

Liebenbergite

(Ni,Mg)₂SiO₄

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Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Grains, to 1 mm, filling interstices between trevorite grains.

Physical Properties: *Cleavage:* {010}, fair to poor; {100}, poor. Hardness = 6–6.5
D(meas.) = 4.60 D(calc.) = 4.60

Optical Properties: Transparent to translucent. *Color:* Yellowish green; colorless to pale green to greenish yellow in thin section.

Optical Class: Biaxial (–). *Pleochroism:* $X = Y$ = colorless to pale green; Z = greenish yellow.
Orientation: $X = b$; $Y = c$; $Z = a$. *Dispersion:* $r > v$. $\alpha = 1.820(3)$ $\beta = [1.854]$ $\gamma = 1.888(3)$
 $2V(\text{meas.}) = 88(2)^\circ$

Cell Data: *Space Group:* $Pbnm$. $a = 4.727(1)$ $b = 10.191(3)$ $c = 5.955(2)$ $Z = 4$

X-ray Powder Pattern: Bon Accord, South Africa.

2.442 (100), 2.759 (90), 1.738 (90), 2.503 (80), 3.47 (60), 5.09 (30), 2.252 (30)

Chemistry:

	(1)
SiO ₂	29.39
FeO	4.37
CoO	1.80
NiO	56.32
MgO	6.50
Total	98.38

(1) Bon Accord, South Africa; by electron microprobe, average of eight grains; corresponds to $(\text{Ni}_{1.52}\text{Mg}_{0.33}\text{Fe}_{0.12}\text{Co}_{0.05})_{\Sigma=2.02}\text{Si}_{0.99}\text{O}_4$.

Mineral Group: Olivine group.

Occurrence: In a small tabular nickel deposit at the contact between quartzite and serpentinized ultramafics; it appears to have formed at $\sim 730^\circ\text{C}$ and < 2 kbar during thermal metamorphism, possibly of a nickel-rich meteorite.

Association: Trevorite, nickeloan serpentine, nickeloan ludwigite, bunsenite, violarite, millerite, gaspéite, nimite, bonaccordite.

Distribution: From three km west of the Scotia Talc mine, Bon Accord, Barberton, Transvaal, South Africa.

Name: For W.R. Liebenberg, Deputy Director-General of the National Institute for Metallurgy of South Africa.

Type Material: Royal Ontario Museum, Toronto, Canada, M33443; Harvard University, Cambridge, Massachusetts, 133404; National Museum of Natural History, Washington, D.C., USA, 132463.

References: (1) De Waal, S.A. and L.C. Calk (1973) Nickel minerals from Barberton, South Africa: VI. Liebenbergite, a nickel olivine. *Amer. Mineral.*, 58, 733–735. (2) Bish, D.L. (1981) Cation ordering in synthetic and natural Ni–Mg olivine. *Amer. Mineral.*, 66, 770–776.