DANALITE FROM BRITISH COLUMBIA

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ABSTRACT

Danalite,$(Fe,Mn,Zn)_4Be_3Si_3O_{12}S$, has been found at Needlepoint Mountain, McDame Area, British Columbia, in a metamorphic contact zone between Cambrian sediments and a Mesozoic granitic intrusive. The host rock is a skarn composed of magnetite, dark-green chlorite, fluorite and quartz. The anhedral grains of danalite are cinnamon to reddish-brown in colour and have S.G. = 3.31, n = 1.753, and a_0 = 8.196 Å.

Location and History

The mineral occurs at the 5000 foot level on the southwest slope of Needlepoint Mountain, about 2 miles northeast of the junction of Bass Creek and Cottonwood River, McDame Area, B.C. (Reference Map, Canada Sheet 104P-VR 5655). The locality is about 75 airline miles southwest of Lower Post on the Alaska Highway.

The beryllium content of the rock was discovered by the British Columbia Department of Mines by a spectrographic analysis of a specimen submitted for tin assay by Mr. Gerald Davis of McDame Lake. The beryllium mineral was identified as helvite by Mr. J. J. McDougall of the St. Eugene Mining Corporation Limited in June, 1954, and the writer is indebted to him for specimens of this mineral. Subsequently, tests have shown that this mineral is closer to danalite than helvite.

Occurrence

Mr. McDougall describes the geological setting as follows: "The deposit occurs in metamorphosed Cambrian sediments, chiefly hornfels, marble, and skarn near an irregular tongue-like intrusion of Cassiar granite. The replacement of a band of highly contorted, thin bedded, impure limestone by iron-rich minerals has resulted in the formation of a dense black skarn. The skarn is exposed as an elongate mass about 300 feet long with an average width of 12 feet. A maximum width of 35 feet occurs near the granite contact where the sediments are most highly contorted. The skarn terminates against granite to the northwest and is obscured by talus and overburden to the southeast".

Properties

The danalite occurs as translucent cinnamon to reddish-brown anhedral grains up to 3 mm. in size, scattered throughout a ground-mass of magnetite, dark-green chlorite, pale fluorite, sericite, carbonate and quartz. Small grains of native bismuth are present in minute amounts.

In thin section, most of the danalite grains appear clean but a few contain small amounts of a finely divided black opaque mineral, possibly magnetite. Small crystals of zircon with pleochroic haloes are seen in the chlorite.

The specific gravity of the danalite, measured on the Berman Balance, is 3.31 ± 0.01, and the refractive index is 1.753 ± 0.005.

A spectrographic analysis of the cleanest picked material shows major amounts of Fe, Mn, Si, and Be; minor amounts of Zn, Ca, and Mg; and traces of Cu, Pb, Sn, Sb, Ti, and Ba. It was not possible to obtain enough danalite for a complete chemical analysis. Five hundred milligrams were submitted to Dr. G. C. B. Cave, the Chief Analyst and Assayer, British Columbia Department of Mines, and through his courtesy, chemical analyses for Fe, Mn, and Zn were made by Mr. S. Metcalfe with the following results: Fe 25.1%, Mn 10.5%, and Zn 2.9%.

The writer wishes to express his thanks to Dr. L. G. Berry of Queen's University who kindly made an *x*-ray fluorescence analysis of a similar sample, the results of which appear below:

Fe_2O_3	36.2%	Fe	25.2%
MnO_2	17.5%	Mn	11.05%
ZnO	2.55%	Zn	2.05%

Table 1 (Glass, *et al.*, 1944) gives the chemical analyses for FeO, MnO and ZnO for various danalites and for the theoretical end members of the Helvite group, namely, helvite, danalite, and genthelvite. Also listed in the table are data on specific gravity, index of refraction and cell edge. From this table it can be clearly seen that the British Columbia mineral falls in the danalite end of the series.

TABLE 1

Locality	FeO	MnO	ZnO	S.G.	*n*	a_0
Redruth, Cornwall	37.53	11.53	4.87	3.35	1.758	8.199 Å
McDame Area, B.C.	32.29	13.55	3.61	3.31	1.753	8.196
Rockport, Mass.	27.40	6.28	17.52	3.43	1.755	8.155
Gloucester, Mass.	28.13	5.71	18.15	..	..	..
Helvite	..	51.12	..	3.20	1.728	8.27
Danalite	51.44	..	..	3.35	1.771	8.18
Genthelvite	..	..	54.54	3.70	1.740	8.10

TABLE 2. DANALITE: *X*-RAY POWDER PATTERN

Cubic; $a_0 = 8.196$ Å

I	*d* (meas)	*hkl*	*d* (calc)	*I*	*d* (meas)	*hkl*	*d* (calc)
1	4.087	002	4.098	½	1.297	026	1.296
4	3.678	012	3.665	4	1.268	145	1.265
10	3.347	112	3.346	½	1.237	226	1.236
1	2.897	022	2.898	½	1.224	036, 245	1.222
3	2.591	013	2.592				
2	2.368	222	2.366	½	1.208	136	1.208
1	2.274	023	2.273	½	1.185	444	1.183
5	2.193	123	2.190				
1	2.129	..	..	1	1.162	017, 055, 345	1.159
1	2.052	004	2.049				
7	1.932	033, 114	1.932	½	1.128	027, 146	1.126
2	1.833	024	1.833				
1	1.790	124	1.789	5	1.118	127, 255, 336	1.115
3	1.678	224	1.673				
2	1.607	015, 134	1.607	2	1.079	037	1.076
				1	1.051	056, 346	1.049
1	1.524	025, 234	1.522				
				5	1.043	237, 156	1.041
2	1.498	125	1.496				
4	1.451	044	1.449				
3	1.410	035, 334	1.406	6	1.012	118, 147, 455	1.009
3	1.368	006, 244	1.366	3	0.9966	028, 446	0.9939
3	1.333	116, 235	1.330	2	0.9887	128, 247	0.9867

X-ray powder photographs of danalite were taken, using a camera with a diameter of 57.3 mm., and manganese oxide filtered iron radiation. The observed intensities and measured spacings are listed in Table 2, together with the spacings calculated from a lattice constant of 8.196 Å. A correction for film shrinkage was applied.

The McDame area is one of the few localities in British Columbia where beryllium minerals are known. In addition to the occurrence of danalite in skarn, beryl[1] has recently been found in pegmatites in the same general area.

Several years ago the writer examined numerous specimens of garnet from contact metamorphic deposits in the province. While a few garnets showed spectrographic traces of beryllium, helvite or danalite were not

[1]Personal communication, Mr. Einar Hagen.

recognized in association with the garnets. The presence of abundant fluorite in the Needlepoint Mountain skarn distinguishes it from other skarns in the province, and its presence may be of value in prospecting for further occurrences of members of the helvite group.

Reference

Glass, J. J., Jahns, R. H., & Stevens, R. E. (1944): Helvite and danalite from New Mexico and the helvite group: *Am. Mineral.*, **29**, 163–191.