

## MAGMATIC DIFFERENTIATION IN THE LAVRAS GRANITE (RS) EVIDENCED BY MAJOR AND TRACE ELEMENTS IN AMPHIBOLE AND PLAGIOCLASE

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**ABSTRACT:** New chemical data of amphibole and plagioclase allow to reassess processes of magma differentiation in the Lavras pluton, which consists of two compositional-structural domains: (1) a central laccolith constructed by intrusion of the core Bt-Amp granodiorite into a sill formed by the middle, Amp-Bt monzogranite-to-syenogranite; and (2) annular intrusions including Bt-Amp syenogranite and alkali-feldspar granite. The latter granites are ferroan and displays higher alkalinity index, HFSE and REE, and lower CaO, Sr and Ba than the former that are magnesian, but all are mostly alkali-calcic. The Lavras pluton and the Tapera monzonite constitute an intrusive complex partly coeval with trachyandesitic volcanics (Hilário Formation), in the Southern Brazilian Shield. In both, <sup>207</sup>Pb/<sup>238</sup>U SHRIMP and <sup>207</sup>Pb/<sup>206</sup>Pb evaporation ages for zircon indicate a major period of 603-596 Ma for accumulation of zircon-saturated magmas in the upper crust. Younger ages of 593-582 Ma, concordant with the <sup>40</sup>Ar/<sup>39</sup>Ar phlogopite-age of 590 ± 4 Ma for a K-lamprophyric dike in the Lavras granite, are probably reflecting remobilization of a magma-mush chamber caused by inputs of more primitive hotter magmas. Regular decrease of MgO, CaO, Al<sub>2</sub>O<sub>3</sub>, TiO<sub>2</sub>, Sr and Ba for increasing SiO<sub>2</sub> contents (71-75 wt. %), in bulk compositions, point to processes of fractional crystallization for the border granites. The two inner types, however, show no clear evolutionary trends in a short SiO<sub>2</sub> interval (70-72 wt. %), with the middle granites displaying higher MgO and TiO<sub>2</sub>, and the core granodiorite higher Al<sub>2</sub>O<sub>3</sub>, CaO, Sr and Ba, and the lowest content of HFSE and REE. Analytical data for major and trace elements in minerals were obtained on laboratories at IGeo/UFRGS and IG/USP, respectively. Oligoclase (An<sub>17-26</sub>), dominant in the inner types, evolves up to An<sub>28-35</sub> showing the highest Sr and Ba in granodiorite, and more sodic plagioclase (<An<sub>15-10</sub>) with low Sr, Ba and LREE occur in the border syenogranite. Amphiboles in the inner granites, mostly Hst/Hbl, define overlapped trends marked by slight decrease of Ca, minor increase of Fe<sub>T</sub> and Na and relatively constant *mg#* (Mg number) for increasing Si. They show slightly higher *mg#* and Ca, the highest contents of Sr, Ba, Sc and V, and the lowest of HFSE, REE, Rb, Li, Th, U and Zn in granodiorite. In the middle granites, they display maximum contents of Y, Th, U and REE, but have concentrations of HFSE, LILE and Ga, and more pronounced negative Eu anomalies comparable to those from the border granites, predominantly Fe-Hbl transitioning to Fe-Wnt. Amphiboles compositions, here, follow a trend of Fe-enrichment, abrupt decrease of Ca, Al and *mg#*, and moderate increase of Na with increasing Si. These amphiboles show moderate REE, the highest contents of Li, Mn and Zn, and the lowest of Sr, Ba, V and Sc. Such differences for traces in amphibole reinforce a multi-intrusive pluton. The middle granites are hybrid rocks initially formed by some evolved magma, after remobilized by new inputs of diversely fractionated granitic magmas on the center and along the borders. This is consistent with the emplacement sequence, textural features and Sr-Nd-Pb isotopes.

**KEYWORDS:** AMPHIBOLE, TRACE ELEMENTS, REINTRUSION, LAVRAS GRANITE