D-26: Formation of secondary orthoferrosilite and coronal garnet in high-X_{Fe} rocks of Kataragama area

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In southern Sri Lanka, there is a group of magnesian impoverished rocks with FeO/FeO+MgO(mol) ranging from 0.90 to 0.98. Clinopyroxene (hedenbergite) of granitic rocks from the Kataragma area contained 2 sets of optically discernible exsolution lamellae. A very thin (thickness not more

than few mμ) set of lamellae parallel to 001 was the commonest. Electron microprobe analyses on these thin lamellae occasionally gave pigeonite compositions indicating the presence of very fine orthopyroxene lamellae within them. Within these 001 lamellae, there were dark segments oriented in a definite direction. Approximately parallel to the orientation of these dark segments within 001 lamellae were thin orthoferrosilite rods (Fs_{95}) very often protruding beyond the periphery of the host clinopyroxene (Cpx) grains. These orthopyroxene rods which were subsequently grown as larger rods should be parallel to 100 as this was the only plane of exact dimensional fit for both ortho- and clinopyroxenes. Rather closely spaced and very thin lamellae of this nature may have exsolved below the peak temperature of granulite metamorphism. Two pyroxene thermometry applied to the compositions of host Cpx and orthoferrosilite lamellae yielded a temperature around 780°C.

Garnet in these high X_{Fe} granitic rocks being a late mineral phase formed after Cpx exhibited spectacular corona textures. Atolls of garnet together with symplectitic quartz occurred around clusters of Cpx grains. Microperthite with corroded margins can also be seen in the vicinity. Plagioclase was perhaps already consumed and not found in most reaction domains. The following garnet-forming reactions could take place if quasi-isobaric cooling prevailed during early stages of the retrograde path.

Clinopyroxene + Plagioclase ------> Garnet + Quartz

Clinopyroxene + Microperthite ------> Garnet + Quartz

These coronal garnets were formed at temperatures around 725° C (Garnet-Cpx thermometry).