

from anandite is characteristic of S^{2-} ions. This result is also consistent with the observation that H_2S was evolved during the acid dissolution of the mineral as described previously. The similarity in ionic radius between S^{2-} (1.84 Å) and Cl^- (1.81 Å) suggests that both ions replace OH^- (1.40 Å) ions in the anandite structure.

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Kaersutite from the minverite of Cornwall

THE Devonian spilitic suite in Cornwall includes sills of proterobase, albite diabase, and picrite (Dewey and Flett, 1911). The proterobase of St. Minver was named minverite by Dewey (1910) and consists of purplish titan-augite, fresh dark brown hornblende, and traces of olivine, together with biotite, albite, ilmenite, and apatite, more or less altered to chlorite, saussurite, epidote, leucoxene, and other secondary minerals. The dark brown hornblende has usually been referred to as barkevikite (by Dewey and others) but in a personal communication to the writer (1960) M. E. Cosgrove regarded it as kaersutite. Lehmann (1963) places it in the kaersutite-syntagmatite series (in the sense of Tröger, 1956, p. 76) and gives the following optical properties: α , 1.673–5; β , 1.693–6; γ , 1.703–5; $2V_a$, 76° to 82° ; γ : [001], 6° to 16° . In the absence, to the writer's knowledge, of an analysis, a sample was separated from a British Museum specimen (B.M. 1920/583 (3)) and an analysis made by A. J. Easton. This is given in the table below,

together with the optical properties and cell dimensions ($C/2m$), determined by the writer.

TABLE I. Kaersutite from minverite, St. Minver, Cornwall. Anal. A. J. Easton

SiO ₂	36.01	Numbers of ions on the basis of 24 (O,OH,F)				
TiO ₂	9.08			<i>a</i>	1.684	
Al ₂ O ₃	13.23	Si 5.659	} 8.00	γ	1.715	
Fe ₂ O ₃	1.15	Al 2.341		$2V_a$	68°	
FeO	16.09	Al 0.110	} 5.16	γ : [001]	19°	
MnO	0.37	Ti 1.075				
MgO	7.15	Fe ³⁺ 0.136			<i>a</i> (Å)	9.891
CaO	13.28	Mg 1.675			<i>b</i> (Å)	18.139
Na ₂ O	2.37	Fe ²⁺ 2.115	} 3.08	<i>c</i> (Å)	5.310	
K ₂ O	0.61	Mn 0.049			β	105.16°
H ₂ O ⁺	[0.30]	Na 0.722		<i>V</i> (Å ³)	920	
H ₂ O ⁻	n.d.	Ca 2.236				
F	n.d.	K 0.122				
Total	[100]	OH 0.315				
		100 Mg/(Mg + Fe ²⁺ + Fe ³⁺ + Mn)				
		42.1				

(H₂O⁺ value by difference; total includes P₂O₅, 0.36; n.d.: not determined.)

The analysis is of interest as it shows the amphibole to have in some respects, e.g. Ti, a formula close to the ideal for kaersutite:

'Ideal' kaersutite: Ca₂(Na,K)(Mg,Fe²⁺,Fe³⁺)₄Ti[Si₆Al₂O₂₂](O,OH,F)₂.

Minverite kaersutite: Ca_{2.2}(Na,K)_{0.8}(Mg,Fe²⁺,Fe³⁺)_{3.9}Ti_{1.1}[Si_{5.7}Al_{2.3}O_{23.7}](OH,F)_{0.3}.

Wilkinson (1961) and Deer *et al.* (1963) found the maximum (Fe²⁺+Fe³⁺) content of kaersutites to be approximately 1.5 atoms, a limit illustrated by amphiboles from Sakhalin (Yagi, 1953), with an Mg ratio (100 Mg/(Mg+Fe²⁺+Fe³⁺+Mn)) of 58.1, and the Lugar Sill, Ayrshire (Howie, 1963), with an Mg ratio of 57.3. Aoki (1963), discussing the kaersutites and oxykaersutites from Japan, showed with a kaersutitic hornblende from Gonoura, Iki Island, Mg ratio: 48.9, that the range of this group can extend nearly into that of the barkevikites. The minverite amphibole is notable in that, with 2.2 atoms of (Fe²⁺+Fe³⁺), giving an Mg ratio of 42.1, it extends the range even further. Its optical properties are typical of kaersutite and the γ refractive index has a value consistent with those for kaersutites when compared with the other dark brown hornblendes (Deer *et al.*, 1963, fig. 81, p. 324), whilst the relatively low $2V$ results from the high iron content. The optical properties given by Lehmann (1963, p. 237) suggest a more

magnesian amphibole and it seems probable that a fairly wide range of compositions is present in the minverite kaersutites.

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The crystal structure of joesmithite: a preliminary note

JOESMITHITE is a new mineral from Långban, Sweden, named by the author¹ and soon to be described elsewhere. Pertinent structure cell data are: a 9.88, b 17.87, c 5.277 Å, $\beta = 105^\circ 40'$, $P2/a$, $D_{\text{obs}} = 3.83$ gm/cc. Based on a quantitative emission spectrographic analysis by Ing. Benita Rajandi at the Swedish Geological Survey, and water and iron oxidation grade determinations by Mr. A. Parwel at the Swedish Natural History Museum, the cell contents are: $(\text{Pb}_{0.62}, \text{Ca}_{0.56}, \text{Ba}_{0.14}, \text{Mn}_{0.84})_{2.16} \text{Ca}_{4.00} \text{Fe}_{2.00}^{3+} (\text{Mg}_{6.34}, \text{Fe}_{1.40}^{3+}, \text{Fe}_{0.78}^{2+})_{8.42} (\text{Si}_{13.82}, \text{Al}_{0.32}, \text{Be}_{0.18})_{14.32} \text{O}_{39.72} (\text{OH})_{14.9}$. The three-dimensional crystal structure analysis suggests $(\text{Pb}, \text{Ca}, \text{Ba})_2 \text{Ca}_4 \text{Fe}_{\frac{3}{2}} (\text{Mg}, \text{Fe})_8 [\text{Si}_2 \text{O}_6]_4 [\text{Si}(\text{O}, \text{OH})_4]_4 (\text{OH})_8$.

Joesmithite so resembles hornblendes that it was almost overlooked as a possible new mineral. The structure cell, though dimensionally similar to the common clinoamphiboles, has different symmetry elements, which prompted complete crystal-structure analysis. Its

¹ After Prof. Joseph ('Joe') V. Smith. It has been approved by the Commission on New Minerals and New Mineral Names, International Mineralogical Association.