Geology of Sleemanabad Area And Its Mineral Significance

Pushpraj Singh Kaurav[1], S.N. Mohapatra[2]
[1, 2] School of Studies in Earth Science
[1, 2] Jiwaji University, Gwalior

Abstract- *Madhya Pradesh, the Central region of India is blessed with an abundance of natural resources. The mineral industry is one of the most important components which forms one of the state's economic growth engine. There are a number of factors to be considered in the process of identifying a potential terrain. The focus of this study is on the geological study of Sleemanabad area and its mineral significance. This area comes under Mahakoshal Group of rocks. A number of different rock types can be found in the area, including shale, slate, phyllites, dolomites, quartzite, conglomerates, cataclasites, and laterite. A dyke system, composed of chlorite and quartz-porphyre, traverses the rocks. A variety of rock types have undergone cataclastic processes, resulting in varying degrees of metamorphism. Dolomites play the role of hosts for mineralized of copper and lead minerals, generally along fault lines. There are visible traces of malachite and azurite throughout the entire mineralised area. In addition to quartz and calcite, other minerals that are commonly found in the mineralised horizons include chalcopyrite pyrites, tetrahedrite, galena, and magnetite. Mineralization is primarily controlled by structural features in this area, although lithological factors have also been important. Additionally, this area has been reported to contain bauxite, barytes, talc, clay, and fluorite as well as copper and lead mineral occurrences.*

Keywords- Dolomite, phyllite, copper, quartz porphyre dyke, Mahakoshal, Sleemanabad

I. INTRODUCTION

Sleemanabad is an area in the district Katni located on the National Highway 7 (Nagpur - Allahabad section). This railway station is conveniently located along the West Central Railway line that connects Jabalpur and Katni. The area is easily accessible throughout the year due to all-weather roads.The study area is shown in Figure 1. As part of the Precambrian Mahakoshal Group, the Sleemanabad area exposes metabasalts, quartzites, metaconglomerates, metacherts, Banded Iron Formation, phyllites and dolomitic marbles. Sleemanabad is an area in the district Katni located on the National Highway 7 (Nagpur - Allahabad section). This railway station is conveniently located along the West Central Railway line that connects Jabalpur and Katni. The area is easily accessible throughout the year due to all-weather roads.The study area is shown in Figure 1. As part of the Precambrian Mahakoshal Group, the Sleemanabad area exposes metabasalts, quartzites, metaconglomerates, metacherts, Banded Iron Formation, phyllites and dolomitic marbles.

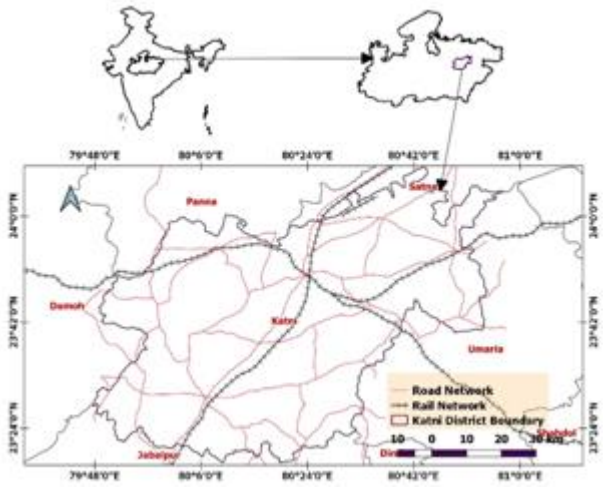

Figure 1. Location of study area map

In 1977, Narain and Thambi introduced the term 'Mahakoshal Group' for these rocks types because they have a different lithological association, metamorphic grade, and degree of deformation than type Bijawars and cover a wider region in Mahakoshal. In subsequent years, all the researchers have adopted this new nomenclature, including Jha et al. (1981-82), Devarajan and Shrivastava (1996), and Devarajan and Hanuma Prasad (1995-96). In 1995-96, Devarajan and Hanuma Prasad mapped parts of the Mahakoshal belt in the south and west of Vilayat Kalan and collected 118 bed rock

samples for gold analysis. This study concluded that gold deposition could not occur in this area due to the lack of CO2 enrichment in hydrothermal fluids.

It was Hacket and Hughes who first mapped this area in 1870-71 and assigned lithounits to Bijawars. During 1904-1906, Dutt of Jabalpur conducted trenching, pitting, and shaft sinking in search of base metal deposits. As a result of the fact that the conglomerate occurring in this region resembles those of the Dharwars, Fermor (1904) assigned these rocks a Dharwarian age. Krishnan (1932-34) considered them equivalent to the Gangpur series. As part of a program to document the geological conditions in Sleemanabad-Niwar in 1961-62, Sharma, from GSI, carried out systematic geological mapping at a scale of 1:63,360 in Sleemanabad-Niwar and large scale mapping in Imalia, on a scale of 1:2000. During regional mapping, he reported copper ore occurrences in Mohania, Amgawan, and Sumehra. Dharwarian age was assigned to these rocks. In 1968-1971, officers of Mineral Exploration Division, Central Region, and Geological Survey of India investigated polymetallic mineralisation in this area.
Medlicott (1860) coined the name 'Bijawar Series' for the phyllite-metacarbonate sequence in and around Bijawar that lies above Bundelkhand Granite and below the Lower Vindhyans. There were several workers who referred to the phyliite-metacarbonate-metavolcanic - banded ferruginous chert association of Narsinghpur - Jabalpur as the Bijawar Group during the later period.

A copper ore deposit near Sleemanabad was discovered by Olperts in 1870, which revealed this area's geological significance. He worked for GIP Railway as an engineer. In 1870-71, Hughes and Hacket mapped the area. There is also a mention of this area in Oldham, Datta, and Vredenberg's memoir (1901). During 1904-06, Dutt prospected for basemetal in the Imaliya area. During 1969 to 1972, Chande&Bhoskar (1972) carried out detailed investigations for basemetals in Imaliya, Bhula, and Nawalia. Devrajan and Shrivastava (1995) measured gold values in quartz veins and altered metabasalts around Bhula area during 1994-95, although they did not mention the presence of base metal occurrences. Banereji (2002) conducted Regional Geochemical Stream Sediment sampling and found gold values between 100 ppb and 130 ppb. from some of the streams around Tivari, Devri, and Banehri,

II. GEOLOGY OF THE SLEEMANABAD AND ADJOINING AREA

There are two lithological associations associated with Mahakoshal Group of rocks in Sleemanabad. The Sleemanabad Formation is dominated by carbonates, while the Bhitrigarh Formation is dominated by clastic and argillite. They are separated by an impersistent polymictic conglomerate horizon. Among the carbonate-dominated units, chert, ortho-quartzite, manganiferous chert, argillaceous chert, and thin jasper bands are intercalated. As opposed to clastic dominated units, meta volcanics often interlayer or interfinger these rocks (Devarajan & Shrivastava, 1994-95). Phyllite & chert interbands are present in the carbonate dominated lower Sleemanabad Formation. The upper Bhitrigarh Formation, which is dominated by clastic and argillite, consists of phyllite, quartzite and conglomerate with rare metavolcanics. Occasionally, quartz carbonate veins and quartz veins are seen intruding these zones. The generalized stratigraphy of the area has been given in Table 1.

Table-1: Generalized Stratigraphy of the area after Devarajan & Shrivastava, (1995)

<table>
<tr><td>Lower Cretaceous</td><td>Gondwana Supergroup</td><td>Chandia Beds</td><td>Finetomedium grained Sandstone.</td></tr>
<tr><td colspan="4">---------- Faulted Contact ----------</td></tr>
<tr><td>Proterozoic</td><td>Vindhyan Supergroup</td><td></td><td>Sandstone, shale, conglomerate.</td></tr>
<tr><td colspan="4">---------- Unconformity ----------</td></tr>
<tr><td rowspan="5">Early Proterozoic to Archaean</td><td rowspan="5">Mahakoshal Group</td><td>Intrusives</td><td>Quartz veins, Quartz porphyry veins. Mafic and Ultramafic intrusives.</td></tr>
<tr><td>Bhitrigarh Formation</td><td>Phyllite with bands of quartzite, Conglomerate.</td></tr>
<tr><td colspan="2">---------- Unconformity ----------</td></tr>
<tr><td>Sleemanabad Formation</td><td>Dolomite, Limestone with bands of BIF, Manganeferous chert, quartzite and metabasalts, pyroclastics.</td></tr>
<tr><td colspan="4">Base Not Seen</td></tr>
</table>

III. MAJOR ROCKS IN SLEEMANABAD FORMATION

Dolomite – The study area has few rock exposures, but dolomite, the most abundant rock type, occurs extensively in the central and south western parts of the study area. A variety of shades of gray are present in dolomite, including pinkish white varieties, siliceous varieties, and crystalline varieties. This area is characterized by bands of chert and jasper mainly in the south-west. Elephant skin weathering is evident in the dolomite (Figure- 2).

Figure2: Dolomite exposed in Sleemanabad area showing elephant skin weathering.

Phyllite – There are very small outcrops of phyllite in the study area, which occur within dolomite. There are khaki, purple gray to greenish gray phyllite patches within the dolomite in the north eastern part of the area. There is also discrete contact between phyllite bands and dolomite in the south-east and south-south parts of this area.

Quartz Veins– Quartz veins with oxidized zones range in width from a few centimeters to a few meters at a number of places,. Colors of quartz veins range from milky white to greyish white. There are a number of veins in this area that have been excavated for prospecting and for the development of cultivated land, so their dimensions are just approximate at this point (Figure- 3).

Figure 3: Quartz Veins intrusion in dolomite.

Quartz Porphyry Veins – In the central part of the area, quartz porphyry veins are found with a medium-to-coarse grain size and are green to yellowish green in colour. There are intermittently exposed veins that trend NNW-SSE along horizontal lines that do not match the regional trend of the country rocks. There are hard, compact, sheared quartz porphyry veins containing quartz phenocrysts with little feldspar within a matrix of greenish gray, medium-grained silicaous matrix. Upon contact with dolomite, grain size changes and fineness is observed. In quartz porphyry veins, kaolinisation is prominent along fractures and joint planes. It is possible to see specks of fluorite, pyrite, and magnetite along the shear plane, as well as specks and disseminations of these minerals. There is a thin film of kaolin along the planes where joints are well developed and the effect of shearing is visible.

Laterite – In the study area, laterite capping has been observed over dolomite and phyllite horizons. Both the depth and the aerial extent of the capping vary. Strata thickness varies by a few meters, and there are pockets of bauxite in some of the laterites. Most hillocks and high grounds within the area are covered by thick lateritic caprocks with ferruginous laterite. In this region, most of the bauxite mines and some clay mines are located. The laterite is ferruginous and grades into pisolitic bauxite near Padwar, Pahari, and Saraswahi.

IV. MINERAL SIGNIFICANCE IN SLEEMANABAD AND ADJOINING AREA

The minerals found in the study area include limestone, dolomite, marble, Talc, Barytes, Fluorite, bauxite, Manganese, Copper, Lead, Zinc and some instances of gold and silver also found by detailed geological work done by Geological Survey of India in recent years.

Basemetal

Copper, lead, and zinc ores are primarily mineralized in dolomites, although phyllite and quartzites contain small amounts of malachite and traces of chalcopyrite and galena. From a study of the area, the dolomite band appears to have the most potential for copper mineralization. There are three main mineralised zones in the area: Imalia, Bhula, and Nawalia. In Imaliamineralised area, where old workings still exist. Copper, lead, and zinc deposits at Imalia, Bhula, Nawalia village are limited to a N-S trending quartz vein traversing dolomite-phyllite country rocks. The findings of geochemical results of stream sediments are shown here in table 2.

Table 2: Important statistical parameters of elemental data in streamsediments

	Copper	Lead	Zinc
Mean	48.95	34.74	36.58
Median	32.50	20.00	30.00
Mode	30.00	10.00	30.00
Standard Deviation	31.95	32.47	27.44
Sample Variance	1020.48	1053.98	752.84
Kurtosis	-1.04	-0.17	1.32
Skewness	0.60	1.05	1.38
Range	115.00	110.00	110.00
Minimum	10.00	0.00	0.00
Maximum	115.00	110.00	110.00
Sum	1860.00	1320.00	1390.00
Count	37.00	37.00	37.00
Anomaly	112.84	99.67	91.45

Barytes

In the north-eastern part of the region, barytes occur as veins within dolomites. Over a dozen old workings indicate that fining activities for barytes were carried out in the Khirsaru-Manehra area. It appears that the barytes vein originated from hydrothermal activity. Several old pits and trenches can be found within the dolomites near village Mohania. Malachite and galena cubes are occasionally seen within barytes. Two long trenches are still visible in Sunehra area of old dolomite workings.

Phyllite

Dolomitic limestone almost everywhere in the area contains phyllite interbands. In the southern part of the area, however, phyllite bands can be traced especially along the ENE-WSW ridges. Within the Salhana area, phyllite can be found in continuous bands between the marble bands. The rocks are green in colour, well foliated with phyllitic sheens, and contain pyrite and other sulphides as well.

Chert

In the central part of the area, there are invariably thin chert bands associated with carbonate rocks that dominate the terrain. Chert occurs in a wide variety of colors ranging from light gray to white, golden yellow, black, dark brown and rarely red varieties, as well as a wide range of color variation. Chert bands vary in thickness as well. They can be as thin as paper thin laminations or as thick as massive bands forming huge ridges.

Talc

It has been found that talc occurs as pockets within dolomites in the area south and west parts of the study area, where it is found to be genetically associated with the dykes and sills of your basic igneous rocks (Figure 4).. There has been an intense mining activity for soapstone in this area in the past. There are also barytes associated with soapstone found in the old-workings in the south of study area.

Figure 4. Talc within Dolomites in the area

Clay

There have been a few new quarries for clay opened up in the area, especially in west of the study area, in recent times. There are a number of lateritic boulders that can be seen on the surface of the deposits that are bedded in nature. The clay is a white to purple colour with a soapy feel, and ranges

in colour from snow white to purple and its thickness varies in few meters.

V. CONCLUSION

An attempt has been made to describe the geology of the Mahakshal Group of rocks and its mineral significance around Sleemanabad area. It is concluded that while clastic and argillite predominate in the Bhitrigarh Formation, carbonates dominate the Sleemanabad Formation. Dolomites act as hosts for the base metal mineralization . The mineralization is structurally controlled. Bauxite, barytes, talc, clay, fluorite, and mineral occurrences of copper and lead have all been recorded in this area and were confirmed by the geochemical analysis.

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