D-58: Behaviour of granulites during vein graphite mineralization in Sri Lanka

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Vein graphite deposits of Sri Lanka occur in the form of veins in granulites derived from sedimentary and igneous protoliths. This study was undertaken to explain the behaviours of host granulites during Sri Lankan-type vein graphite mineralization.

Mineralogical and petrographical study of the host granulites of the graphite veins of the Bogala, Rangala, Wagalla and Siyambalapitiya graphite deposits in Sri Lanka indicates that, close to the veins, the host rocks are intensely altered, and their gneissic foliation and granulite textures are completely or partially obliterated. Where the alteration is very intense, no grain boundaries of the original minerals can be recognized. The alteration zone is greasy to greenish in colour and varies in thickness from a few cm to some tens of dm. The intensity of the alteration is independent of the size of the veins. It was also noted that the host granulites have deformed in a semi-brittle to brittle manner during the mineralization, at depths where the brittle conditions are not permitted. The semi-brittle to brittle deformation has been caused by high fluid pressure of graphite-bearing solutions. The graphite veins have formed through hydraulic

fracturing, as the host granulites were fractured by the tensile stress created by high fluid pressure of these solutions.

Detailed study of three main host granulites - namely quartzo-feldspathic gneiss, metabasite and impure marble - from the above deposits shows that the original granulite facies mineral assemblages have been altered to new minerals by vein graphite mineralization. The new minerals formed due to the alteration are antiperthite, chlorite, quartz, dark reddish brown biotite, orthoclase, scapolite, myrmekite, zoned plagioclase, dark greenish hornblende, sericite, sphene, rutile, apatite, calcite, siderite and a very fine grained Ti-bearing mineral. The new minerals formed depend upon the original mineralogy of the host granulites and are not related to any high-grade metamorphism. None of these minerals has suffered ductile deformation. Most of the plagioclase in quartzo-feldspathic and basic granulites close to the veins has been altered to antiperthite, scapolite or sericite. Grain boundary orthoclase has formed around new antiperthite. Close to the veins, almost all the mafic minerals in all rocks, including impure marble, have been altered to chlorite. The alteration of impure marble suggests that there was no involvement of carbonate carbon in the origin of this type of vein graphite. The nature of the alteration of the host granulites and the new minerals formed indicate that the vein graphite mineralization in Sri Lanka has no relationship to the main granulite-facies metamorphism and that it post-dates the latter. Similar type of results have also been reported from the Kahatagaha-Kolongaha vein graphite deposit, indicating that the host granulites during this type of vein graphite mineralizations behave in a unique manner, especially with respect to the alternation.

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