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**Composition and source of fluids in high-temperature graphite-bearing granitoids associated with granulites: examples from the Southern Marginal Zone, Limpopo Complex, South Africa.**

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**Abstract**

P-T conditions, fluid regime and carbon isotope composition of graphite and fluid inclusions from garnet-sillimanite-bearing leucocratic tonalites, trondhjemites and granites associated with orthopyroxene-bearing granulite metapelites in the Southern Marginal Zone (SMZ) of the Limpopo complex, South Africa, are presented in the paper. Re-integrated compositions of perthitic alkali feldspars and antiperthitic plagioclase, as well as P-T and T-X<sub>CO2</sub> phase equilibria modeling using PERPLE\_X software indicate that the granitoids began to crystallize at temperatures of 900 - 940°C and pressures of 7 - 9 kbar, and were equilibrated with a fluid phase with X<sub>CO2</sub> > 0.5 - 0.6 as is recorded in dense fluid inclusions in quartz. A small fraction of a saline fluid accumulated during cooling only. Average  $\delta^{13}\text{C}_{\text{PDB}}$  values for graphite (-6.52 to -8.65 ‰) and fluid inclusions (-2.50 to -5.58 ‰) from the granitoids differ substantially from the

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