

TREMOLITE AND ACTINOLITE FROM THE DOLOMITE
MARBLE OF YELLANDU, SINGARENI

By N. Jayaraman

The occurrence of tremolite and actinolite in the dolomite marbles of Singareni is known since a long time. Tremolite and actinolite occur in the marbles as radiating platy and acicular bands of varying sizes. In general the marble carries about 2.5 per cent of tremolite but quite often the tremolite content exceeds ten per cent. The crystals of tremolite and actinolite present either a bladed or a fibrous appearance and they are almost always elongated in a direction parallel to the 'c' axis. They vary in size from very minute microscopic acicular forms to crystals having a thickness of a few inches.

Tremolite — Tremolite is much more abundant than actinolite in the specimens available. It is greyish-white in colour. Thin sections under the microscope are colourless, but between crossed nicols they are strongly birefringent. Generally the tremolite blades are free from inclusions and only occasionally are a few small patches of talc derived from the alteration of the tremolite met with.

Specific gravity = 2.9962

Refractive indices in sodium light (± 0.0004)

$\alpha = 1.6112$, $\beta = 1.6245$, $\gamma = 1.6366$

$\gamma - \alpha = 0.0254$

$Z \wedge c = +18^\circ$

A complete chemical analysis of an unaltered sample of tremolite was carried out and from the results obtained the structural formula of this mineral was calculated on the basis of 24 (O, OH, F) atoms per unit cell. The values are given in table I.

TABLE I

Oxides	Chemical composition per cent	Metal atoms	Metal groups	Ideal tremolite formula
SiO ₂ ...	57.98	7.951	7.979 (8)	8
Al ₂ O ₃ ...	0.16	0.025		
Fe ₂ O ₃ ...	0.11	0.012		
MgO ...	21.39	5.018	5.158 (5.2)	5
FeO ...	1.12	0.128		
CaO ..	13.92	2.016	2.016 (2)	2
H ₂ O ...	1.85	1.692	1.692 (1.7)	2
Total ...	99.53			

Structural formula (OH)₁₇ Ca (Mg, Fe)₅ (Si, Al)₈ O

It can be noticed from the results shown in table I that the magnesium group shows an excess while (OH) group shows a deficiency. The deficiency shown by silicon is to some extent made good by aluminium. Calcium shows a slight excess.

Actinolite—This occurs only sparingly. Its colour is pale dirty green to greyish-green. Its occurrence in the marble is similar to that of tremolite described above.

Specific gravity - 3.0115

Refractive indices in sodium light (± 0.001)

$\alpha = 1.613$, $\beta = 1.628$, $\gamma = 1.639$.

$\gamma - \alpha = 0.026$.

(Owing to the lack of perfect transparency in the mineral the refractive indices could not be measured accurately.)

$Z \wedge c = +18^\circ$.

A complete analysis of a fairly pure sample was carried out and the results obtained were utilized to calculate the structural formula as was done in the case of tremolite. The values are given in table II

TABLE II

Oxides	Chemical composition per cent	Metal atoms	Metal groups	Ideal tremolite formula
SiO ₂ ..	55.89	7.811	7.999 (8)	8
Al ₂ O ₃ .	1.15	0.188		
Fe ₂ O ₃ ..	0.36	0.039	5.165 (5.2)	5
MgO ..	21.20	4.445		
FeO ...	5.83	0.679	1.987 (2)	2
CaO ..	13.27	1.987		
H ₂ O ..	1.99	1.856	1.856 (1.9)	2
Total .	99.69			

Structural formula (OH)₁₀ Ca₂(Mg, Fe)_{5.2} (Si, Al)₈ O₂₂

It appears from table II that the magnesium group is in excess and silicon calcium and (OH) groups show a deficiency. The deficiency in silicon is made good by aluminium.

A comparison of tables I and II reveals that the values of the magnesium group (Mg, Fe) are almost the same in both. Values of the silicon (Si, Al), calcium and (OH) groups of the actinolite are more in agreement with the ideal tremolite formula than those of the tremolite.

The author wishes to express his grateful thanks to Dr K. R. Krishnaswami for his keen interest and constant encouragement during the course of this work, and also to Sir C. V. Raman, F.R.S., N.L., for giving him facilities in the Physics Department of this Institute.

*Department of Pure & Applied Chemistry,
Indian Institute of Science,
Bangalore*