

Ninningerite

(Mg, Fe²⁺, Mn)S

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Crystal Data: Cubic. *Point Group:* $4/m\bar{3}2/m$. As grains intimately intergrown with kamacite and troilite; grains may contain oriented exsolution lamellae of troilite and minute grains of kamacite.

Physical Properties: Hardness = n.d. VHN = n.d. D(meas.) = n.d. D(calc.) = 3.21–3.59

Optical Properties: Opaque. *Color:* Gray in reflected light. *Luster:* Metallic.

R: n.d.

Cell Data: *Space Group:* $Fm\bar{3}m$ (by analogy to synthetic). $a = 5.17(2)$ $Z = 4$

X-ray Powder Pattern: Synthetic MgS.

2.601 (100), 1.8388 (60), 1.5010 (16), 1.1630 (14), 1.0617 (10), 3.004 (8), 1.3001 (8)

Chemistry:

	(1)	(2)	(3)
Mg	18.3	23.5	16.84
Fe	27.0	15.6	38.72
Mn	6.5	11.6	
Ca	1.28	0.39	
Cr	1.66	0.14	
S	43.4	46.9	44.45
Total	98.14	98.13	100.00

(1) Indarch meteorite; by electron microprobe, corresponds to $(\text{Mg}_{0.56}\text{Fe}_{0.36}\text{Mn}_{0.09}\text{Ca}_{0.02}\text{Cr}_{0.02})_{\Sigma=1.05}\text{S}_{1.00}$. (2) Kota-Kota meteorite; by electron microprobe, corresponds to $(\text{Mg}_{0.66}\text{Fe}_{0.19}\text{Mn}_{0.14}\text{Ca}_{0.01})_{\Sigma=1.00}\text{S}_{1.00}$. (3) (Mg, Fe)S with Mg:Fe = 1:1.

Mineral Group: Galena group.

Occurrence: In less extensively metamorphosed enstatite chondrite meteorites.

Association: “Nickel-iron” (kamacite), troilite.

Distribution: In the Indarch [TL], St. Marks [TL], Kota-Kota [TL], Qingzhen, Yamoto 691, Yamoto 74370, South Oman, Kaidun, etc. enstatite chondrite meteorites.

Name: In honor of Harvey Harlow Ninninger (1887–1986), of Sedona, Arizona, USA, for his contributions to meteoritics.

Type Material: n.d.

References: (1) Klaus, K. and K.G. Snetsinger (1967) Ninningerite: a new meteoric sulfide. *Science*, 155, 451–453. (2) (1967) *Amer. Mineral.*, 52, 925 (abs. ref. 1). (3) Leitch, C.A. and J.V. Smith (1982) Petrography, mineral chemistry and origin of type I enstatite chondrites. *Geochim. Cosmochim. Acta*, 46, 2083–2097. (4) Ehlers, K. and A. El Goresy (1988) Normal and reverse zoning in niningerite: a novel key parameter to the thermal histories of EH-chondrites. *Geochim. Cosmochim. Acta*, 52, 877–887. (5) (1957) *NBS Circ.* 539, 7, 31.