Cordierite-bearing rocks of southwestern Sri Lanka: field observations, petrography, mineral chemistry and some implications

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In southwestern Sri Lanka, cordierite-bearing assemblages occur in rocks of pelitic composition (area around and north of Colombo) as well as in semi-pelitic/psammitic rocks (southern areas of Ambalangoda and Galle). The appearance or disappearance of this mineral in the above rock types is basically controlled by local $Al_2O_3 + MgO/CaO + K_2O + Na_2O$ variation of the bulk composition. Cordierite bound to the gneissic fabric is a product of garnet-consuming decompression reactions such as:

1. garnet + biotite ⟶ cordierite + K-feldspar + hercynite + opaques
2. garnet + biotite ⟶ sillimanite + cordierite + biotite + hercynite + opaques
3. garnet + biotite ⟶ cordierite + orthopyroxene + K-feldspar
4. garnet + sillimanite ⟶ cordierite + hercynite
5. garnet + sillimanite + quartz ⟶ cordierite

A similar reaction, which produces a minor amount of plagioclase, was also noticed. In addition, later formed, coarse and translucent (subhedral to euhedral) cordierite occurs in granitic veins (probably resulting from a dehydration melting process) associated with mobilized/migmatitic zones or in discrete dykes.

Microprobe analyses of minerals from 22 samples (excluding late veins and dykes) reveal that garnet, cordierite and hercynite are increasingly enriched with Fe towards the southern area and this observation can be explained partly by regional bulk compositional variation. Also noteworthy are the high spessartine contents (3-17%, SpGr) of garnets from the area around and north of Colombo whereas the garnets from southern parts have extremely low (Gr + Sp 3.5%, Gr > Sp) grossular and spessartine contents. The

variation of spessartine in garnet cannot always be correlated to bulk-Mn, perhaps due to its extreme dilution in host-rocks.

Temperatures were calculated for coexisting garnet-cordierite pairs of 22 specimens using compositions of garnet rims and cordierite interiors. T-ranges of 725±25°C for the southern area and 650±50°C for the northern area were obtained with the calibrations of Thompson (1976), Holdaway and Lee (1977) and Perchuck *et al.* (1981). A wide range of pressures is estimated by garnet + sillimanite + quartz ⟷ cordierite geobarometry (Lonker 1981, Martingole and Sisi 1981) depending on hydration of cordierite. However, to be consistent with the results of thermobarometry on garnet-pyroxene granulite, a reduced water fugacity ($aH_2O < 0.5$), and even a varying degree of cordierite hydration, in different parts of southwestern Sri Lanka have to be assumed. Mineral zoning and paragenetic relationships are also discussed.