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TALC MINERALISATION IN RAKHABDEV ULTRAMAFIC SUITE

Priyanka Chauhan*
Mr. Saurabh**

ABSTRACT

During the synorogenic phases of the Aravalli Geological Cycle, the Rakhabdev Ultramafic Suite intruded concordantly along the litho-contacts before beginning and during the first phase of Aravalli folding. The ultramafic rocks consist mainly of serpentinites and are extensively altered and metamorphosed to talc-carbonate rocks and talc and chlorite schists. The Talc and Talc Schist (Steatite) bodies present in the form of lenticular and irregular pockets, veins showing pinch and swell nature and impersistent bands in Serpentinites. The ultramafic bodies show lithological zoning, with a core massive and irregularly broken Serpentinite surrounded successively by the zone of less-foliated and shear talc-serpentine (Carbonate-Tremolite- Actinolite) rock; foliated and sheared Talc-Carbonate (Tremolite) rock; Talc-schist and Tremolite-Actinolite-Talc-bearing Dolomite and Tremolite-Actinolite (Chlorite-Talc) schist. Steatisation is much later to Serpentinisation. The process of steatisation can be attributed to carbon-dioxide metasomatism, shearing and metamorphic activities. At some places talc, tremolite, actinolite and chlorite associated with dolomitic patches, are the products of regional metamorphism of these rocks under green schist facies condition. Evidences are also available which indicates that the dolomitisation of serpentinites is due to replacement process. With increasing metamorphism, steatisation of dolomite take place particularly along shear planes, which seems to facilitate development of talc. In Rakhabdev Ultramafic Suite three stages of development of talc schist lenses observed: 1. Fine disseminations of talc within dolomite, 2. Progressive steatisation with increasing metamorphism, 3. Complete steatisation of dolomite.

Keywords: *Ultramafic Rocks, Serpentinites, Steatisation, Metamorphism, Aravalli Supergroup.*

Introduction

During the Aravalli Geological Cycle, there were three main events of magmatism. An extensive shoreline syn-sedimentational basic volcanism, named as the Delwara-Siri Volcanics, occurs almost all along the base of the Aravalli Supergroup. Rakhabdev Ultramafic Suite of rocks intruded concordantly during the synorogenic phases of the Aravalli Geological Cycle. These ultramafic rocks found in southern part of Rajasthan consist predominantly of serpentinite and are extensively altered and metamorphosed to talc-carbonate rocks along with talc and chlorite schists. Further rise of geo-isotherms led to widespread migmatisation and emplacement of syn-orogenic to late-orogenic granites (viz. in Udaipur, Udaisagar, Salumber, Darwal and Titri areas).

Rakhabdev Ultramafic Suite

Rakhabdev Ultramafic Suite occurring in Antaliya-Rakhabdev-Kherwara-Dehlana area has been considered to have intruded concordantly along the litho-contacts before and during the first phase of Aravalli folding and is subsequently folded along with metasediments. These ultramafic rocks consist predominantly of serpentinite and are extensively altered and metamorphosed to talc-carbonate rocks, talc and chlorite schist. These rocks occur as large, irregular lensoid bodies of more than 5 km length

* Assistant Professor, Department of Geography, Government College, Chaksu, Rajasthan, India.
** Assistant Professor, Department of Economics, Government College, Rajgarh, Alwar, Rajasthan, India.

within the Aravalli Supergroup of rocks in three different belts. The first belt extends from Dad in Dungarpur district in the SE to Sero-ki-pal in the north over a distance of 77 km, the second from Kanthria to Kaliguman over a distance of 115 km and the third from Kaunthal to Titri over a distance of 15 km. In Antaliya area, the ultramafic bodies are very small, lensoid or oval-shaped. The Rakhabdev Ultramafic Suit occurs along two prominent lineaments (the Rakhabdev and the Kaliguman Lineaments) indicative of a deep-seated mantle tapping fracture.

Serpentinites and Serpentinite-Talc Rocks

The ultramafics consisting of serpentinites and serpentinite-talc rocks occur from Dad in south to Sero-ki-pal in the north and from Kanthria to Kaliguman, and between Kaunthal and Titri intermittently for over 200 km. The main occurrence between Dad and Sero-ki-pal through Rakabdev, is the widest (About 5 km) at Rakabdev. These ultrabasic rocks were considered to be Post-Delhi intrusives (Heron, 1953), but the recent study of their structural setting has indicated that these were emplaced during early stage of Aravalli orogeny (Mathur, 1966;Rakshit, 1969; Chattopadhyay, 1975;Basu and Arora, 1968; Arora, 1971). Serpentines have been formed due to complete serpentinisation of ultramafic rocks; as a result of which no trace of the original texture or composition is traceable. These rocks show shades of green color, varying in deep-green, pistachio green, apple green, greenish yellow and in varying greenish shades. These rocks are predominantly compact, tough, translucent to sub transparent, dense, fine to medium grained breaking with a splintery to conchoidal fracture and have smooth, greasy and wax like appearance. At places, extensive deformation and shearing render the rock highly jointed, fractured and crudely-foliated. In the foliated varieties development of carbonates, chlorite and talc is seen. The soapstone and talc represent alteration product of serpentinites and dolomites associated with the Aravalli metasediments, which have been subjected to polyphase folding, faulting and granitic intrusion.

The Talc and Steatite bodies occur in a variety of forms viz. lenticular and irregular pockets, pinch and swell veins and impersistent bands in Serpentinites. The ultramafic bodies show lithological zoning, with a core massive and irregularly broken Serpentinite surrounded successively by the zone of less-foliated and shear talc-serpentine (Carbonate-Tremolite- Actinolite) rock; foliated and sheared Talc-Cabonate (Tremolite) rock; Talc-schist and Tremolite-Actinolite-Talc-bearing Dolomite and Tremolite-Actinolite (Chlorite-Talc) schist (Fig. 1.A). This zone are impersistent and at place absent.

Talc and Soapstone occur along the sheared contact of Talc-Carbonate rock or within the Talc-Serpentinite rock. Talc vein also occur within the core of massive Serpentinites (Fig. 1.B). Flaky or fibrous Talc is associated with the ultramafic and form disseminations, aggregates, local concentrations and veinlets. The workable deposit occurs as large lenses, vein and bands.

The Talc bodies generally follow N 300^0 - 320^0 to$N120^0$ - 140^0 trend parallel to the foliation of country rocks and general trend of ultramafic bodies. Foliated, flaky and fibrous greenish Talc, showing cross-fibres also occur as veins in shear and fracture trending $N20^0$-40^0 to$N\ 200^0$ - 220^0. The Calcareous horizons appear to be favorable locales for emplacement of Serpentinite bodies. Steatisation is much later to Serpentinisation. The Steatisation is a result of metasomatic processes associated with hydrothermal, metamorphic and shearing activities. Talc occurs as alteration product of Serpentine minerals (particularly Antigorite and Chrysotile), Tremolite and Dolomite by addition of CO_2, H_2O or ionic replacement. The magnesia removed from these minerals has crystallized as Magnesite ($MgCO_3$), at places. Aggregates and vein of Calcite also occur in the Soapstone.

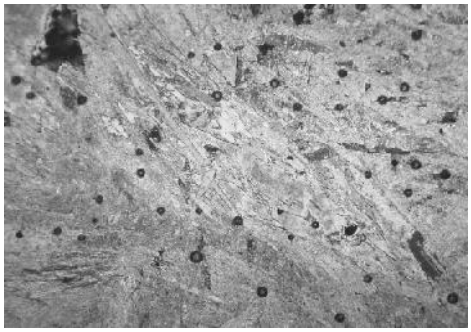

Figure: 1 A: Talc with Tremolite in a Schist

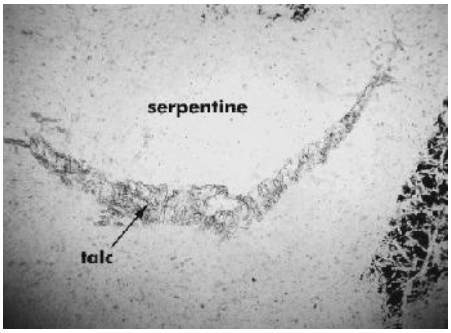

Figure: 1 B: Talc in a Serpentinites.

Talc-Carbonate rock and Talc-Carbonate Schist are grayish brown to grayish-white in color and comprise an admixture of talc, chlorite dolomite, and other carbonate and calc-silicate minerals. Amidst

the talc-carbonate rock, bands, lenses, patches and knots of brownish, unaltered dolomite are frequently seen, which indicate their derivation from dolomite due to alteration of it, along margins by steatisation due to hydrothermal solutions. At the culmination of steatisation a grayish-green to green-colored talc is developed at many places.

The process of steatisation can be attributed to carbon-dioxide metasomatism, shearing and metamorphic activities. Some of talc, tremolite, actinolite and chlorite associated with dolomitic patches are the products of regional metamorphism of these rocks under green schist facies condition (Rakshit, 1968). Field evidences indicate that dolomitisation of serpentinites is due to replacement process. With increasing metamorphism, steatisation of dolomite take place particularly along shear plane, which seems to facilitate development of talc.

Abundant lenses of talc schist (steatite) are developed within the talc carbonate rocks. Development of talc seems to have been particularly facilitated by shearing within these rocks. The three stages of development of talc schist lenses (Chattopadhyay, 1975) observed are fine disseminations of talc mainly within dolomite, progressive steatisation with increasing metamorphism resulting in very coarse-flakes of talc with isolated large grains of dolomite and finally, complete steatisation of dolomite.

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