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PETROGRAPHICAL CHARACTERISTICS OF MAFIC AND ULTRAMAFIC ROCKS AROUND BIDASAR, CHURU DISTRICT, RAJASTHAN

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Abstract :
Petrography is mainly deals with the systematic classification and specific description of rocks. Petrographic descriptions includes with the field records at the outcrop and macroscopic study of hand-sized specimens in thin sections. The detailed analysis of minerals by optical mineralogy in thin section and the micro-texture and structure are needs to understanding the origin of the rock. In the Bidasar-Dunkar-Charwas and Surawas area of Churu district Ophiolite suite of rocks mainly ultramafic are exposed which includes serpentinite, serpentinized pyroxenite, pyroxenite, amphibolite and gabbro are bounded by rocks of Delhi supergroup in east and Marwar supergroup by west and south. Northern part of suite is buried in the thick cover of windblown sand of Thar Desert. Ophiolites represent slivers of ancient oceanic lithosphere obducted onto the continental or oceanic crust. Mineralogical association, textural and structural relationship with evolution history of exposed rocks in the area of investigation around Bidasar in Churu district, Rajasthan has been established in present study.

KEYWORDS: Bidasar, Delhi Supergroup, Petrography, Texture, Thar Desert, Ophiolite Suite, Ultramafic.

I. INTRODUCTION

Petrography is study of rocks in which mineral content and textural relationship within rock are described. Petrographical analysis suggest the classification group of rocks. Petrographic descriptions includes with the field records at the outcrop and macroscopic study of hand-sized specimens in thin sections. The detailed analysis of minerals by optical mineralogy in thin section and the micro-texture and structure are needs to understanding the origin of the rock. In the western side of Aravalli mountain range younger rocks are exposed. (1,2,3,4). In the Bidasar-Dunkar-Charwas and Surawas area of Churu district Ophiolite suite of rocks exposed which includes serpentinite, serpentinized pyroxenite, pyroxenite, amphibolite and gabbro are bounded by rocks of Delhi supergroup in east and Marwar supergroup by west and south. Northern part of suite is buried in the thick cover of windblown sand of Thar Desert. Ophiolites represent slivers of ancient oceanic lithosphere obducted onto the continental or oceanic crust (5). Present study is to establish mineralogical association, textural and structural relationship with evolution history of exposed rocks in the area of investigation.

II. REGIONAL GEOLOGY

The northern and central part of the district is occupied by windblown sand and concealed in cover. The area is basically a fluvio-aeolian depositional basin containing thick pile of quaternary sediments which makes an undulating topography consisting of sand dunes interspersed with interdunal valley and linear depressions. In the trans-Aravali region high grade rocks like granitic gneiss, migmatites occurs are considered as western flank of banded gneissic complex (1). The western contact between gneissic terrain and Delhi supergroup is marked in map of Aravali region (6, 7). The basement gneissic rocks are overlain by metasedimentary rocks of sirohi group which is younger part of Delhi supergroup (8, 9). Delhi Supergroup is represented by slate, phyllite, quartz-mica schist, ferruginous quartzite etc. These rocks are well exposed in the area south of Bidasar and east of Pandurai and near Gopalpura. These metasediments of the Sirohi Group are intruded by Granite, Pegmatite and amphibolite and are further followed by Marwar supergroup and tertiaries of Bikaner Nagaur basin **(Table1.1**). In area around Bidasar, Dunkar-Charwas and Surawas ophiolite suite of rocks are bounded by basements rocks in mine pits and dug wells. These rocks includes

serpentinized ultramafics, serpentinized pyroxenite, dark-green pyroxenite, gabbro-diorites, sheeted dykes and acid volcanics with chert bands.

Table 1.1 General stratigraphical succession of Churu district, Rajasthan (10).

Supergroup	Group	Formation/Lithology
	Recent to sub-recent	Windblown sand and alluvium
……Unconformity……..		
	Bikaner-Nagaur Basin	Palana-Clay beds, Friable sandstone and gravels
……Unconformity……..		
Marwar Supergroup	Jodhpur	Sandstone, Shale and Siltstones
	Post Delhi Intrusives	Rhyolites and Granites
Delhi Supergroup	Sirohi/Punagarh	Quartzite and Schists

Study area

The study area includes villages Dunkar-Charwas-Surawas-Gunpaliya areas is located about 130 km south–east of Churu district headquarter well connected by metaled road State highway-20 passes through Bidasar which connects Nokha to Salasar and NH-58 passes through Sujangarh, which connects Fatehpur at North and Palanpur in Gujarat at south. The nearby town is Sujangarh which is around 32 Km SE of Bidasar. Location of study area in base map is shown in location map **(Fig. 1.1).** The study area forms a part of the Survey of India Toposheet No. 45I/7 and 45F/5 and approximately lies between the latitudes 27º46' to 27º 52' and longitudes 74º18' to 74º 26'.

III. MATERIAL AND METHODOLOGY

Extensive field work have been carried out in the study area to delineate topography and then litho-units. These topographical maps so prepared using Arc-GIS software have served as base for the preparation of the Geological maps. During the course of the field study all the field data have been recorded and selective rock samples have been collected. Codes and name marked on collected rock samples with needed particulars. Megascopic and microscopic study was carried out in the laboratory. Megascopic analysis of rocks consists of all the observations that are noticeable in hand specimens by unaided eyes Thin sections of various litho units for microscopic studies have been prepared and studied for mineralogy, texture and petrogenetic interpretations and have also been photographed as photomicrographs. The microscopic study have been carried out using Olympus BX51 under transmitted and reflected light in different magnifications i.e., 2.5x, 10x, 20x, 50x, and 100x. During the microscopic study, photomicrographs were captured using camera Olympus DP27.

IV. FIELD RELATIONS AND PETROGRAPHY

Geomorphologically, the higher topography in the study area is covered by windblown sand and alluvium which is further followed by mafic and ultramafic rocks of Bidasar Ophiolite Suite in Dunkar, Charwas, Surawas and Rupeli areas. **Fig.2A** showing field photograph of exposed rock which is medium to fine grained and light green to white-gray in color. The rock is highly altered, fractured and intruded by veins of carbonate, crysotile, siderite and magnesite. At places magnetite is also associated along carbonate veins. **Fig. 2B** showing field photograph of exposed rock it is medium to fine grained and creamy brown to dark grey in color. The rock is traversed by many carbonate and iron oxide veins. Representative sampling of exposed rocks were carried out during field work in the study area and nomenclature was done accordingly. **Plate 1 Fig. A** shows light greenish and grey bands in colour having fibrous nature and fined grained in texture. Fibers of crysolite are encountered in the rock sample. Photomicrograph shows that the rock is medium to fine grained, consisit of antigorite, crysotile, lizardite and chlorite with relict grains of augite and olivine. Under plane polarized light it seems colourless and low relief minerals are seen. Other than these minerals opaque minerals are magnetite in the form of aggregates and veins (**Plate 1 Fig. B**). In cross polarized light the alteration of the olivine and pyroxene shows formation of light coloured that may be antigorite mineral. Original minerals are completely altered and formed antigorite (**Plate 1 Fig. C**). Megascopic and microscopic properties the rock reveals that it is serpentinite.

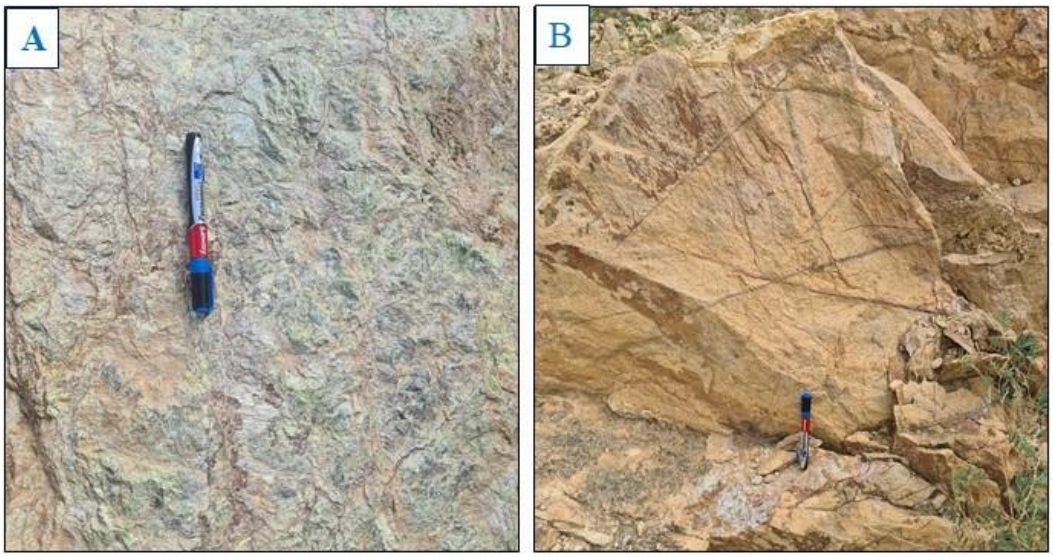

Fig. 2 Field photograph showing exposed rocks in the study area.

Plate 1 Fig. D shows the rock is of medium to fine grained, consists of antigorite, chrysotile and lizardite with relict grains of augite and olivine. Photomicrograph in plane polarized light shows colorless and low relief minerals. Other than these minerals opaque and iron carbonate type of veins (**Plate 1 Fig. E**).In cross polarized light antigorite and lizardite mineral has been seen with carbonate veins. Original minerals are completely altered and only grain boundaries preserved (**Plate 1 Fig. F**). On the basis of megascopic and microscopic properties the rock is of serpentinised pyroxenite.

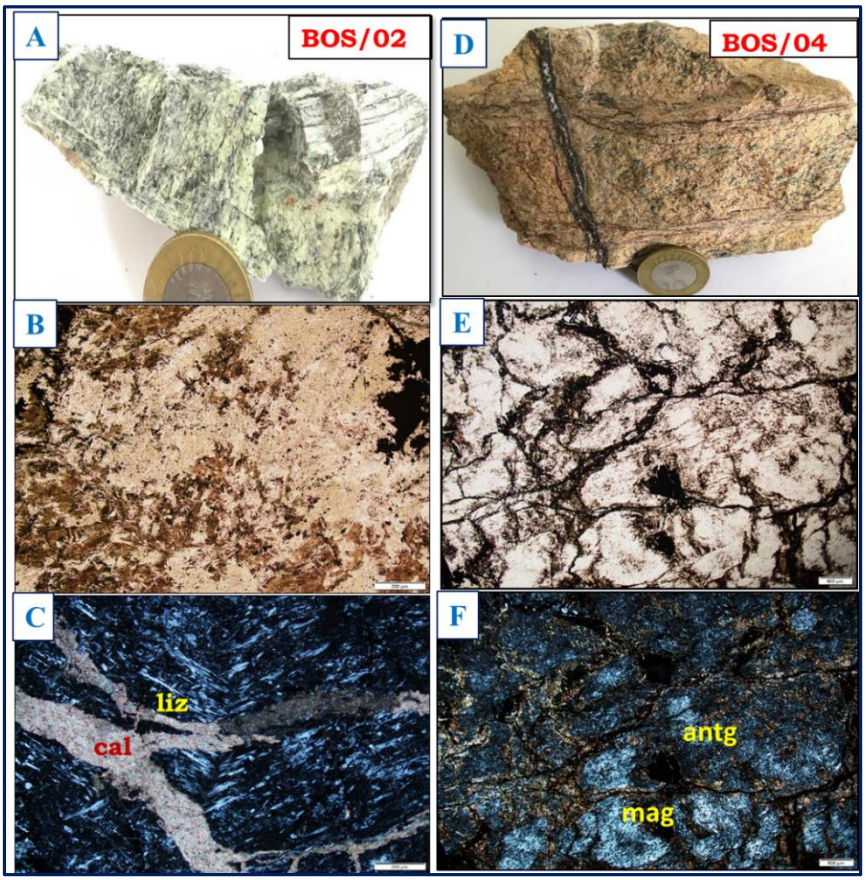

Plate 1. Shows hand speciman sample BOS/02 and BOS/04 with photomicrograph in PPL and XPL.

Plate 2Fig. **A** shows hand specimen sample of rock which is mesocratic in nature, medium to coarse grained and creamish to green in color. It is consisting of antigorite, crysotile, lizardite with magnetite and traversed by numerous carbonate veins. Under plane polarized light it is seems medium grained, inequigranular and consists of antigorite, crysotile, lizardite, euhedral magnetite grains and carbonate veins, fractured olivine grains are seen which is crisscrossed by carbonate veins (**Plate 2 Fig. B**). In cross polarized light antigorite and lizardite mineral has been seen which are replacing olivine (**Plate 2 Fig. C**).on the basis of optical properties it is encountered that

the rock may be of serpentinite. Hand specimen sample BOS/09B shows it is mesocratic in nature, medium to coarse grained and dark green in color (**Plate 2 Fig. D**). It is consisting of antigorite, crysotile, pyroxene, amphibole with magnetite and transversed by numerous carbonate veins. Under plane polarized relic pyroxene and olivine grains with magnetite grains seen (**Plate 2 Fig. E**). In cross polarized light antigorite and lizardite mineral has been seen which are replacing olivine and pyroxene and rocks seems to a serpentinized pyroxinite (**Plate 2 Fig. F**).

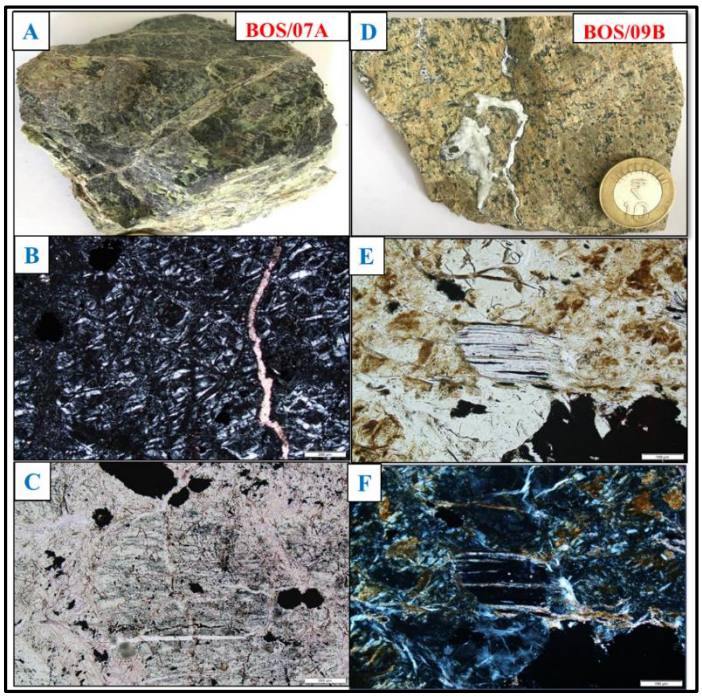

Plate 2. Shows hand speciman sample BOS/07A and BOS/09B with photomicrograph in PPL and XPL.

V. CONCLUSIONS

On the basis of field record and petrographical studies of study area it is somehow inferred about geotectonic setting. The rocks are exposed in the same level more or less below sandcover and difficult to make complete stratigraphic coloum. In the dugwells rock sections can be clearly seen upto their depth. The field record reveals that is area is undeformed and presence of numerous carbonate veins, altered asbestos mineral and magnetite, it is may be because of hydrothermal activity in the area. Presence of rocks of sequences of ophiolite suite like serpentinite, serpentinized pyroxenite, pyroxenite, amphibolite and gabbro in the area it seems that it's a basin which is relict of oceanic crust.

VI. ACKNOWLEDGEMENT

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