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STILPNOMELANE AND SPESSARTITE-GROSSULARITE FROM FRANKLIN, NEW JERSEY[1]

Clifford Frondel and Jun Ito, *Department of Geological Sciences, Harvard University, Cambridge, Massachusetts.*

Stilpnomelane

Stilpnomelane occurs at Franklin as thin coatings upon crystals of dolomite and pale green sphalerite in hydrothermal veinlets that locally cut the main orebody. Specimens are contained in many collections of Franklin minerals, where they are usually found labelled chlorite. A chemical analysis is cited in Table 1. It yields a total of 8 Si atoms in the talc-layer of the structure when calculated on the basis of 30 (O, OH) ions, and thus conforms to the interpretation of the composition of this

[1] Mineralogical Contribution No. 415, Harvard University.

TABLE 1. CHEMICAL ANALYSIS OF STILPNOMELANE

	1	2	Atoms per 30 (O,OH)	
SiO_2	43.67	45.11	Si	7.96
Al_2O_3	4.64	4.79	Al	0.99
Fe_2O_3	6.92	7.15	Fe^3	0.95
FeO	7.09	7.32	Fe^2	1.08
MnO	6.02	6.22	Mn	0.93
ZnO	5.22	4.92	Zn	0.64
MgO	11.63	11.39	Mg	3.00
CaO	1.42	0.59	Ca	0.11
BaO	0.88	0.91	Ba	0.06
Na_2O	0.37	0.38	Na	0.13
K_2O	2.67	2.76	K	0.62
S	0.18		H	9.95
CO_2	1.33		O	30
H_2O+	8.19	8.46		
	100.23	100.00		

1. J. Ito, analyst. Cu,Pb,Ti,P and Cl lacking.
2. Recalculated to 100 after deduction of CO_2 as dolomite and S as sphalerite.
Formula: $(K,Na,Ca,Ba)_{.92}(Mg,Al,Fe^3,Fe^2,Mn,Zn)_{7.56}(Si,Al)_8O_{20}(OH,O)_{10}$.

problematic mineral given by Hutton (1956). The composition is of interest not only in the presence of Zn—found also in pyroxenes and other ferromagnesian gangue minerals of the locality—but in the relatively high content of Mg and $H_2O(+)$. The analysis sample was found optically to contain a small amount of dolomite that remained after repeated separations in heavy liquids. The CO_2 reported corresponds to 2.78 per cent $CaMg(CO_3)_2$, and this has been deducted. Fragments of the mineral are quickly leached by hot HCl leaving a white pseudomorphous residue of silica.

The stilpnomelane is grayish green to brownish green in color with a suggestion of a bronzy luster. A scaly habit is sometimes apparent to the unaided eye, but most material consists of dense crusts with an earthy fracture that show a micaceous structure only under the microscope. Optically negative with 2V 0°; $\beta = \gamma = 1.583$ (dark olive brown); α, difficult to determine, is approximately 1.539 (pale yellow brown). These values are among the lowest reported for stilpnomelane. The value of c was measured as 12.18 Å from the (004) relection on x-ray powder photographs taken in Fe radiation, using the indexing of Gruner (1937, 1944). The density could not be determined with precision, but is near 2.80.

The occurrence of stilpnomelane as a low temperature, hydrothermal

sulfide vein mineral is unusual. It also has been noted by Stewart (1956) with calcite, epidote and chlorite in a metamorphosed sulfide vein deposit at Dunham's Point, Deer Isle, Maine.

Spessartite-Grossularite

Garnet was an abundant and widespread mineral in the Franklin orebody. The reported analyses (Palache, 1937) and unpublished data on specimens in the Harvard collections indicate that virtually all of it was a manganoan andradite, with MnO generally in the range from 2 to 10 weight per cent. Aluminum garnets also occurred, but very sparingly, and have not been previously described. Specimens probably from the Trotter shaft area showed a transparent, bright orange-red garnet as thin veinlets cutting massive andradite. A chemical analysis, cited in Table 2, proves it to be a calcian spessartite with Ca:Mn=1:2.1. Isotropic, with n 1.789 (Na); a 11.697 Å; specific gravity 4.01. A bright pink garnet forming tough, very fine-grained aggregates associated chiefly with axinite, manganophyllite, bustamite and calcite has long been known as rare specimens from the Parker shaft workings. An unpublished partial analysis on a sample inseparably intergrown with about 8 per cent barysilite and barite and traces of willemite was made in 1935 by L. H. Bauer. It yielded Al_2O_3 21.66, CaO 26.77, MnO 8.10, FeO 0.77 and MgO 0.49, indicating the material to be a manganoan grossularite with Mn:Ca~1:4.2. Isotropic, with n 1.742 (Na) and a 11.814 Å.

Table 2. Chemical Analysis of Calcian Spessartite

	1	Atoms per 12 oxygens		
Na_2O	0.01			
K_2O	< 0.01			
CaO	10.89	Ca	.944	
MgO	0.05	Mg	.006	
FeO	0.28	Fe	.019	2.97
MnO	28.90	Mn	1.977	
ZnO	0.36	Zn	.021	
Al_2O_3	19.27	Al	1.834	2.01
Fe_2O_3	2.95	Fe	.179	
SiO_2	37.18	Si	3.00	
TiO_2	0.03			
H_2O-	0.00			
H_2O+	n.d.	O	12	
Total	99.92			

1. J. Ito, analyst. Sr and V present in range 0.00x; Ga,Cr,Cu,Ag,Mo,Ni present in traces.

TABLE 3. SPESSARTITE-GROSSULARITE SERIES

Sp	Gr	An	Al	Py	Reference
66.7	22.7	9.1	1.3	0.2	Franklin, N. J.
58.3	21.7	2.7	12.1	5.2	California. Bloxam (1959)
58	40				Algeria. Byramjee and Meindre (1956)
49.2	26.3	5.9	13.7	4.9	India. Fermor (1934)
42.8	41.4	3.4	12.4		Nevada. Lee (1962)
34.0	54.3	1.9	9.9		Nevada. Lee (1962)
25.3	56.1	7.2	11.4		Nevada. Lee (1962)
18.6	77.7		1.7	2.0	Franklin, N. J.

The solid solution series between spessartite and grossularite probably is complete under some natural conditions, as is suggested by the present analyses and those tabulated in Table 3. The cited analyses are restricted to those with (Sp+Gr) over 75 mol per cent and with Sp and Gr each over 18 mol per cent. Gentile and Roy (1960) found "practically no solid solution" between spessartite and grossularite in synthetic material.

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