AREADO GRANITE-MIGMATITE UNIT: EVIDENCE FROM THE PALEOPROTEROZOIC BASEMENT OF THE SOUTHERN BRASILIA OROGEN

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ABSTRACT: The Alfenas and Areado (MG) region hold meta-igneous rocks, usually associated with rocks of the infrastructure, which represents the basement of kyanite-bearing granulites from Três Pontas-Varginha nappe. This unit corresponds to a meta-syenogranite that passed through intense metamorphism, deformation and partial melting, leading to the formation of a patch metatexite and stromatic diatexites. This study uses petrography, coupled with modal analysis, whole-rock geochemistry, structural geology, quartz c-axis data, zircon dating and trace elements chemical analysis in quartz and titanite. The main goals of this research are: determine the temperatures of metamorphic peak and leucosome deformation, and understanding the causes for different patterns of metamorphism, deformation and degrees of anatexis. The meta-syenogranite has inequigranular blastoporphyroid texture, with plagioclase enveloped by garnet and xenoblastic K-feldspar; it rarely presents leucosome veins with idioblastic hornblende. The hornblende-garnet metatexite is inequigranular, porphyroclastic, with idioblastic hornblende in the leucosome and K-feldspar porphyroclasts, garnet and two different types of titanite in the residuum. The biotite stromatic diatexite exhibits mylonitic foliation marked by the melanosome composed of biotite, titanite and epidote. This rock also shows two quartz recrystallization textures in different structures. Due to the occurrence of relicts of igneous feldspar porphyroclasts on the migmatites and similar accessory minerals in all three rocks, we state that the meta-syenogranite is the protolith of the migmatites, as observed in the field, as well. The presence of idioblastic hornblende in the leucosome, along with a diffusive contact between leucosome and residuum, it is inferred that water influx caused the different degrees of partial melting and deformation, but the source of the water is still unknown. Structural data, together with geological cross-sections, allow us to interpret that the major mylonitic foliation follows the thrust patterns. Two different deformation temperatures were calculated with the quartz c-axis thermometer, one between 775-863 °C and other in 546-642 °C, inside 8-10 kbar pressure interval. These intervals corroborate with Zr-in-titanite data, that is 660-693 °C for idioblastic crystals and 784-808 °C for xenoblastic grains. The TitaniQ thermobarometer shows geological unrealistic results when compared to the other methods, resulting in a metamorphic peak at 25 kbar. This happened possibly because of the low Ti-activity, making challenging the application of this thermometer. Reducing the titanium activity, as suggested in the literature, caused a shift of the equilibrium curves, and matched the TitaniQ results with the low-temperature titanite crystals analysis. In addition, the xenoblastic titanite results might be overrated due to its association with zirconium-rich allanite. The meta-syenogranite presents an absolute age of 2.07 Ga, and its tectonic meaning must be clarified further on. We propose to call these rocks as Areado Granite-Migmatite unit, even if it was already mapped as Gaspar Lopes Orthogneiss. Future analysis shall include zircon dating of the metamorphism and cathode-fluorescence on quartz to understand the variation of titanium concentration.

KEYWORDS: Metamorphism, quartz c-axis, thermobarometry, water-influx partial melting