Ferrocarpholite $(Fe^{2+},Mg)Al_2Si_2O_6(OH)_4$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Crystals prismatic, elongated along [001], or as aggregates of parallel fibers, to 5 cm.

Physical Properties: *Cleavage:* Perfect on {010}, indistinct on {110}. Hardness = 5.5 D(meas.) = 3.04 D(calc.) = 3.05

Optical Properties: Transparent to translucent. *Color:* Dark green, bright green, grayish green; colorless in thin section.
Optical Class: Biaxial (–). *Pleochroism:* X = yellowish to greenish; Y = colorless to yellowish; Z = pale bluish to bluish green. *Orientation:* $X = b$; $Y = a$; $Z = c$. *Dispersion:* $r > v$, weak to strong. *Absorption:* $X > Y > Z$. α = 1.614–1.628 β = 1.627–1.644 γ = 1.632–1.647 2V(meas.) = 49°–70°

Cell Data: *Space Group: Ccca.* $a = 13.797(9)$ $b = 20.20(2)$ $c = 5.116(5)$ Z = 8

X-ray Powder Pattern: Haute-Ubaye district, France.
5.04 (100), 5.69 (70), 3.355 (30), 2.603 (25), 3.019 (20), 1.680 (11), 3.44 (10)

Chemistry:

	(1)	(2)
SiO_2	37.59	38.56
TiO_2	0.22	0.30
Al_2O_3	29.39	31.68
Fe_2O_3	2.07	1.65
FeO	17.98	12.21
MnO	0.14	0.32
MgO	2.52	4.65
H_2O	10.08	11.02
Total	[99.99]	[100.39]

(1) West of Tomata, Celebes, Indonesia; after deduction of CaO 0.13%, Na_2O 0.14%, K_2O 0.09%, SO_3 0.12%; corresponds to $(Fe^{2+}_{0.81}Mg_{0.20}Mn_{0.01})_{\Sigma=1.02}(Al_{1.87}Fe^{3+}_{0.08}Ti_{0.01})_{\Sigma=1.96}Si_{2.03}O_{9.87}H_{3.64}$.
(2) Haute-Ubaye district, France; after deduction of Na_2O 0.23% and K_2O 0.45% as mica; corresponds to $(Fe^{2+}_{0.53}Mg_{0.36}Mn_{0.01})_{\Sigma=0.90}(Al_{1.95}Fe^{3+}_{0.06})_{\Sigma=2.01}Si_{2.01}O_6(OH)_4$.

Polymorphism & Series: Forms two series, with carpholite, and with magnesiocarpholite.

Occurrence: In quartz veins in blueschists of low metamorphic grade, formed from felsic tuffs at about 250 °C and 3 kbar.

Association: Quartz, glaucophane, lawsonite, pumpellyite, jadeite, stilpnomelane.

Distribution: At several localities west of Tomata, Celebes, Indonesia. In the Diahot region, New Caledonia. From Italy, at Colle Ciarbonet, Piedmont. From the Vanoise massif, Savoie, and Pic du Pelvat, Haute-Ubaye district, Alpes-de-Haute Provence, France. At Ruwi, Oman.

Name: The FERROus iron analogue of *carpholite*.

Type Material: National Museum of Natural History, Washington, D.C., USA, 106754.

References: (1) De Roever, W.P. (1951) Ferrocarpholite, the hitherto unknown ferrous iron analogue of carpholite proper. Amer. Mineral., 36, 736–745. (2) De Roever, W.P. and C. Kieft (1971) Additional data on ferrocarpholite from Sulawesi (Celebes), Indonesia. Amer. Mineral., 56, 1976–1982. (3) Steen, D. and J. Bertrand (1977) Sur la préscence de ferrocarpholite associée aux schistes à glaucophane de Haute-Ubaye (Basses-Alpes, France). Schweiz. Mineral. Petrog. Mitt., 57, 157–168 (in French with English abs.). (4) Ferraris, G., G. Ivaldi, and B. Goffé (1992) Structural study of a magnesian ferrocarpholite: are carpholites monoclinic? Neues Jahrb. Mineral., Monatsh., 337–347.