

REPORT on a SPECIMEN OF GERSDORFFITE FROM TASMANIA

A small mineral specimen, submitted for mineragraphic examination by Mr. P.B. Nye Government Geologist of Tasmania, has the following analysis:-

Insoluble	2.80 per cent
Arsenic	34.50
Nickel	25.76
Sulphur	18.28
Iron	10.70
Zinc	1.20
Cobalt	0.28
Silver	3 dwts per ton

The mineral has a steel gray colour on a fractured surface and is associated with a little limonite and pyritic mineral.

The examination of a polished surface discloses the presence of two sulphides, in addition to a little quartz and limonite. The most abundant mineral is white in colour and proves to be gersdorffite (NiAsS) while the subordinate mineral is yellowish white in colour and is pyrrhotite showing considerable alteration to limonite.

Gersdorffite. This white mineral polishes readily. It is found to be isotropic and to show abundant traces of a cubic cleavage (see Fig.1). When etched it is found to effervesce with HNO_3 , leaving a dark stain without any prominent zoning. It is negative to HCl , KCN , KOH and FeCl_3 but tarnishes with HgCl_2 .

Pure areas of this mineral are sufficiently large to enable a small drop of HNO_3 to be placed wholly on it. The solution, so obtained, is transferred to a glass slide and ammonia added. No precipitate of iron hydroxide is observed and the addition of dimethylglyoxime produces a copious magenta coloured precipitate indicating the presence of nickel and the absence of iron. Another similar drop is evaporated nearly to dryness and a drop of ammonium molybdate added, after which the solution is very slowly evaporated to dryness. A drop of 1% HNO_3 is then added to dissolve the excess ammonium molybdate and on examination an abundant crop of characteristic tiny, yellow, isometric crystals of ammonium arseni-molybdate are observed, indicating the presence of arsenic in the white mineral. The filtrate across the arsenic test was then merged with a drop of potassium mercuric thiocyanate and the formation of small brown spherulites again confirmed the presence of nickel, while the absence of any brown colouration confirmed the absence of iron. Cobalt, if present in sufficient quantity, would also be indicated by the potassium mercuric thiocyanate test but was not observed. In all probability the test drop is too dilute to reveal the small percentage of cobalt which probably replaces a little nickel in gersdorffite.

The white mineral is thus proved to contain both nickel and arsenic. Among nickel-arsenic mineral there are two compounds gersdorffite (NiAsS) and chloanthite (NiAs_2) which are cubic. The etching behaviour of these two minerals is similar and both may conform to the etching results on the test mineral. Chloanthite, however, possesses an octohedral cleavage and usually reveals marked zoning on etching with HNO_3 . The test mineral does not show marked zoning and moreover has a cubic cleavage and is therefore identified as gersdorffite. This determination is in accord with the

abundant presence of sulphur in the chemical analysis.

The yellowish white mineral, associated with gersdorffite shows considerable alteration to limonite and is obviously an iron sulphide. It occurs in aggregates of platy crystals, as plates along the junction of adjoining crystals of gersdorffite and also in the corners and interstices between them. In places thin lines of limonite, arising from its decomposition, extend along the cleavage planes of gersdorffite. This sulphide is anisotropic, at least in part, and is thus distinguished from pyrite. It is also tarnished by etching with KOH and is thus distinguished from marcasite. It therefore agrees with pyrrhotite and, like pyrrhotite, is found to be magnetic. The tabular form of the crystals can be reconciled with pyrrhotite as well as the traces of a basic cleavage which is accentuated in the section by the lines of decomposition (see Fig.2).

The theoretical percentage composition of gersdorffite is 45.3% As, 35.4% Ni, and 19.3% S. These percentages correspond to a ratio of 34.5 As, 27.0 Ni and 14.8 S, where-as the figures determined by analysis are 34.5% As, 25.76% Ni and 18.28% S. The correspondence between the theoretical ratios of nickel and arsenic with the analytical percentages bears out the identification of gersdorffite. The excess sulphur in the analysis is 3.48% which can be allotted to the iron for pyrrhotite. This percentage of sulphur is however too small for combination with 10.7% of iron for pyrrhotite and the discrepancy can be explained by the presence of iron in the oxidised product, limonite.

The mineragraphic examination and the chemical analysis are therefore in agreement regarding the identification of the rare mineral, gersdorffite, in association with subordinate pyrrhotite.

Fig. 1. Unetched section showing traces of cubic cleavage of gersdorffite. Mag. 100.

Fig. 2. Group of crystals of pyrrhotite (white) embedded in limonite (black), with traces of decomposition along cleavage planes. Grey particle is quartz. Mag. 140.

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