A PRELIMINARY DESCRIPTION OF THE NEW MINERAL PARTRIDGEITE

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Natural Mn_2O_3 is found in the Postmasburg manganese ores and has been named partridgeite in memory of the late Mr. F. C. Partridge, formerly Senior Mineralogist of the Geological Survey. It occurs in intimate association with braunite and sitaparite, and also forms isomorphous mixtures with these minerals. Intermediate members of the partridgeite-sitaparite series especially, are well represented.

In a hand specimen partridgeite closely resembles sitaparite. Its colour is dark steel-gray with a yellowish tinge and it has a distinct octahedral or pseudo-octahedral cleavage. Its hardness is about equal to that of braunite or sitaparite. No measurable crystals of partridgeite have yet been found and cleavage fragments have not proved suitable for accurate goniometric measurement.

In a polished section, partridgeite is easily distinguished from braunite by its colour (which is practically identical to that of sitaparite), and from sitaparite by means of etch tests. It may be mentioned here that the composition of South African braunite is given by the formula $3Mn_2O_3 \cdot MnSiO_3$ and that of South African sitaparite by $(Mn, Fe)_2O_3$. The percentage of Fe_2O_3 in the sitaparite is variable and amounts up to 25.6% have been noted. The colour in polished section of members of the braunite group of minerals apparently varies with the silica content and is little affected by the amount of iron present.

The most useful etch reagent for distinguishing sitaparite from partridgeite is $H_2O_2+H_2SO_4$ (equal parts of H_2SO_4 (1:1) and H_2O_2 (10%)) which strongly etches the latter mineral but has no effect on the former. Etching often reveals an intricate zonal structure in the ferriferous varieties of partridgeite, this zoning probably being due to small chemical differences between the different layers.

Between crossed nicols partridgeite is weakly anisotropic, resembling braunite, while the twinning lamellae characteristic of sitaparite are absent.

Fairly pure specimens of the ferriferous variety of partridgeite have been available for analysis, but the iron-free mineral has thus far been found only in association with braunite and pyrolusite. Three samples have been analyzed by Dr. C. F. J. van der Walt of the Division of Chemical Services. Of these, No. 1 is a ferriferous partridgeite while No. 2 is a braunite-partridgeite-pyrolusite ore. Number 3 was submitted for analysis at a later stage than the previous two samples and was found

to contain a trace of hematite in addition to pyrolusite and braunite. In each of the analyzed specimens the amount of the impurities was estimated by inspection of three polished surfaces under the reflecting microscope.

TABLE 1. ESTIMATED COMPOSITION OF THE SPECIMENS

No.	Partridgeite	Braunite	Pyrolusite	Diaspore
1	92	2	4	2
2	53	40	7	—
3	80	5	15	—

TABLE 2. ANALYSES OF PARTRIDGEITE

No.	1	2	3
MnO_2	53.02	56.50	61.9
MnO	37.90	35.96	35.9
Fe_2O_3	6.71	0.56	0.5
SiO_2	0.36	4.92	0.5
Al_2O_3	1.49	0.26	0.4
H_2O+	—	1.0	—
B_2O_3	—	0.6	—
CaO	—	trace	nil
Total	99.48 Sp. Gr.=4.96	99.80	99.2

From the above analyses the approximate mineralogical constitution of the specimens has been calculated, assuming the formula of partridgeite to be $(Mn, Fe)_2O_3$. The small amounts of Al_2O_3 (in No. 2), H_2O, B_2O_3 and Fe_2O_3 (in No. 3) have been neglected in these calculations.

TABLE 3. CALCULATED COMPOSITION OF THE SPECIMENS

	Partridgeite	Braunite	Pyrolusite	Diaspore
1	87	4	7	2
2	29	50	19	—
3	75	5	19	—

The agreement between the observed and the calculated values for the composition of samples 1 and 3 is satisfactory but in case of sample No. 2 there is a rather large discrepancy. This is no doubt in large part due to the low accuracy of the method of estimating the composition of

the specimens, but it is also possible that part of the silica given in the analysis is contained in the partridgeite molecule. The analysis of this sample is of interest chiefly because it shows that a mineral superficially resembling sitaparite is practically free from iron.

Boron was detected in sample No. 2 with the aid of the spectrograph by Dr. B. Wasserstein of the Union Geological Survey. As shown by subsequent tests this element is contained chiefly in the braunite. The quantitative determination of B_2O_3 in various samples of braunite ore was undertaken by van der Walt and results as high as 1.1% were obtained.