

A study of the gemstones from the Muslim Bagh, Ophiolite Complex, Balochistan, Pakistan

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Abstract

The geology of Muslim-Bagh area, northern Balochistan can be divided into three tectono-stratigraphic zones. At the base is the Calcareous zone consisting mainly of limestone, sandstone and mudstone and is ranging in age from Early Jurassic to Paleocene. This zone is overlain by the suture zone and comprises of the Muslim Bagh Ophiolite and the Bagh Complex. The Muslim Bagh Ophiolite has nearly a complete ophiolite sequence; mantle peridotite at the base transition zone in the middle and the crustal rocks (gabbros, sheeted dykes) at top. The Bagh Complex is an accretionary-wedge complex which comprises of Triassic to Jurassic sedimentary rocks, Cretaceous igneous rocks, pelagic to hemi-pelagic sediments and a small amount of mélangé. The Pishin zone (also called Fylsch zone) comprises of marine to fluvial successions of Eocene to Pleistocene in age. This study assesses all the three zones in the Muslim Bagh area for the occurrences of gemstones and mineral specimens. For the first time in the history of Muslim Bagh Ophiolite study, the geomological characteristics such as refractive index, specific gravity, inclusions, pleochroism, fluorescence and crystal systems of the collected gemstone are studied using the equipments such as Polariscopes, Refractometers, Chelsea Color Filter, Hardness Tester, Hydrostatic Balance, Spectroscopes, Fluorescences, Microscopes and Dichroscopes. The gemstones and mineral specimens identified and collected from the Muslim Bagh Ophiolite area are natrolite, malachite, azurite, serpentine, and talc from the rocks of ophiolite sequence. Epidote, natrolite, chrysocolla, malachite, azurite, jasper, quartz, green chert, calcite, agate, and amethyst have been reported from the Bagh Complex, while almandine garnet, tsavorite garnet, actinolite, epidote, natrolite, and marble occur in the Metamorphic sole rocks; exposed beneath the ophiolite. Low quality gems such as natrolite, jasper, quartz, green-chert, calcite, agate, and amethyst are found within the sedimentary rocks of the area. Field evidences reveal that the gemstones collected from the Muslim Bagh Ophiolite sequence are possibly formed due to the magmatic and secondary hydrothermal replacement processes, while, those from the Bagh Complex are both hydrothermal vein type formed by volcanogenic processes and miscellaneous in origin. Few gemstones such as garnets, marble, quartzite and actinolite are formed by metamorphic processes. Epidote from the north of Muslim Bagh town near Mulghozar village is associated with dykes and may have been formed by rodingitization. The origin of green garnet (tsavorite) found in the basalts of Bagh complex is debatable. The chrysocolla, malachite and azurite are found as stains in the alteration zone of copper sulfides deposits. The gemstones collected from the Pishin and Calcareous zones may be formed by sedimentary processes. Majority of the studied gemstones are semi-precious in nature with few gems such as almandine garnet, tsavorite garnet, natrolite, chrysocolla, malachite, azurite, jasper, quartz, and agate have economic reserves and can be mined for commercial purpose.