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RELATION OF THE MANGANESE-CALCIUM SILICATES, GAGEITE AND HARSTIGITE: A CORRECTION

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Dr. Michael Fleischer has kindly called a serious oversight to my attention. In a paper on harstigite (Moore, 1968), I referred to the chemical analysis reported in Flink (1886) and overlooked a revised analysis, published much later (Flink, 1917). In this later paper, Flink noted that the original harstigite material was almost entirely sacrificed for the old analysis but specimens located in the 1890s permitted a new and more reliable analysis. The average of the two more recent analyses, performed by R. Mauzelius, is given in Table 1. The revised specific gravity is 3.16.

The new analysis is similar to the old one, except that all alumina actually proved to be beryllia. Calculation of the cell contents in Table 1 shows that the formula should be

$$Mn_{0.86}Mg_{0.20}Ca_{5.88}Be_{4.00}Si_{5.80}O_{21.34}(OH)_{2.40}, \quad Z = 4,$$

using my structure cell data (Moore, 1968).

Harstigite is closely related to but distinct from aminoffite. A recent crystal structure analysis of aminoffite by Coda, Rossi, and Ungaretti (1967) led to cell criteria in Table 2, which, if transformed to the *C*-centered tetragonal cell, can be immediately related to harstigite. This structure analysis led to the crystallochemical formula $Ca_6(BeOH)_4 \cdot [Si_3O_{10}]_2$ for aminoffite. This is to be compared with $MnCa_6(Be_2OOH)_2 \cdot [Si_3O_{10}]_2$ for harstigite.

TABLE 1. REVISED CRYSTALLOCHEMICAL CALCULATION FOR HARSTIGITE
[Mauzelius in Flink (1917)]

	Weight percent	Moles in cell	Ideal
SiO_2	40.00	23.22	24.00
BeO	11.49	16.02	16.00
MnO	7.05	3.44 } 4.25	4.00
MgO	0.94	0.81 }	
CaO	37.82	23.52	24.00
F_2	0.15	—	
H_2O	2.48	9.60 (OH)	8.00
	99.93		

There are several facts which support the distinction between aminoffite and harstigite. The powder data of aminoffite (Mandarino, 1964) are only remotely related to those for harstigite (Moore, 1968). Though the two cells are geometrically similar, the space group criteria are distinct. Furthermore, Flink (1886) noted $2V=52°$ for harstigite, whereas aminoffite is uniaxial (Hurlbut, 1937). Finally Flink (1917) shows a cruciform twin, composed of two orthorhombic individuals twinned on $p(110)$ using Flink's letter and my orientation.

It is doubtful that harstigite is merely a stuffed derivative of the aminoffite crystal structure since the relative intensities of the diffraction spectra are quite different. Aminoffite is a sheetlike structure, composed of $[Si_3O_{10}]$ triplets linked to Be-(O,OH) tetrahedra, with the large cations intercalated between the sheets (Coda, *et al.*, 1967). Harstigite is probably similar, though the order of the tetrahedra and the large cations may be different and a crystal structure analysis will be necessary to elucidate these differences.

TABLE 2. RELATIONSHIP BETWEEN HARSTIGITE AND AMINOFFITE

	Harstigite[a]	Aminoffite[b]		
		True cell		*C*-cell
a	13.90 Å	9.865 Å	$x\sqrt{2}$	13.95
b	13.62	—		—
c	9.68	9.930		9.930
Space group	*Pcmn*	$P4_2/n$		
	4	2		4
Formula	$MnCa_6(Be_2OOH)_2\,[Si_3O_{10}]_2$	$Ca_6(BeOH)_4\,[Si_3O_{10}]_2$		

[a] Moore (1968)
[b] Coda, Rossi, and Ungaretti (1967)

In my previous paper (Moore, 1968), I suggested a relationship between harstigite and gageite. The crystal structure of gageite is now known and there doesn't appear to be any relationship between the two minerals. It is suggested that harstigite be classified with aminoffite under the melilite group of minerals and related structures.

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