Indicator mineral (Spinel) from the Wajrakarur kimberlites, southern India: implications for diamond potential and prospectivity

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P-5 and Kl-4 Mesoproterozoic (ca. 1110 Ma) kimberlites from the Wajrakarur and Kalyandurg clusters, Eastern Dharwar craton (EDC), southern India are intruded into the diamondiferous cratonic roots. The spinel compositions is straddling between magnesian ulvöspinel (Group-1 kimberlite) and titanomagnetite (Group-2 kimberlite), comparable with orangeite and lamproites. These Ti-rich minerals have orangeitic affinity, as in the Kaapvaal craton of South Africa, and reflect the high Ti-, high Ca- and the low Al-bearing nature of the parent magma (Group II kimberlites). Larger chrome spinel macrocrysts/xenocrysts show >500 μm of size with distinctly high chromium (Cr_2O_3 up to 59.62 wt%), and TiO_2-poor (<1.19 wt%). The high chromium spinel macrocrysts represent fragments of mantle xenocrysts and their composition falls within the diamond stability field. The groundmass spinel has been replaced by Ti- schorlomite. The schorlomite garnet represents solid solution of schorlomite -pyrope -almandine-grossular and Cr-rich schorlomite -pyrope -almandine- uvarovite solid solution. These associations recommend that the schorlomite formed through the replacement of spinel through interaction of late residual fluids/melts in the final stages of crystallization of the kimberlite magma and enrichment in Fe and Ti in schorlomite suggests the involvement of metasomatized sub-continental lithospheric mantle. Present study may have useful application in diamond prospectivity.