

## ULTRA-HIGH TEMPERATURE SAPPHIRINE-BEARING GRANULITES FROM ARAPIRACA COMPLEX, NE BRAZIL: THERMOBAROMETRY AND TECTONIC SIGNIFICANCE

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Inserted in northeast of Sergipano belt, the Arapiraca complex consists of an amphibolite to granulite facies metasedimentary sequence. Despite the recent advances in geological map of this area, the tectonic correlation with other domains and the relationship with regional Barrovian metamorphism (Brasiliano event) are still uncertain. Here we report the first finding of ultrahigh-temperature sapphirine-bearing granulite in the Borborema Province. These rocks from the Arapiraca complex are granulites with grt-opx-spr-sill/ky-crd-bt-qtz-spl-crn-cfps-ilm-mag/hem/rt/zrc/mnz. Orthopyroxene and garnet occur in variable spatial settings and are always partly replaced by late Fe-Mg phases and show core to rim Mg-Al and Fe-Mg zoning profiles (respectively), suggesting chemical potential gradient and resetting of peak composition during retrograde P-T path. We estimate peak P-T temperature using the composition from core of pyrope-rich garnet and orthopyroxene with highest Al<sub>2</sub>O<sub>3</sub> contents (8.5 wt.%). Using the classical approach to “back calculate” the peak composition of garnet-orthopyroxene adjusted for pressure with Fe-Mg independent barometer (FAGS) assemblage yielded peak conditions of 970-960 °C and 8.2-8.0 kbar. Using the calibrations for Mg-Al thermometer, Al-in-opx thermometry yielded peak temperatures of 955-944 °C calibrated to 8.2 kbar. In the RCLC program grt-opx thermometer coupled to a grt-opx-plg-qtz barometer with a correction for late Fe-Mg exchange yielded an average of 1000 °C and 11 kbar. Using Al<sub>2</sub>O<sub>3</sub> isopleths calculated in FMAS system for maximum alumina content in orthopyroxene temperatures of about 950-1000 °C could be found. Therefore, application of multiple thermobarometry methods suggests peak or near-peak P-T conditions of 8.2 – 11.0 kbar and 944–1000 °C. The high Al-opx plus pyrope-rich grt was consumed by post-peak reactions at very high temperatures to produce sapphirine-spinel-corundum symplectites. The post-peak stage is followed by a decrease in pressure of an overall clockwise path represented by consumption of high-T assemblages to form late cordierite which can be interpreted as result of exhumation and/or back reactions with residual melt during retrograde P-T path. Based on lateral continuity of similar rock types and apparent progression of deformation intensity and P-T conditions in Macururé domain from south to northeast in Sergipano belt, we suggest that the Arapiraca complex can be represents the high-grade counterpart of the Macururé domain or rift sequence associated to Canindé domain and the ultra-high temperature conditions was reached during extensional to convergent tectonics related to the closure of the Sergipano basin and following collision of the São Francisco craton against the northern terranes from the Borborema Province. Finally, another possibility is that the high-T nucleus represents a detached segment of the Paleoproterozoic-Archaean basement (SFC) with no correlation to Neoproterozoic metamorphism. Ongoing zircon and monazite petrochronological investigation will constrain the duration of UHT conditions and the processes involved in middle-deep crustal environments, as well as correlation with other domains in the belt.

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