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New data on cowlesite from Northern Ireland

SINCE its discovery in the USA and Canada by Wise and Tschernich (1975) cowlesite has been observed from many localities in Co. Antrim. At one of these localities, the Ballyclare Quarry, cowlesite occurs in the shape of spherical balls, up to 7 mm in diameter. This cowlesite was examined chemically, optically and by X-ray diffraction to see if it was in any way different from the North American cowlesites. Another cowlesite forming less than 2 mm thick cavity lining in basalt from Dunseverick was also chemically analysed for comparative purposes. No optical or X-ray study was made on this material.

Optical and physical properties. The Ballyclare cowlesite balls are composed of elongated thin crystal blades which correspond in optical and unit cell orientation to that given by Wise and Tschernich (1975, fig. 5), except that the crystals do not show the perfection noted by the above authors. Optical examination reveals that the crystals are extremely thin, flexible and their alignment with each other is less than perfect, so that the extinction is spread over a few degrees. Aggregates give a centred negative acute bisectrix figure and show very low birefringence.

Chemical composition. The chemical composition of the Ballyclare and Dunseverick cowlesites was determined by an electron microprobe fitted with an energy dispersive system. The data appear in Table I. The water is given as difference and amounts to $4H_2O$. These analyses are very similar to each other and to those of Wise and Tschernich (1975), although the water content of $5H_2O$ (see below) is lower than proposed by these authors. It appears that one of the $5H_2O$ molecules is easily lost in the probe vacuum.

Water determination. The Ballyclare cowlesite was not available for water determination. Dunseverick cowlesite obtained from several cavities from the same hand specimen (I657) was checked for purity under a stereo-microscope and a 106 mg powdered sample was then heated in a platinum boat of 680 mg weight. The material lost 11.15% at 136 °C in one hour, a further 9.47% at 620 °C in an hour and finally a further 0.65% at 810 °C in an hour; the total loss being 21.27% amounting to 5.06 H_2O molecules for each $CaAl_2Si_3O_{10}$. These results are very similar to those of Wise and Tschernich (1975, fig. 6).

Density determination. The Ballyclare cowlesite spherules contain calcite overgrowths which was removed by a razor blade from a small bunch of bladed crystals. Their density was then matched with a bromoform–acetone mixture and the specific gravity (2.126) of this liquid determined by weighing in a 25 ml pycnometer bottle. The liquid was further tested by gems of natrolite (2.237) and opal (2.100) which respectively sank and floated in it. Since the cowlesite just sank in the mixture it was assumed that its specific gravity must be 2.13. This figure, however, must be somewhat higher than the true density since there may have been left over traces of calcite. Using the observed values of the cell volume (see below), density and water content the value of Z is 52.83 which may be taken to be 52. If Z is assumed as 52 then the calculated density is 2.10 g/cc.

TABLE I. *Probe analyses of Co. Antrim cowlesites*

	Ballyclare	Dunseverick
SiO_2	44.85	44.12
Al_2O_3	24.55	25.22
MgO	—	0.25
CaO	12.53	11.92
Na_2O	0.69	0.83
K_2O	—	0.26
[H_2O]	[17.38]	[17.40]
Total	100.00	100.00
Si	24.39	24.03
Al	15.74	16.19
Mg	—	0.20
Ca	7.30	6.95
Na	0.73	0.87
K	—	0.18
[H_2O]	[31.49]	[31.59]
O	80	80

X-ray powder data. The X-ray powder data is difficult to obtain as found by Wise and Tschernich (1975). The data (Table II) was obtained by filtered copper radiation on a camera of 114.59 mm diameter. The intensities estimated visually are probably affected by preferred orientation. The pattern is essentially similar to that of Wise and Tschernich, but the new record goes down to

TABLE II. *X-ray powder pattern of the Ballyclare cowlesite*

d_{obs} Å	*I*	*hkl*	d_{obs} Å	*I*
15.34	100	020	2.499	5
12.57	40	002	2.421	10
11.68	10	200, 201	2.378	10
8.51	80	202	2.322	10
7.63	10	040	2.285	10
6.92	5	141	2.220	20
6.16	5	241	2.164	5
5.61	90b	400, 124, 313	2.092	20
5.20 }	10	412	2.044	5
5.12 }		060	1.986	5
4.86	7	153, 304, 234	1.935	20
4.53	10	511, 352	1.909	10
4.23 }	10	171, 353	1.868	10
4.16 }		414, 415	1.837	15
3.91 }			1.762	20
3.82 }	20		1.693	10
3.78 }			1.644	5
3.66	5		1.619	7
3.44	10		1.605	7
3.38	10		1.538	20b
3.28	40	290, 614, 257	1.496	5
3.12	40	482	1.461	5
3.047	20		1.438	10
2.955	20b	490	1.414	10
2.828	80		1.374	10
2.751	10		1.348	20
2.587	5b		1.323	10

b = broad reflection; braces indicate unresolved reflections.

$d = 1.323$ Å as compared to 2.819 Å recorded previously. Also the new data is partially indexed on a unit cell which is doubled in all three dimensions.

Unit cell dimensions. The Ballyclare cowlesite was rotated about the elongation direction which was found to coincide with 24.92 Å repeat, twice the length of *c*-axis of Wise and Tschernich. The zero-level Weissenberg pattern shows a number of axial reflections but very few *hk*0 reflections which are difficult to index on account of spot-lengthening in the ω direction. There are even fewer spots on the first-level Weissenberg and the spot elongation is increased, so that it is not easy to determine the space group. the first level, however, does indicate the pattern of halvings so that *a* and *b* repeats can be determined. These were found to be $a = 23.17$ Å and $b = 30.58$ Å, both double the corresponding values given by Wise and Tschernich.

Probable space group. Examination of the zero and first-level Weissenberg photographs indicates that there are probably no restrictions on *hkl*, *hk*0 0*kl* and *h*0*l*. Thus if $l = 2n$ the probable space group should be $P222_1$, otherwise one of *Pmmm*, *Pmm*2, *P*2*mm*, or *P*222.

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Killinite is a di-octahedral hydromuscovite

KILLINITE was named as a new species by Taylor (1818) in allusion to the locality of Killiney, near Dublin. A note was published (Nawaz, 1980) stating that killinite was a hydromuscovite, but this proposal was not presented to the International Mineralogical Commission on New Minerals and Mineral Names for approval prior to publication. This has now been done and the proposal has been accepted by fourteen votes to one, with one abstention. The proposal was based on information