Ringwoodite $(Mg, Fe^{2+})_2SiO_4$

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Crystal Data: Cubic. *Point Group:* $4/m\ \bar{3}\ 2/m$. As rounded grains, to 100 μm, or massive.

Physical Properties: Hardness = n.d. D(meas.) = n.d. D(calc.) = 3.90

Optical Properties: Semitransparent. *Color:* Purple, bluish to smoky gray, colorless. *Optical Class:* Isotropic. $n = 1.768(3)$

Cell Data: *Space Group: Ia3d.* $a = 8.113$–8.127 Z = 8

X-ray Powder Pattern: Tenham meteorite.
2.447 (100), 1.434 (60), 2.028 (40), 2.872 (20), 1.560 (20), 1.0559 (10), 0.8283 (10)

Chemistry:

	(1)	(2)
SiO_2	38.9	38.42
TiO_2		0.05
FeO	23.4	22.98
MnO		0.30
MgO	37.0	37.86
CaO		0.05
Total	99.3	[99.66]

(1) Tenham meteorite; by electron microprobe, corresponding to $(Mg_{1.48}Fe^{2+}_{0.52})_{\Sigma=2.00}SiO_4$.
(2) Pampa del Infierno meteorite; by electron microprobe, Al_2O_3, Cr_2O_3, NiO, Na_2O, K_2O all $< 0.01\%$, original total given as 99.64%; corresponds to $(Mg_{1.48}Fe^{2+}_{0.52})_{\Sigma=2.00}SiO_4$.

Polymorphism & Series: Trimorphous with forsterite and wadsleyite.

Occurrence: In veinlets cutting the matrix of meteorites and replacing olivine; probably produced during shock metamorphism.

Association: Majorite, magnesian silicate glass.

Distribution: In the Tenham, Pampa del Infierno, Catherwood, and Coorara chondrite meteorites.

Name: For Professor Alfred Edward Ringwood (1930–1993), noted geochemist of the Australian National University, Canberra, Australia.

Type Material: The Natural History Museum, London, England, 1935,792.

References: (1) Binns, R.A., R.J. Davis, and S.J.B. Reed (1969) Ringwoodite, natural $(Mg, Fe)_2SiO_4$ spinel in the Tenham meteorite. Nature, 221, 943–944. (2) (1969) Amer. Mineral., 54, 1219 (abs. ref. 1). (3) Coleman, L.C. (1977) Ringwoodite and majorite in the Catherwood meteorite. Can. Mineral., 15, 97–101. (4) Boctor, N.Z., P.M. Bell, and H.K. Mao (1982) Petrology and shock metamorphism of Pampa del Infierno chondrite. Geochim. Cosmochim. Acta, 46, 1903–1911.

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