

SPHEROIDAL-ASBESTOS FROM QILLA, CHARSADDA TEHSIL

KHURSHID JEHAN and AINUL HASAN KHAN

PCSIR Laboratories, Karachi 39

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Abstract. Spheroidal-asbestos has been found near the village Qilla in Charsadda tehsil (Pakistan). The chemical composition, X-ray powder data and DTA show that the asbestos is composed of chrysotile mineral. The genesis of the mineral is also discussed.

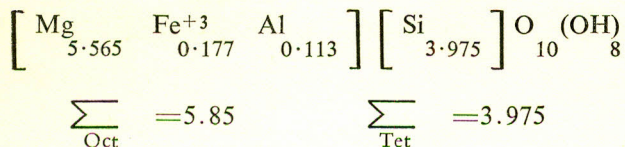
Kaiser, Ali and Khan¹ have described the mineralogy of slip-fibre asbestos found near the village Qilla in Charsadda tehsil. Asbestos and chromite occur in ultramafic intrusive rocks, mostly dunite exposed in the hills to the north of Peshawar. Serpentinization is common throughout the area. The asbestos occurs with serpentine.

Potato-like asbestos is found in the same area as the slip-fibre asbestos but are rather rare. The size of the 'potatoes' varies between 0.7-4 cm. On crushing a 'potato' rounded white fibres were obtained. The fibres are strong and flexible.

The experimental procedure adopted for the study is the same as described by Kaiser *et al.*¹

Oxide Composition of the Mineral. The chemical composition of the mineral in weight per cent is SiO₂ 42.13; Al₂O₃, 1.02; Fe₂O₃, 2.51; CaO, 0.36; MgO, 39.60; MnO, 0.0; TiO₂, 0.0; and P₂O₅ traces, loss on ignition 14.84; total, 100.56.

The relationships of the ions in octahedral and tetrahedral coordination were calculated from the chemical analysis of the sample. Hence, the structural formula for the sample may be written as:

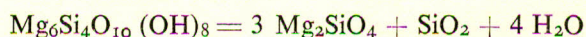


X-Ray Diffraction Studies. The X-ray diffraction data of the powder pattern of the 'potato' asbestos together with that of the chrysotile² are given in Table 1. Most of the reflections of the 'potato' asbestos are comparable to those of clino-chrysotile, except the reflection 2.88. This line has remained unidentified.

Differential Thermal Analysis. The DTA curve of the potato asbestos shows an endothermic peak between 600 and 750°C with a peak temperature at 685°C and a very sharp exothermic peak between 810 and 840°C with a peak temperature at 825°C. The DTA curve of the potato asbestos is comparable with those of slip-fibre asbestos of Qilla, Kurram³ and Canadian chrysotile.

The mechanism of decomposition of serpentine the—mother-rock of chrysotile—has been studied by a number of authors.⁴⁻⁶ The same mechanism applies to chrysotile. The endotherm indicates the dehydroxy-

lation of chrysotile, and exotherm suggests transformation of the anhydride to forsterite and silica, the total decomposition corresponds to:



Chrysotile^c Forsterite Quartz

Genesis. Chrysotile asbestos normally occurs as cross-fibre or slip-fibre structure. Occurrence of spheroidal-asbestos like that of Qilla is rather rare.

The formation of fibres and again the spheroidal structure seem to be enigmas of asbestos. A combination of factors, e.g. chemical composition, atomic structure, pressures, tensions, concentrations, impurities, temperatures and rates of growth may play important role during the first formation of the mineral.

The mother-rock serpentinite of Qilla seems to have formed by hydrothermal action on dunite consisting mainly of olivine. The iron content of the above rock seems to emerge as magnetite and is found segregated with the slip-fibre chrysotile of Qilla. No magnetite was found associated with the spheroidal-asbestos. However, it seems that at a certain temperature under the hydrothermal condition a mixture of magnesium silicate and water constituted a binary systems of immiscible liquids. Subsequently when this mixture cooled down spheroids of asbestos suspended in the water. On further cooling massive serpentinite were formed which enveloped the spheroids.

TABLE 1. X-RAY POWDER DATA FOR ASBESTOS MINERALS.²

Potato asbestos		Clino-chrysotile	
$d(\text{Å})$	I	$d(\text{Å})$	I
7.38	10	7.36	10
4.55	8	4.58	6
3.63	10	3.66	10
2.88	1	2.66	4
2.64	7	2.54	6
2.46	7	2.456	8
2.10	1	2.09	6
1.82	1	1.82	2
1.76	1	1.74	6
1.54	5	1.53	8

Conclusions

The chemical composition, X-ray powder data and DTA show that the 'potato-asbestos' of Qilla is chrysotile. Evidences support the idea that first spheroids were formed and were enveloped by serpentine later on.

References

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