

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. As thin cyclically twinned pseudo-hexagonal tablets, to 1 cm; typically in crusts and coatings. *Twining:* On {110}, cyclic.

Physical Properties: *Cleavage:* On {010} and {001}, good. Hardness = n.d.
D(meas.) = 2.66 D(calc.) = [2.667] Soluble in H₂O.

Optical Properties: Transparent to translucent. *Color:* White to colorless, yellow.
Optical Class: Biaxial (+). *Orientation:* $X = b; Y = c; Z = a$. *Dispersion:* $r > v$, moderate.
 $\alpha = 1.494$ $\beta = 1.495$ $\gamma = 1.497$ $2V(\text{meas.}) = 67^\circ 20'$

Cell Data: *Space Group:* $Pnam$ (synthetic). $a = 7.746(3)$ $b = 10.071(4)$ $c = 5.763(2)$
 $Z = 4$

X-ray Powder Pattern: Synthetic.
2.903 (100), 3.001 (77), 2.886 (53), 4.176 (28), 2.422 (25), 2.089 (25), 2.082 (25)

Chemistry:	(1)	(2)
SO ₃	45.37	45.95
Na ₂ O	< 0.01	
K ₂ O	47.50	54.05
(NH ₄) ₂ O	5.14	
Total	98.01	100.00

(1) Chincha Islands, Peru; original total given as 97.87%; corresponds to [K_{1.78}(NH₄)_{0.35}]_{Σ=2.13}SO_{4.00}. (2) K₂SO₄.

Polymorphism & Series: Forms a series with mascagnite.

Occurrence: In a pine railroad tie (Santa Ana mine, California, USA); in hydrothermally altered rock in a geothermal field (Cesano geothermal field, Italy); derived from bird guano on islands and bat guano in caves.

Association: Synygenite (Cesano geothermal field, Italy); swaknoite, mundrabillaite, dittmarite (Arnhem Cave, Namibia).

Distribution: From the Santa Ana tin mine, Trabuco Canyon, Orange Co., California, USA. On the Chincha Islands, off the coast of Peru. At the Cesano geothermal field, Latium, Italy. From the Arnhem, Arun Aas, Baobab, Gâuan Aas, Né-rab-aas, Temple of Doom, and Uisib Caves, Namibia. In the Lobatse Cave, Botswana. From Timbavati Cave, South Africa. In the Murra-el-elevyn Cave, Cocklebidy, Western Australia.

Name: From the Latin *arcanum duplicatum*, for *double secret*, a medieval alchemical name.

Type Material: University of California, Berkeley, California; Harvard University, Cambridge, Massachusetts, USA, 100763.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 399–400. (2) McGinety, J.A. (1972) Redetermination of the structures of potassium sulphate and potassium chromate: the effect of electrostatic crystal forces upon observed bond lengths. *Acta Cryst.*, 28, 2845–2858. (3) Arnold, H., A. Kurtz, A. Richter-Zinnius, J. Bethke, and G. Heger (1981) Struktur und Umwandlung des Arcanits, β -K₂SO₄. *Zeits. Krist.*, 154, 246–247 (in German). (4) Groat, L.A. and F.C. Hawthorne (1985) Taylorite discredited (=ammonian arcanite). *Can. Mineral.*, 23, 259–260. (5) (1954) NBS Circ. 539, 62.