

XCVIII.—*Sulvanite, a New Mineral.*

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**THIS** mineral was found in considerable quantity in some ore from a new mine, not yet named, near the Burra in South Australia.

It appears to afford the first recorded instance of a sulphide mineral containing vanadium as one of its principal constituents.

From the first analysis made, the composition appeared to be that of a sulphovanadite of copper,  $3\text{Cu}_2\text{S}, \text{V}_2\text{S}_3$ , mixed with chalcocite; a paper describing the mineral and giving this as a provisional structure, was read before the Royal Society of South Australia at Adelaide on June 5th.

On further examination, it was found that the sulvanite is so intimately penetrated by malachite and other oxidised minerals as to require fine comminution and digestion with dilute or weak acids before these oxidised portions can be removed.

Two samples, appearing nearly pure, were therefore finely ground, levigated and treated, one with cold dilute hydrochloric acid (1:1) and the other with 30 per cent. acetic acid heated on the water-bath; there was considerable evolution of carbon dioxide in each case, and much copper was dissolved. The washed and dried powders yielded the following figures on analysis, A having been treated with hydrochloric acid and B with acetic acid:—

	Cu.	V.	S.	$\text{SiO}_2$ .	$\text{Fe}_2\text{O}_3$
A .....	47.98	12.53	32.54	4.97	0.42
B .....	48.95	12.68	30.80	5.72	1.53

From these analyses, it appears that the mineral consists of sulphovanadate of copper,  $3\text{Cu}_2\text{S}, \text{V}_2\text{S}_5$ , and a table follows showing the composition of A and B after deducting the silica and iron, together with the calculated analysis of  $3\text{Cu}_2\text{S}, \text{V}_2\text{S}_5$ :

	Cu.	V.	S.
A .....	51.57	13.46	34.97
$3\text{Cu}_2\text{S}, \text{V}_2\text{S}_5$ (calc.).....	51.50	13.88	34.62
B.....	52.96	13.72	33.32

In these analyses, the sulphur is a little high in A from a slight decomposition of the sulphide by the action of hydrochloric acid, whilst in B the copper is high owing to the acetic acid having failed to remove all the oxidised copper minerals.

On heating a picked and apparently pure specimen in a closed tube before the blowpipe, a ring of sulphur was deposited on the cool surface of the tube, indicating the presence of vanadium pentasulphide,  $\text{V}_2\text{S}_5$ , or cupric sulphide; a previous test on a less pure fragment had given no sulphur, but another portion of this same fragment was found to contain only 8 per cent. of sulphur, which explains the discrepancy.

Physical properties of the mineral:—Massive, lustre metallic to sub-metallic, colour bronze-yellow, streak nearly black, hardness 3.5, sp. gr. 4.0. No crystalline form could be detected in the specimens examined, and this, with the presence of oxidised minerals, renders

the physical properties rather vague. Two specimens had the sp. gr. of 3.94 and 3.82, and the first, after deducting the effect of 5 per cent. of silica, gave the sp. gr. as 4.03; as malachite has the same sp. gr., its presence does not affect the result.

The associated minerals are malachite, azurite, quartz, vanadium ochre, gypsum, and calcite, with probably some copper vanadate, although none of this has, so far, been separated for identification.

NOTE.—In separating sulphuric acid from vanadium in hydrochloric acid solution, the vanadium should be first reduced from vanadium pentoxide,  $V_2O_5$ , to vanadium tetroxide,  $V_2O_4$ , otherwise the barium sulphate is contaminated with vanadic acid or barium vanadate, from which it cannot be freed by treatment with acids, whereas when first reduced, none or only negligible traces are carried down.

If solution has been preceded by fusion with sodium hydrogen carbonate and potassium nitrate, the nitrite present suffices for the reduction, otherwise the acid solution is boiled with a little alcohol until it is of a pure blue colour. The vanadium tetroxide is oxidised by bromine prior to precipitation as barium vanadate.

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