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REFERTILIZED CONTINENTAL LITHOSPHERE BENEATH CATALÃO, ALTO PARANAÍBA IGNEOUS PROVINCE, EVIDENCED BY CLINOPYROXENES FROM METASOMATIZED MANTLE PERIDOTITES

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Volcanic rocks with kimberlite affinity located in the Alto Paranaíba Igneous Province (APIP), Catalão region, Central Brazil, host a suite of mantle-derived xenoliths that provide valuable insights into the nature and evolution of the continental lithosphere. These peridotites vary from spinel-lherzolites to clinopyroxene-bearing harzburgite, and phlogopite-garnet-wehrlites. In-situ major and trace element analyses of clinopyroxenes reveal a broad range of temperature (T) and pressure (P) conditions, as well as distinct enrichment processes. Wehrlites (958-1043 °C; 4.2-5.3 GPa) and harzburgite (905-990 °C; 5.0 GPa) were formed at higher T-P than spinel-lherzolites (730-888 °C; 1.6-1.8 GPa). Clinopyroxenes in wehrlites display Mg# between 0.91 and 0.92, high Ca/Al (13.34-20.20) and La/Yb_N (56.79-117.88) ratios, and high Cr contents (1.38-2.18 wt.%) coupled with low Ti/Eu ratios (481-1069). They also have high Sr (187-531 ppm) and Ba (2-85 ppm) contents and high Nb/Ta ratios (15.71-22.61). Clinopyroxenes in harzburgite have Mg# between 0.93 and 0.95, high Ca/Al (12.55-17.87) and La/Yb_N (7.58-10.51) ratios, high Cr contents (1.15-1.87 wt.%) and intermediate Ti/Eu ratios (2583-3252). Sr (209-325 ppm) and Ba (40.60-73.10 ppm) are comparatively high with Nb/Ta reaching the highest values (127.54-205.58) among all samples. Conversely, clinopyroxenes from the spinel-lherzolites show wide range of Mg# (0.90-0.94, 0.93 on average) with low Ca/Al (2.90-4.09) and La/Yb_N (0.001-0.073) ratios, low Cr contents (0.49-0.99 wt.%), and the highest Ti/Eu values (4410-6904) when compared to wehrlites and harzburgite. Sr (6.26-59.20 ppm), Ba (0.01-2.57 ppm) and Nb (0.01-0.35 ppm) concentrations are low and Ta contents are below detection limits. The geochemical signatures of clinopyroxenes from wehrlites and harzburgite suggest that they were formed by reactions between a residual peridotite and a metasomatic melt. The formation of wehrlites may indicate an intense metasomatism in the deep lithosphere (>140 km) caused by melt percolation of carbonatite affinity. The LREE enrichment, high Ca/Al, low to moderate Ti/Eu, high Sr and Nb coupled with high Nb/Ta ratios support this hypothesis. Moreover, clinopyroxenes in the spinel-lherzolites present limited interaction with the metasomatic agent and their REE patterns are typical of melt extraction processes, which suggests that the refertilization was restricted to the deeper parts of the APIP continental lithosphere.