

Petrology of the Naweoba block of Zhob ophiolite, Northern Balochistan, Pakistan

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Abstract

In northern Balochistan Pakistan, the Zhob Valley ophiolites comprise of the Muslim Bagh, Khanozai and Zhob ophiolites. The Zhob Ophiolite is divided into three detached blocks; Naweoba, Jizha and Ali Khanzai. This study reports the petrology of Naweoba block; the largest and well exposed block of Zhob Ophiolite. The Naweoba block is bracketed between the sediments of Indian plate passive margin at the base and the sediments of the Flysch belt at the top. The block is mainly composed of mantle peridotite, crustal gabbros and the underlying basalts-chert unit. The mantle rocks are mainly foliated peridotites which are partially to completely serpentinized and tectonically deformed. The rock types identified in petrography are lherzolite, harzburgite, dunite, wehrlite and pyroxenite. Lherzolite is mainly composed of olivine, clinopyroxene and orthopyroxene with spinel and opaques, while, the constituent minerals of harzburgite include olivine, orthopyroxene with minor clinopyroxene and spinel. Both the lherzolite and harzburgite are medium to coarse-grained and generally granular to sub-equigranular in texture. Dunite mainly consists of olivine with minor pyroxene and spinels. It is generally fine to coarse-grained and holocrystalline in texture. The veins and dykes of wehrlite and pyroxenite are found in the upper part of the mantle section. Wehrlite is fine to medium-grained, consists of olivine, clinopyroxene, and orthopyroxene and the accessory spinel with granular interlocking to hipidiomorphic in texture. Pyroxenite is medium to coarse-grained and predominantly consists of clinopyroxene with minor orthopyroxene and olivine and opaques. The crustal section of the Naweoba Block comprises of gabbroic rocks only. The Gabbros are both layered and massive in nature and are highly deformed and in structural contact with surrounding lithological units. Petrographically, gabbros are divided into gabbro, norite, and hornblende gabbro. They mineralogically consist of plagioclase, pyroxene and hornblende with minor olivine and opaques. The secondary minerals identified are chlorite, epidote and serpentine. The Basalt in Naweoba Block covers a large area. It surrounds peridotite and gabbro and is in thrust contacts with them. The basalt is mainly pillow, sheet and tube like in structures and is intercalated with chert and minor mudstone and limestone. At some localities the chert has thick separate units, forming prominent hills in the area. The chert is red, green, cream and grey in colours. Basalt has showings of copper, iron, and manganese. Mineralogically, basalt consists of altered phenocrysts of plagioclase and augite embedded in micro-crystalline groundmass of plagioclase, augite, and magnetite. Basalt shows aphanitic, porphyritic and subophitic textures. The mantle section of Naweoba block is dominated by the harzburgite with subordinate dunite; they are interpreted residual after significant melting, while, the wehrlite and pyroxenite are possibly formed by magmatic processes. The gabbroic rocks are developed by in situ fractional crystallization at the floor of magma chamber. Field and petrographic characteristics of the mantle to crustal rocks of Naweoba Ophiolite and the underlying basalt-chert unit are nearly similar to that of the Muslim Bagh Ophiolite Complex found in the south of Zhob Ophiolite. It can be interpreted that the Naweoba block of the Zhob Ophiolite may have been formed in the same tectonic setting as the Muslim Bagh Ophiolite Complex.