

Blödite

$\text{Na}_2\text{Mg}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$

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Crystal Data: Monoclinic. *Point Group:* $2/m$. Crystals equant to prismatic [001], with complex development, as with prominent {110}, {210}, {011}, {001}, {111}, $\{\bar{2}11\}$, and many others, to 10 cm; granular to compact massive.

Physical Properties: *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 2.5–3
D(meas.) = 2.218–2.24 D(calc.) = 2.23 Soluble in H_2O , taste slightly saline, bitter.

Optical Properties: Transparent to translucent. *Color:* Colorless, may be dark gray, bluish green, or reddish from inclusions; colorless in transmitted light. *Luster:* Vitreous.
Optical Class: Biaxial (-). *Orientation:* $Y = b$; $X \wedge c = 37^\circ$. $\alpha = 1.483$ $\beta = 1.486$ $\gamma = 1.487$
 $2V(\text{meas.}) = 71^\circ$

Cell Data: *Space Group:* $P2_1/a$. $a = 11.126(2)$ $b = 8.242(1)$ $c = 5.539(1)$ $\beta = 100.84^\circ$
 $Z = 2$

X-ray Powder Pattern: Soda Lake, California, USA.
3.252 (100), 4.555 (95), 3.289 (95), 2.971 (40), 2.732 (40), 4.281 (30), 2.025 (30)

Chemistry:	(1)	(2)
SO_3	47.61	47.87
Fe_2O_3	0.08	
MgO	12.09	12.06
Na_2O	18.00	18.53
Cl	0.31	
H_2O	21.49	21.54
Total	99.58	100.00

(1) Ischl, Austria. (2) $\text{Na}_2\text{Mg}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$.

Occurrence: In lacustrine salt deposits and salt efflorescences; probably a product of metamorphism of marine salt deposits; in nitrate deposits; may be a volcanic sublimate.

Association: Halite, kainite, carnallite, polyhalite (marine salt deposits); halite, thénardite, mirabilite (lacustrine salt deposits).

Distribution: From Ischl and Hallstatt, Austria. In the Stassfurt district, Saxony-Anhalt, Germany. From Kaluszyn, Poland. In Italy, at Monte Sambuco, Sicily. In the USA, from the Green River Formation, Garfield and Rio Blanco Cos., Colorado; at the Great Salt Lake, Davis Co., Utah; large crystals from Soda Lake, Carrizo Plain, San Luis Obispo Co., and at Bertram Siding, Salton Sea, Imperial Co., California; from Laguna Salina, Estancia Valley, Torrance Co., New Mexico. At Chuquicamata, Antofagasta, Chile. In the Mayo and Warcha mines, Salt Range, Punjab, India. Additional localities are known, most as widespread surficial efflorescences.

Name: To honor the German chemist Carl August Blöde (1773–1820).

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 447–450. (2) Hawthorne, F.C. (1985) Refinement of the crystal structure of bloedite: structural similarities in the $[\text{VI}M(\text{IV}T\Phi_4)_2\Phi_n]$ finite-cluster minerals. *Can. Mineral.*, 23, 669–674. (3) (1968) NBS Mono. 25, 63–64.