

Ahlfeldite



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Crystal Data: Monoclinic. *Point Group:* $2/m$. Rare crystals, to 1 mm, elongated along [001] or flattened parallel {110}, showing {110}, {011}, {032}, {103}, $\{\bar{1}01\}$; in crystalline crusts and spherical aggregates.

Physical Properties: *Cleavage:* On {110} and {103}, fair. *Tenacity:* Brittle. Hardness = 2–2.5 $D(\text{meas.}) = 3.37(2)$ $D(\text{calc.}) = 3.51$

Optical Properties: Transparent. *Color:* Pale green, apple-green, olive-green; brown, brownish pink, becoming pink with increasing cobalt content. *Luster:* Vitreous.

Optical Class: Biaxial (-). *Pleochroism:* $X = \text{pale green}$; $Y = \text{pale pink}$; $Z = \text{pink}$. *Orientation:* $Y = b$; $Z \wedge c = -16^\circ$. *Dispersion:* $r < v$, strong. $\alpha = 1.709(1)$ $\beta = 1.752(1)$ $\gamma = 1.787(2)$ $2V(\text{meas.}) = 85^\circ$

Cell Data: *Space Group:* $P2_1/n$. $a = 7.53(1)$ $b = 8.76(2)$ $c = 6.43(1)$ $\beta = 99^\circ 05'(15)'$ $Z = 4$

X-ray Powder Pattern: Pacajake mine, Bolivia; close to cobaltomenite. 5.69 (100), 3.426 (80), 2.992 (75), 2.190 (75), 3.772 (60), 2.719 (60), 2.354 (50)

Chemistry:	(1)	(2)
SeO ₂	50.01	50.03
CoO	3.55	16.89
NiO	30.24	16.84
H ₂ O	16.2	16.24
Total	100.0	100.00

(1) Pacajake mine, Bolivia; by electron microprobe, H₂O by evolved H₂O analyzer; corresponds to $(\text{Ni}_{0.90}\text{Co}_{0.10})_{\Sigma=1.00}\text{Se}_{1.00}\text{O}_3 \cdot 2.00\text{H}_2\text{O}$. (2) $(\text{Ni}, \text{Co})\text{SeO}_3 \cdot 2\text{H}_2\text{O}$ with Ni:Co = 1:1.

Polymorphism & Series: Forms a series with cobaltomenite.

Occurrence: A rare alteration product of nickel-bearing selenides and sulfides.

Association: Penroseite, chalcomenite, olsacherite, cerussite, anglesite (Pacajake mine, Bolivia); chalcomenite, olsacherite, lepidocrocite, goethite (El Dragón mine, Bolivia).

Distribution: In Bolivia, from the Pacajake mine, Hiaco, 24 km east-northeast of Colquechaca, and the El Dragón mine, 30 km southwest of Cerro Rico de Potosí, Potosí.

Name: To honor Friedrich E. Ahlfeld (1892–1982) German–Bolivian mining engineer and mineralogist.

Type Material: The Natural History Museum, London, England, 1972,347.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 635. (2) Aristarain, L.F. and C.S. Hurlbut, Jr. (1969) Ahlfeldite from Pacajake Bolivia; a restudy. *Amer. Mineral.*, 54, 448–456. (3) Sturman, B.D. and J.A. Mandarino (1974) The ahlfeldite-cobaltomenite series. *Can. Mineral.*, 12, 304–307. (4) Wildner, M. (1990) Crystal structure refinements of synthetic cobaltomenite ($\text{CoSeO}_3 \cdot 2\text{H}_2\text{O}$) and ahlfeldite ($\text{NiSeO}_3 \cdot 2\text{H}_2\text{O}$). *Neues Jahrb. Mineral., Monatsh.*, 353–362.