

Oldhamite

(Ca, Mg)S

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Crystal Data: Cubic. *Point Group:* $4/m\bar{3}2/m$. As single-crystal nodules, to 3 mm (Busti meteorite).

Physical Properties: *Cleavage:* On {001}. *Hardness* = 4 *VHN* = n.d. *D(meas.)* = 2.58 *D(calc.)* = 2.589

Optical Properties: Transparent. *Color:* Pale chestnut-brown, tarnishes strongly on exposure to wet air; in transmitted light, colorless to pale brown with many internal reflections.

Optical Class: Isotropic. $n = 2.137$

R: n.d.

Cell Data: *Space Group:* $Fm\bar{3}m$. $a = 5.6948$ $Z = 4$

X-ray Powder Pattern: Synthetic CaS.

2.846 (100), 2.013 (70), 1.6439 (21), 1.2737 (20), 1.1627 (14), 1.4238 (10), 0.9491 (8)

Chemistry:

| | (1) | (2) | (3) |
|-------|----------|-------|--------|
| Ca | 53.45 | 51.0 | 55.55 |
| Mg | 1.49 | 0.90 | |
| Na | | 0.04 | |
| Mn | | 0.17 | |
| Fe | 0.32 | 5.50 | |
| Cu | | 0.02 | |
| S | 44.74 | 41.6 | 44.45 |
| Total | [100.00] | 99.23 | 100.00 |

(1) Bustee meteorite; after deduction of other mineral impurities 7.15% and insoluble 8.46% from an original total of 97.99%, recalculated to 100.00%; then corresponds to $(\text{Ca}_{0.96}\text{Mg}_{0.04})_{\Sigma=1.00}\text{S}_{1.00}$. (2) Kota-Kota meteorite; by electron microprobe, average of 11 determinations, corresponds to $(\text{Ca}_{0.98}\text{Fe}_{0.08}\text{Mg}_{0.03})_{\Sigma=1.09}\text{S}_{1.00}$. (3) CaS.

Occurrence: Due to high melting point of 2450 °C, an early nebular condensate; may fill the latest interstices between silicates in enstatite chondrite and achondrite meteorites.

Association: Enstatite, augite, niningerite, osbornite, gypsum, calcite, troilite.

Distribution: In the Bustee [TL], Hvittis, Mayo Belwa, Indarch, Kota-Kota, Adhi-Kot, Norton County, Peña Blanca Spring, Abee, Qingzhen, etc., meteorites.

Name: Honors Thomas Oldham (1816–1878), Irish geologist, Director of the Indian Geological Survey (1850–1876).

Type Material: The Natural History Museum, London, England, 32100.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 208–209. (2) Leitch, C.A. and J.V. Smith (1982) Petrography, mineral chemistry and origin of type I enstatite chondrites. *Geochim. Cosmochim. Acta*, 46, 2083–2097. (3) Lodders, K. (1996) Oldhamite in enstatite achondrites (aubrites). *Proc. NIPR Symp. Antarct. Meteorites*, 9, 127–142. (4) Oftedal, I. (1927) Die Gitterkonstanten von CaO, CaS, CaSe, CaTe. *Z. Phys. Chem.*, 128, 154–158 (in German). (5) (1957) NBS Circ. 539, 7, 15.