THE AMERICAN MINERALOGIST, VOL. 54, SEPTEMBER–OCTOBER, 1966

VERMICULAR PSEUDOHEXAGONAL SERPENTINE AGGREGATES AS INCLUSIONS IN QUARTZ VEINS FROM THE PRECAMBRIAN KOLHAN FORMATION, SINGHBHUM DISTRICT, INDIA

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Abstract

Well-preserved, bent and twisted lamellar aggregates of serpentine occur as inclusions in the quartz of intricately folded veins. Apparently the quartz controlled the growth of the inclusions during deformation.

The western portion of the Kolhan basin of Singhbhum district of Bihar, comprising the youngest phyllitic shale member, is characterized by the abundance of intricately folded quartz veins, probably related to the early phase of Singhbhum Orogeny (Sarkar and Saha, 1963, p. 90). The destruction of phyllitic shale by weathering agencies makes the folded structure of quartz vein more conspicuous and prominent (Fig. 1). Such widespread folding of quartz veins appears to be derived from the initial crenulated cleavage planes of the host phyllitic shale. Quartz veins are thus metasomatic in origin, which is also corroborated by field evidences such as occurrence of phyllitic bands in quartz veins and occasional transitional contact between the two.

In the cavities of such folded quartz veins, dark greenish colored quartz has been encountered in the field. In thin sections, this quartz reveals an

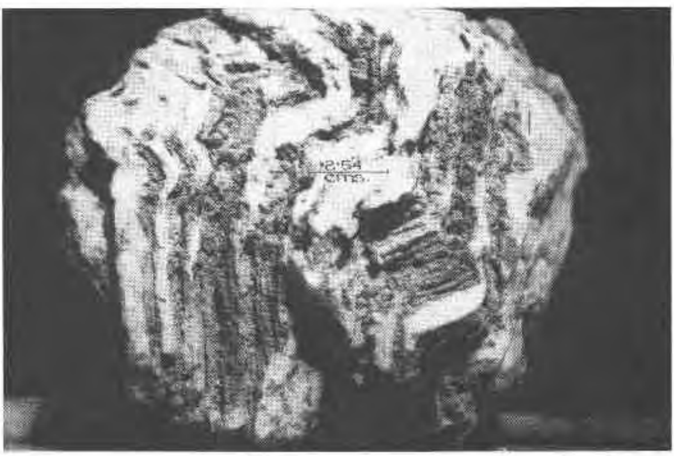

Fig. 1. Crumpled silica vein from the Kolhan phyllitic Shale. Weathering out of phyllitic bands makes the folded structure more conspicuous and prominent.

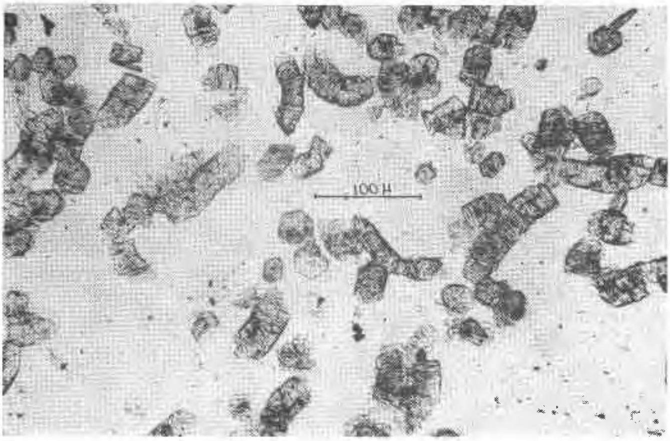

FIG. 2. Vermicular serpentine (7 Å) inclusions in vein quartz. The flakes are arranged in bent and twisted lamellar aggregates. A few hexagonal basal flakes are also visible. Plane polarized light.

interesting growth of vermicular serpentine inclusions, partly altered to limonite. They are arranged in a regular twisted pattern (Fig. 2). However, associated quartz does not show any microscopic evidence of deformation such as deformation lamellae and strain shadows. This differential behavior may be ascribed to a greater state of plasticity of serpentine in comparison with that of quartz during deformation.

These minute pale green, pleochroic, pseudohexagonal flakes measure from 22 to 53 microns, modal diameter being 30 microns. They are oriented in groups, giving a lamellar appearance to the aggregates. The refractive index (1.6284) measured at 20°C, uniaxial nature of the crystals, the high Al_2O_3 (about 20.1%) content, and a basal (001) spacing of about 7Å, leave no doubt that the mineral is an Al-rich serpentine mineral. The examination of the serpentine aggregates under the electron microscope shows morphology similar to that of illite and characteristic faint hexagonal electron diffraction pattern.

The oriented growth of the lamellar serpentine (7 Å) may be conditioned by the growth of the low-temperature hydrothermal quartz host, and the evidence of deformation is very well preserved in the bent and twisted arrangements of the lamellar aggregates of serpentine. The source of the serpentine appears to be the associated phyllitic shales, which are themselves rich in prochlorite.

ACKNOWLEDGEMENT

The author is highly indebted to Dr. A. K. Bhattacharya for critically reading the manuscript and for helpful suggestions. He is further grateful to the Head of the Department of Geology for providing necessary facilities and to the University Grants Commission for financial assistance.

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THE AMERICAN MINERALOGIST, VOL. 54, SEPTEMBER–OCTOBER, 1969

ELECTROPHORETIC SEPARATION AND FRACTIONATION OF CLAY MIXTURES

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ABSTRACT

An electrophoretic continuous particle separator makes it possible to separate mixtures of bentonite-illite and bentonite-kaolinite clays. Separating bentonite and kaolinite from an artificial mixture requires an electrolyte of 0.001 M Na_2CO_3 adjusted to a *p*H of 4.5 with HCl. The concentration of clay in suspension was 0.2 mg/ml. The suspension contained 20×10^{-5} meq of Th^{4+} per ml. Separating bentonite and illite from an artificial mixture required the same conditions except that the clay suspension contained 30×10^{-5} meq of Th^{4+} per ml.

It is often desirable to study the mineralogical, chemical and physical characteristics of individual clay minerals found in a natural mixture of clay. These studies have been difficult due to the lack of a good method for a quantitative separation of the various clay mineral components. Electrophoretic methods have shown promise in performing these separations.

Beavers and Larson (1953) used a schlieren moving-boundary procedure to study the mobility of Putnam and Cisine subsoil clays and montmorillonite clay. When a mixture of Cisine and montmorillonite was subjected to electrophoresis, the clays retained their characteristic mobilities and the distance between bands indicated that a separation of the clays might have been accomplished.

McNeal and Young (1963) used a paper electrochromatographic technique to separate bentonite from a mixture containing bentonite, kaolinite and vermiculite. Disadvantages of the method included considerable adsorption of the clay onto the paper and the time required for separation (48 hours).

It appears theoretically possible, therefore, to separate various clays