming minerals, (2nd edition), v. 1B, disilicates and ring silicates, 135–150. (3) Asklund, A.M. (1966) Sur les paramètres cristallographiques de la piémontite. Bull. Soc. fr. Minéral., 89, 246–250 (in French). (4) Dollase, W.A. (1969) Crystal structure and cation ordering of piemontite. Amer. Mineral., 54, 710–717.