HOST ROCK PETROGRAPHY AND GEMMOLOGICAL PROPERTIES OF GEMSTONES ALONG THE INDUS SUTURE ZONE IN THE BARANG AREA OF BAJAUR AGENCY, NW PAKISTAN.

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Abstract

The studied samples represent rocks of the Indus Suture Zone exposed in Bajaur agency, northwestern Pakistan. These include serpentinite, talc carbonate, amphibolite, epidosite and the intruding felsic veins. The serpentinites are inequigranular, fine to medium-grained and comprises of serpentine (antigorite) majorly, olivine (metamorphic), magnesite, magnetite and chromite. These characteristics points to their formation via alteration (serpentinization) and subsequently metamorphism of dunites already present along the Indus Suture Zone. The talc carbonate is medium to coarse-grained, subequigranular and comprises of abundant carbonate, talc, quartz, serpentine, chromian muscovite (fuchsite), and green spinel or chromite. Detailed field and mineralogical studies suggest that these rocks were probably formed by talc-carbonate alteration of the spatially associated, previously serpentinized ultramafic rocks in the area. The samples of green schist are inequigranular and fine to coarse-grained and consist of amphibole including actinolite, plagioclase, quartz, epidote, carbonate, ilmenite, rutile, ore mineral(s) and a substantial amount of clay. This mineralogy suggests its formation through subduction-related metamorphism of an originally basic igneous rock. The close spatial association with altered and metamorphosed mafic and ultramafic rocks and modal mineralogy suggest that the epidosite is derived from an originally basic igneous rock through a process involving introduction of large amounts of calcium. The source of calcium is most probably the fluid related to serpentinization of the associated ultramafic rocks. The talc carbonates are invaded by quartzo-feldspathic veins. These comprise mainly of quartz, alkali feldspar, biotite, carbonate and tourmaline grains. The injection of these hydrothermal veins, which are believed to be genetically linked to the emplacement and crystallization of younger granitoids in the region probably, led the formation of chromium muscovite and beryl (and emerald) in the investigated area. Gemological properties including external observation with 10x loupe, hardness, internal observation, specific gravity, polariscopic study, pleochroism, absorption spectrum, ultraviolet light, Chelsea colour filter and refractive index were also determined. The studied varieties of epidote exhibit recommended external physical properties but show slight variation in their optical properties, however, this variation falls within the range of parameters for gem-quality epidote. The studied actinolite also duplicates the properties of gem-quality actinolite. The particular form (six-sided crystals) and other physical and optical properties of green beryl positively confirm its identification and are similar to the standard values for gem-quality beryl.