Abstract

The Palermo (*ca.* 250 km^2) and Rio Negro (*ca.* 130 km^2) Plutons crop out in the so called Alto Rio Negro region , Parana state, making part of the Graciosa Province, a NeoProterozoic province (ca. 580 Ma) constituted by granites and syenites in S-SE Brazil. The plutons are made predominant granitic rocks, gabbro-diorites, as well as hybrid rocks constituted mainly by granodiorites. Both plutons show compositional a zoning pattern, which is inversed in the case of the Rio Negro Pluton.

The main granitid rocks are mainly metaluminous to slightly peraluminous syeno- and monzogranites with subordinate quartz monzonites and alkcali-feldspar granites. They show a massive structure and a variety of textures, with hb + bi ± all + zr + ap ± ti + mt + ilm as the typical mafic mineral association. Gabbro-dioritic rocks include fine- to medium-grained metaluminous gabro-diorites and quartz monzogabrros and diorites with massive strucure characterized by the mafic mineral associations with cpx ± opx + hb + bt ± ti ± ap ± zr. In these rocks, the plagioclase compositions vary between labradorite and andesine. Hybrid rocks are mainly granodiorites characterized by several strucures and textures indicative of desiquilibrium and mingling/partial mixing between the silicic and basic-intermediate melts that formed the mainn granites and the gabbro-diorites. Such rocks are more abundant in the Rio Negro Pluton. The mafic mineral association is similar, but in contrasted relative abundance, to the ones found in the main granites.

In the main granites the amphiboles are Fe-horblende and Fe-edenite, with 0.65 < fe# < 0.95, the higher among these values appearing in the alkali-feldspar granites. Biotite present 0.70 < fe# < 0.99 and the annitic component are also higher in the later rocks. In the case of the gabbro-dioritic rocks, the fe# numbers range between 0.48 and 0.59, 0.41 and 0.56, 0.47 and 0.53 and 0.54 and 0.57 in ortopyroxene, clinopyroxene, amphibole and biotite, respectively. The averaged compositions of coexisting orto- and clinopyroxene are $Wo_{46}En_{30}Fe_{24}$ and $Wo_3En_{42}Fe_{55}$ and suggest a tholeiitic or calk-alkaline nature of the original melts. Rare earth element patterns reveal enrichment factors up to 1-10, 50-70, 100-300 relative to the chondritic composition in ortopyroxene, clinopyroxene and amphibole, respectively, with a well marked fractionation of the heavy over the light rare earths in the case of the ortopyroxene, a feature not observed in clinopyroxene and amphibole. All patterns show a notable Eu negative anomaly.

Melts crystallization pressures were estimated to be between 1 and 3.5 kbar; however values higher than ca. 2 kbar seems to be unrealistic given the ferroan compositions of some amphiboles. Zircon and apatite saturation temperatures coupled with ortopyroxene-clinopyroxene and amphibole-plagioclase equilibrium temperatures suggest crystallization intervals between ca. 1000 - 750° C in the case of the gabbro-diorites and ca. 900 - 670° C in the case of the main granites. Mineral paragenesis and fe# values in biotite in equilibrium with alkali-feldspar and magnetite suggests relative oxidizing crystallization conditions for the acid and basic-intermediate melts, higher than the QFM buffer, the alkali-feldspat granites being a possible exeption.

Keyword: Palermo Pluton, Rio Negro Pluton, granitic rocks, gabbro-diorites rocks, metaluminous, peraluminous, pressures, temperatures.