

Carbonate hosted talc deposits in Nangarhar Province, Afghanistan

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Talc deposits in the E-W trending Spin-ghar fault block, southeastern part of Afghanistan, are hosted by Paleoproterozoic carbonate rocks. There are two types of talc mineralization in the study area, one is hosted by magnesite and the other by dolomite marbles. The objective of this study is to describe the talc mineralization on the basis of field observation, microscopic observation, XRD, XRF, ICP-MS and EPMA analyses.

In the study area, talc ore bodies are parallel to sub parallel to magnesite rocks and dolomite marble. The ore bodies are cross cut by intrusive rocks of diabase. Schistosity/foliation of quartz chlorite schist and quartz mica schist are parallel to sub parallel to talc ore bodies. Massive layers of tremolite were observed with most of the talc veins. Thin layers of talcose quartz have been marked within talc veins at places. Quartz veins follow the schistosity/foliation of gneiss all over the study area and cross cut by intrusive rocks at places. Mineral assemblages in the study area are (a) talc + tremolite + calcite, (b) talc ± cordierite, (c) talc + dolomite + calcite ± quartz ± apatite, (d) talc + dolomite + calcite and (e) dolomite + tremolite + calcite. Talc was formed by alteration of tremolite and magnesite in most of the studied areas, while in some deposits talc was formed by alteration of dolomite. Total REE contents of talc bodies, magnesite and dolomite marbles are 0.9, 5.3 and 13.0 ppm, respectively. The SiO₂ contents of carbonates and talc bodies range from 1.6 to 33.3 wt% and from 52.9 to 65.1 wt %, respectively, while MgO contents of carbonate and talc bodies range from 18.4 to 48.1 wt% and from 29.4 to 34.0 wt%, respectively. The CaO contents in talc bodies and magnesite are less than 1 wt%, while that of dolomite marbles ranges from 18.0 to 26.0 wt%. EPMA analysis of carbonates shows that dolomite and magnesite compositions are close to the ideal composition with Fe ranges from 0.04 to 0.17 wt % and 0.18 to 0.39 wt % respectively, while Mn ranges from 0 to 0.07 wt % and 0 to 0.04 wt % respectively. The concentrations of Al, Ta, Hf, Zr, Th and total REE in talc ores and carbonates rocks are very low and inconsistent with a felsic igneous rock protolith, whereas the low concentrations of Cr, Ni, and Co are inconsistent with a mafic igneous rock protolith. Therefore, the Mg-rich carbonate rock was likely the protoliths of talc ores. Magnesium has been derived from pre-existing Mg-rich carbonate host rocks, i.e., magnesite and dolomite marbles.

Keywords: Afghanistan, Spin Ghar, Talc, Dolomite, Magnesite, Tremolite