

**Crystal Data:** Orthorhombic. *Point Group:* 2/m 2/m 2/m. As tabular to prismatic crystals, elongated along [001], showing {001}, {010}, {110}, {101}, {111}, to 5 cm.

**Physical Properties:** *Cleavage:* {110}, good; {001}, fair. *Tenacity:* Brittle. Hardness = 4–4.5 D(meas.) = 2.38–2.45 D(calc.) = [2.44] Decomposed by H<sub>2</sub>O.

**Optical Properties:** Transparent. *Color:* Colorless, may be pale red from included iron oxide; colorless in transmitted light.

*Optical Class:* Biaxial (-). *Orientation:* X = c; Y = b; Z = a. α = 1.522–1.527

β = 1.536–1.540 γ = 1.544–1.552 2V(meas.) = 70°–88°

**Cell Data:** *Space Group:* Pnma. a = 10.132(1) b = 12.537(1) c = 7.775(1) Z = 4

**X-ray Powder Pattern:** Inder deposit, Kazakhstan. (ICDD 14-639).

3.47 (100), 3.09 (100), 2.050 (100), 3.13 (80), 2.973 (70), 5.55 (40), 4.40 (40)

**Chemistry:**

	(1)	(2)
SO <sub>3</sub>	22.46	22.08
B <sub>2</sub> O <sub>3</sub>	19.79	19.20
Fe <sub>2</sub> O <sub>3</sub>	0.11	
MgO	33.48	33.34
F	n.d.	5.24
H <sub>2</sub> O	23.53	22.35
insol.	0.32	
–O = F <sub>2</sub>		2.21
Total	99.69	100.00

(1) Westeregeln, Germany. (2) Mg<sub>3</sub>B<sub>2</sub>(SO<sub>4</sub>)(OH)<sub>9</sub>F.

**Occurrence:** An uncommon mineral in marine salt deposits.

**Association:** Carnallite, anhydrite, boracite, celestine, kieserite (Westeregeln, Germany); polyhalite, kaliborite, apthitalite, carnallite, preobrazhenskite (Inder deposit, Kazakhstan).

**Distribution:** In Germany, from near Westeregeln, Saxony-Anhalt, and at the Wittmar potash mine, Asse, southwest of Braunschweig, Lower Saxony. At Forden, near Scarborough, Yorkshire, England. From the Inder borate deposit, Kazakhstan.

**Name:** In allusion to *sulfur* and *boron* in the composition.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 387–388. (2) Giese, R.F., Jr., and G. Penna (1983) The crystal structure of sulfoborite, Mg<sub>3</sub>SO<sub>4</sub>(B(OH)<sub>4</sub>)<sub>2</sub>(OH)F. Amer. Mineral., 68, 255–261.