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JOHACHIDOLITE, A REVISED CHEMICAL FORMULA

W. O. Davies and M. P. Machin,
Portsmouth College of Technology, Portsmouth, England.

Iwase and Saito (1942) described a new mineral which was discovered in nepheline veins in limestone at Johachido, Kankyohokudo, Korea, which they named after the locality. The impossible formula given, $H_6Na_2Ca_3Al_4F_5B_6O_{20}$, has appeared in several books dealing with mineralogy or the chemistry of boron compounds. Only the analysis appears in Dana (1951). A balanced formula, $Na_2Ca_3Al_4B_6O_{14}(OH)_5F_5$, is given in Hey (1962), and Strunz (1957) offers the formula $Ca_3Na_2Al_4H_4[(F,OH)BO_3]_6$, but neither represent the analysis well. A new calculation seemed necessary.

Since impurities due to nepheline, $NaAlSiO_4$, and apatite, $Ca_5(PO_4)_3F$, probably make some contribution[1], column 2 presents the amended analysis. The atomic proportions were calculated on a basis of total anions = 45 (column 3), this being the smallest number whereby an approximately integral number of cations in each group could be ac-

[1] Private communication from M. H. Hey.

TABLE 1. CALCULATION OF NEW FORMULA FOR JOHACHIDOLITE (WEIGHT-PERCENT)

Component	1	2	Component	3	4	5
Na_2O	8.27	8.18	Na	3.760	8.19	8.34
CaO	24.77	24.98	Ca	6.343	24.70	22.64
Al_2O_3	28.34	28.33	Al	7.914	28.74	27.44
B_2O_3	24.21	24.46	B	10.005	24.54	28.12
H_2O^+	6.52	6.59	H	10.419	6.66	6.06
H_2O^-	0.07	—	—	—	—	—
F	12.21	12.33	F	9.241	12.38	12.78
MnO	0.23	0.23	Mn	0.046	—	—
SiO_2	0.34	—	—	—	—	—
Fe_2O_3	0.09	0.09	Fe	0.016	—	—
P_2O_5	0.03	—	—	—	—	—
—	—	—	O	35.759	—	—
	105.08	105.19			105.21	105.38
−O=F	5.14	5.19			5.21	5.38
Total	99.94	100.00			100.00	100.00

1. Chemical analysis, (Iwase and Saito (1942)).
2. Recalculated chemical analysis after deduction of nepheline and apatite.
3. Atomic proportions based on total anions = 45.
4. Theoretical analysis for the composition $(Na_{3.75}Ca_{0.25})Ca_6Al_8B_{10}O_{25}((OH)_{10.50}F_{9.25}O_{0.25})$.
5. Theoretical analysis for the composition $Na_2Ca_3Al_4B_6O_{14}(OH)_5F_5$.

commodated. Basing the structure on five B_2O_5 units and rearranging into groups according to ionic size, we have,

$$Na_{3.76}Ca_{6.34}(Al_{7.91}Mn_{0.05}\overset{3+}{Fe}_{0.02})B_{10.00}O_{25}[F_{9.24}(OH)_{10.42}O_{0.34}]$$

or simply $(Ca, Na)_{10}Al_8B_{10}O_{25}(OH, F, O)_{20}$. The ratio of Ca:Na is much closer to 5:3 than 3:2 so the formula would be more correctly written as $(Na, Ca)_4Ca_6Al_8B_{10}O_{25}(OH, F, O)_{20}$. Replacement of Na by Ca causes a replacement of (OH, F) by oxygen in order to maintain neutrality. More simply this is $Na_4Ca_6Al_8B_{10}O_{25}(OH, F)_{20}$ when the minor substituent of Ca for Na is neglected.

A comparison is made in the table of the amended analysis (column 2) with a somewhat idealized composition in which Ca:Na = 5:3 (column

4) and the theoretical composition of the first balanced formula as it appeared in Chemical Index of Minerals (column 5).

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STRONTIOHILGARDITE-1Tc and TYRETSKITE, A STRUCTURAL PAIR

W. O. DAVIES AND M. P. MACHIN,
Portsmouth College of Technology, Portsmouth, England.

A new formula for tyretskite, $[Ca_2[B_5O_8(OH)_2]OH]$, is deduced which is shown to correspond closely to that of strontiohilgardite-1Tc. (Although the mineral name strontiohilgardite-1Tc (Braitsch, 1959) was disapproved of by the IMA Commission on New Minerals and New Mineral Names in 1959, no alternative name has been proposed for what is certainly a valid new mineral in the hilgardite-heidornite group.) A comparison of the unit-cell dimensions of strontiohilgardite-1Tc (Braitsch, 1959) and tyretskite (Kondrat'eva, 1964) [setting changed to follow the standard convention] (Table 1) reveals a similarity which favors an analogy between them. The unit-cell content of strontiohilgardite-1Tc is $[(Ca,Sr)_2B_5O_8(OH)_2Cl]$, and the Ca:Sr ratio in analyzed

TABLE 1. CELL DIMENSIONS

Strontiohilgardite-1Tc (Braitsch, 1959)	Tyretskite (Kondrat'eva, 1964)
(triclinic, $Z=1$)	(triclinic, $Z=1$)
$a=6.48$ Å	$a=6.44$ Å
$b=6.608$ Å	$b=6.45$ Å
$c=6.38$ Å	$c=6.41$ Å
$\alpha=61°\ 12'$	$\alpha=61°\ 46'$
$\beta=60°\ 30'$	$\beta=60°\ 15'$
$\gamma=75°\ 24'$	$\gamma=73°\ 30'$