Hinsdalite $(Pb,Sr)Al_3(PO_4)(SO_4)(OH)_6$

Crystal Data: Hexagonal. *Point Group:* $\overline{3}\,2/m$. As rhombohedra $\{10\overline{1}1\}$, hexagonal plates, tabular on {0001}, or pseudocubic crystals, to 2 cm; massive or granular.

Physical Properties: *Cleavage:* Perfect on {0001}. Hardness = 4.5 D(meas.) = 3.65 D(calc.) = 4.07

Optical Properties: Translucent. *Color:* Colorless, pale green, pearly white. *Luster:* Vitreous to greasy.
Optical Class: Uniaxial (+); may exhibit biaxial sectors. $\omega = 1.671$ $\epsilon = 1.689$

Cell Data: *Space Group:* $R\overline{3}m$. a = 6.99 c = 16.8 Z = 3

X-ray Powder Pattern: Golden Fleece mine, Colorado, USA.
2.78 (100), 2.96 (80), 5.59 (65), 5.70 (50), 2.222 (50), 3.50 (40), 1.896 (25)

Chemistry:

	(1)	(2)
SO_3	14.13	15.36
P_2O_5	14.50	13.61
Al_2O_3	26.47	29.33
PbO	31.75	21.40
SrO	3.11	9.94
H_2O	10.25	10.36
Total	100.21	100.00

(1) Golden Fleece mine, Colorado, USA. (2) $(Pb,Sr)Al_3(PO_4)(SO_4)(OH)_6$ with Pb:Sr = 1:1.

Mineral Group: Beudantite group.

Occurrence: A rare secondary mineral in the oxidized zone of polymetallic sulfide deposits.

Association: Barite, pyrite, galena, tetrahedrite, rhodochrosite (Golden Fleece mine, Colorado, USA).

Distribution: In the USA, large crystals from the Golden Fleece mine, near Lake City, Hinsdale Co., Colorado; in the Mineral Park mine, Mohave Co., Arizona; and at the Daisy Creek prospect, 25 km north of Thompson Falls, Sanders Co., Montana. In the Sylvester mine, Zeehan, and the Comet mine, Dundas, Tasmania; from Broken Hill, New South Wales, Australia. At Penkiln Burn, 13 km north-northeast of Newton Stewart, Kirkcudbrightshire, Scotland. In the Colettes massif, about 45 km southeast of Montluçon, Allier, France. From Bad Ems, Rhineland-Palatinate, Germany.

Name: For Hinsdale Co., Colorado, USA, source of the first specimens.

Type Material: Harvard University, Cambridge, Massachusetts, 101680, 101682, 101683; National Museum of Natural History, Washington, D.C., USA, 86987, 92971.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 1004. (2) Stanley, C.R. (1987) Hinsdalite and other products of oxidation at the Daisy Creek stratabound copper-silver prospect, northwestern Montana. Can. Mineral., 25, 213–220. (3) Nicolas, J. and A. De Rosen (1963) Phosphates hydrothermaux de basse température et kaolinisation: la gorceixite du massif des Colettes (Allier) et les minéraux associés (hinsdalite). Bull. Minéral., 86, 379–385 (in French).