XENOLITHS OF ORTHOPYROXENE ECLOGITE AND CELSIAN CORONA-BEARING KYANITE ECLOGITE IN KIMBERLITE FROM SOUTH INDIA

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Eclogite xenoliths from two diamondiferous kimberlite pipes (KL2 and P10) of the Wajrakarur Kimberlite Field (1050 to 1100 Ma) in the eastern Dharwar Kimberlite Province have been studied. The KL2 pipe has intruded the 2.6 - 2.5 Ga old Closepet Granite, and contains abundant xenoliths of eclogite some of which are kyanite-bearing. A rare sample of orthopyroxene eclogite has been recovered from this pipe in which the core of garnet is characterized by microscopic triangular arrays of needles or blebs of Al-rich orthopyroxene, clinopyroxene and sphene consistent with an origin by exsolution parallel to the isometric form {111} Some of the exsolved needles are symplectic between orthopyroxene and clinopyroxene. Omphacite contains arrays of exsolved needles or blebs of orthopyroxene and garnet, and spectacular skeletal to feather-like inclusions (<20 μm long) of a chlorine-rich Na, Mg, Al silicate. Independent grains of orthopyroxene and Ti-phlogopite are also found in the orthopyroxene eclogite. Kyanite eclogites show tabular grains of kyanite which are invariably mantled by hydrated Ca-Al silicates with an occasional ring of celsian, which contains ~38 wt% BaO and <1 wt% CaO + Na_2O + K_2O. In all eclogites of KL2 pipe omphacite Na_2O contents are typically between 3 to 6 wt%, and garnet has widely variable composition with end members in the ranges of $Prp_{22-78}Grs_{3-47}Alm_{10-30}Sps_{0-1}Adr_{0-5}Uv_{0-3}$. Garnet and omphacite grains are mostly homogeneous without chemical zoning. Phase relations in the ACF projection (A = Al_2O_3 + Cr_2O_3 - Na_2O - K_2O; C = CaO and F = FeO + MgO + MnO) exhibit systematic increase of Ca-tschermak's component in omphacite from orthopyroxene eclogite through simple eclogite to kyanite eclogite. Thermometry in KL2 eclogites using Grt-Cpx Fe-Mg exchange calibration of KROGH (1988) gives temperatures mostly in the range of 920 - 1030 °C.

The P10 pipe is intrusive into a granitoid pluton within the 3.5 2.6 Ga old Peninsular Gneissic Complex. Eclogites of this pipe are characterised by chromian omphacite (2 to 4 wt% Cr_2O_3) and chromian garnet (4 to 6 wt% Cr_2O_3) but lack in either kyanite or orthopyroxene. Garnet has low calcium contents (<5 wt% CaO), and in one sample paucity of calcium relative to chromium results in 6 mole% knorringite component along with $Prp_{68}Alm_{14}Uv_{11}Sps_1$. PT calculations using Grt-Cpx thermometer of KROGH (1988) and Cr-in-Cpx barometer of NIMIS & TAYLOR (2000) give temperatures around 1100 °C and pressures in the range 31 to 36 kbar for P10 eclogites.

References

KROGH, E.J. (1988): Contrib. Mineral. Petrol., 99, 44-48.
NIMIS, P & TAYLOR, W.R. (2000): Contrib. Mineral. Petrol., 139, 541-554.