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Petrogenesis and Geochemical Characteristics of Nangarhar Talc Deposits, Afghanistan

Tahir, M.¹, Imai, A.¹, Takahashi, R.¹, Ogasawara, M.², Yano, S.³, Hida, T.³ and Baig, A.³

¹ Akita University, 1-1 Tegata Gakuen, Akita 010-8502, Japan, mtahir_geologist@yahoo.com

² National Institute of Advanced Industrial Science and Technology, Japan, masa.ogasawara@aist.go.jp

³ Shokozan Mining Co., Ltd. Tokyo, Japan, vzv06101@nifty.com

Talc deposits in the Spin Ghar block, southeastern part of Afghanistan, were formed in Paleoproterozoic carbonate rocks. This block is composed of various Proterozoic gneisses, schists, quartzites, marbles and amphibolites. These metamorphosed rocks were intruded by Early Cretaceous intrusive rocks such as migmatite-granite and gabbro-monzonite-diorite [1]. Three areas have been studied, namely Dar, Kherwas and Janinaw in the most western part of the block and Mamond Dara in the most eastern part. The deposits in the western and eastern part are hosted by magnesite and dolomite marbles, respectively. The objective of this study is to describe the talc mineralization on the basis of field observations, microscopic observation, XRD, XRF, ICP-MS and SEM-EDS analyses.

In the most western part of the block, talc deposits occur parallel to sub parallel to host magnesite rocks cross cut by intrusive rocks of dolerite/diabase, while metamorphic rocks including quartz chlorite schist are parallel to sub parallel to talc ore body and magnesite at Dar. Layers of actinolite were observed at Kherwas. In the Mamond Dara area, at the most eastern part of the block, parallel alternating layers of talc and dolomite marbles occur with quartz chlorite schist. Gneiss occurs at the contact of these talc and dolomite marbles and quartz chlorite schist. Mineral assemblages of talc ore in the western part are (a) talc + tremolite + calcite, and (b) talc ± cordierite, while those in the eastern deposits are (c) talc + dolomite + calcite ± quartz ± apatite and (d) talc + dolomite + calcite. Talc was formed by alteration of tremolite and magnesite in Dar and Kherwas deposits. In the Janinaw, talc was formed by alteration of dolomite and tremolite, while in Mamond Dara, it was formed by alteration of dolomite. ΣREE 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 65.1wt %, 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 those of dolomite marbles range from 18.0 to 26.0 wt%.

The lower concentration of Al, Ta, Hf, Zr, Th, and REE in talc ores and carbonates rocks are inconsistent with a felsic igneous rock protolith and Cr, Ni, and Co are inconsistent with mafic igneous rock protolith [2]. On the basis of these signatures, the Mg-rich carbonate rock is likely the protoliths of talc ores. Magnesium was derived from the pre-existing Mg-rich carbonate host rocks, *i.e.*, magnesite and dolomite marbles.

References:

[1] Abdullah Sh and Chmyriov V (2008) British Geological Survey Occasional Publication 15

[2] Schandle S et al. (1999) The Canadian Mineralogist 37:1211-1227

