GEOTHERMOMETRY AT THE SERIDÓ BELT REVISITED: F-OH BIOTITE-APATITE COMPARED TO MG-TCHERMAK BIOTITE-MUSCOVITE AND TI IN BIOTITE METHODS.

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The Seridó belt is composed of Neoproterozoic supracrustal rocks with the Seridó mica schist, Jucurutu paragneiss and Equador quartzite crosscut by Ediacaran plutons and Cambrian pegmatitic granite bodies and zoned pegmatite dykes and sills. In the study area, the main transpressive deformation was synchronous with the Acari pluton emplacement at 575 Ma. The pegmatitic granites were emplaced at 528-510 Ma, and the zoned pegmatite dike swarms at 515-505 Ma. Previous geothermobarometry studies using biotite-garnet from mica schist have shown a peripheral staurolite-andalusite zone with T = 550 °C and P = 0.20-0.25 GPa, and an inner sillimanite zone with T = 650 °C and P = 0.4 GPa. We collected samples representing the main petrotectonic units of the Seridó belt along regional profiles and systematically analyzed micas and apatite with electron microprobe. We determined temperatures by three methods: Ti-in-biotite, Mg-Tchermark component distribution between biotite and muscovite and F-OH distribution between biotite and apatite. A Ti-in-biotite average temperature of 623 °C (σ = ± 5 %) was obtained for 35 mica schist samples representing regional profiles across the belt. This temperature agrees with biotite-garnet temperatures near 650 °C previously obtained in the studied area. Several decametric to hand-sized samples of mica schist enclaves contain biotite with re-equilibrated F contents similar to those of their host pegmatitic granites. The Ti-in-biotite average temperature in the mica schist enclaves is 642 °C (σ = ± 4.2 %). Muscovite locally appears in mica schist commonly related to the contact with felsic intrusions. The partitioning of the Mg-Tchermark component between biotite and muscovite allow the computation of the equilibrium temperature. The micas yielded temperatures between 638 and 720 °C including schist from both enclaves in pegmatitic granites and regional profiles. The F-OH biotite-apatite geothermometer in the schist yielded temperatures between 667 and 737 °C at the regional scale, quite similar to those yielded by the muscovite-biotite geothermometer. In the paragneiss, biotite-apatite pairs from the west side of the belt yielded relatively lower temperatures varying from 519 to 690 °C. It agree with the low metamorphic grade of the west side of the belt. The Acari pluton biotite-apatite pairs showed temperatures varying between 643 and 748 °C. The metric to submetric schist enclaves in pegmatitic granites gave similar high temperatures between 679 and 738 °C. The biotite-muscovite and biotite-apatite geothermometers yielded temperatures 50 to 75 °C higher than the Ti-in biotite and biotite-garnet ones. In KFMASH system the low temperature range 625 to 650 °C is consistent with the widespread biotite+cordierite+garnet+silimanite paragenesis. On the other hand, the high temperature range is consistent with the stability of the same paragenesis but as the result of anatexis in the presence of free H_2O. The absence of K-feldspar, muscovite and migmatites in the schist regionally and at the contact of the Acari pluton place the upper limit for the Seridó Belt thermal peak at 675 °C. During the emplacement of the Cambrian pegmatitic granites the high temperatures obtained in schist enclaves indicates fluid-present condition during their emplacement.