

Polyhalite

$\text{K}_2\text{Ca}_2\text{Mg}(\text{SO}_4)_4 \cdot 2\text{H}_2\text{O}$

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Crystal Data: Triclinic, pseudo-orthorhombic. *Point Group:* $\bar{1}$. Rare crystals, tabular {010}, or elongated along [001], to 2 mm; complex development, with 28 forms recorded; fibrous, foliated, massive. *Twining:* Common on {010}, {100}, characteristically polysynthetic.

Physical Properties: *Cleavage:* On {10 $\bar{1}$ }, perfect; on {010}, a parting. Hardness = 3.5 D(meas.) = 2.78 D(calc.) = 2.76 Soluble in H₂O, with precipitation of gypsum and perhaps syngenite.

Optical Properties: Transparent. *Color:* Colorless, white, gray; commonly salmon-pink to brick-red from included iron oxide; colorless in transmitted light. *Luster:* Vitreous to resinous. *Optical Class:* Biaxial (-). $\alpha = 1.547\text{--}1.548$ $\beta = 1.560\text{--}1.562$ $\gamma = 1.567$ 2V(meas.) = 62°–70°

Cell Data: *Space Group:* $P\bar{1}$. $a = 11.689$ $b = 16.332$ $c = 7.598$ $\alpha = 91.65^\circ$ $\beta = 90^\circ$ $\gamma = 91.9^\circ$ $Z = 4$

X-ray Powder Pattern: Netherlands. (ICDD 21-982).

3.18 (100), 2.913 (25), 2.890 (25), 2.849 (25), 2.945 (20), 6.00 (14), 2.904 (14)

Chemistry:

	(1)	(2)
SO ₃	52.40	53.12
MgO	6.48	6.68
CaO	18.75	18.60
K ₂ O	15.66	15.62
H ₂ O	6.07	5.98
rem.	0.27	
Total	99.63	100.00

(1) McDowell Well, Glasscock Co., Texas, USA. (2) $\text{K}_2\text{Ca}_2\text{Mg}(\text{SO}_4)_4 \cdot 2\text{H}_2\text{O}$.

Occurrence: Common in marine salt deposits, where it may constitute the major component, present in billion-ton amounts; diagenetic in playa muds, formed from gypsum in the presence of Mg–K-rich solutions; rare as a fumarolic sublimate.

Association: Halite, anhydrite, glauberite, carnallite, kieserite, langbeinite, vanthoffite.

Distribution: In Austria, from Ischl, Bad Aussee, and Altaussee, Upper Austria; at Hallstatt, Styria; and from Hall, Tirol. In Germany, from the Stassfurt-Westeregeln district, Saxony-Anhalt, and at Berchtesgaden, Bavaria. On Vesuvius, Campania, Italy. In England, in the Boulby potash mine, northwest of Whitby, Yorkshire, England. From Maman, Iran. At Tuz Goelue, Turkey. In the Nagaur-Ganganagar Basin, Rajasthan, India. From the Qarhan alt lake, Quadam Basin, Qinghai Province, China. In the USA, in the Carlsbad potash district, Eddy Co., and adjacent parts of Texas; in the Paradox Basin, Grand Co., and elsewhere in Utah.

Name: From the Greek for *many* and *salt*, in allusion to the mineral's complex composition.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 458–461. (2) Schlatti, M., K. Sahl, A. Zemann, and J. Zemann (1970) Die Kristallstruktur des Polyhalits, $\text{K}_2\text{Ca}_2\text{Mg}[\text{SO}_4]_4 \cdot 2\text{H}_2\text{O}$. *Tschermaks Mineral. Petrog. Mitt.*, 14, 75–86 (in German with English abs.).