



PETROGRAPHY AND MINERAL CHEMISTRY AS FINGERPRINTS OF OPEN-SYSTEM PROCESSES IN MAGMATIC CHAMBERS: AN ALKALINE SYSTEM CASE STUDY, THE PARIQUERA-AÇU SUITE (SP, BRAZIL)

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RESUMO: Disequilibrium textures and zoning patterns among crystals can provide valuable evidence of processes occurring within a magmatic open system. Crystals can register compositional and textural changes in response to variations in the intensive parameters that define the magmatic environment. Hence, specific textures and zoning patterns, such as corrosion, rounded edges (dissolution surfaces), sieve texture and dusty zone (pervasive resorption), overgrowth by re-crystallization (reaction rims), and reverse and normal step zoning can be attributed to processes involving magma recharge and mixing and crustal assimilation. In the Cretaceous Pariquera-Açu alkaline suite (SP, Brazil), we observed petrographic and chemical evidences suggesting magma mixing and recharge, particularly in clinopyroxene crystals. Major element clinopyroxene analyses were performed using JEOL JXA-FE08530 electron microprobe analyzer at the GeoAnalítica-USP facility. The clinopyroxene crystals exhibit five compositional populations (types): (1) Beige augite-diopside correspond to rounded cores in normal step zoned crystals, with high Mg# (92-81) and Cr₂O₃ (1.2-0.1 mass %), and low TiO₂ (0.4-1.6 mass %). These cores exhibit partially resorbed areas, leading to the development of a sieve texture, in some cases. (2) Ti-rich diopside that occurs in the mantle/rim region, overlaying the beige cores and exhibiting resorption interfaces. This region exhibits intermediate Mg# (82-70), relative low Cr₂O₃ (0.4-0 mass %) and high TiO₂ (up to 3.4 mass %). (3) Greenish aegirine-augite reaction rims, exhibiting intermediate value of TiO₂ (0.5-2.5 mass %), and decrease in the Mg# (74-65) and Cr₂O₃ (0.03-0 mass%) contents. (4) Strong green aegirine-augite with low Mg# (66-40) and Cr₂O₃ (0.09-0.001 mass%) occurs as evolution of the greenish aegirine-augite rims (type-3). (5) Slightly-green aegirine rims, which show the lowest Mg# (11-7), occur mantling some crystals exhibit strong green cores of aegirine-augite (type-4). The beige augite-diopside cores (type 1) are interpreted as antecrysts that likely formed in a deeper chamber, supported by their rounded form, resorption interfaces, and higher Mg# and Cr₂O₃. Ti-rich diopside mantle/rim region (type 2), characterized by intermediate Mg#, high TiO₂ and low Cr₂O₃, are considered the principal clinopyroxene phase, representing a main shallow chamber crystallization stage. This type 2 is possibly affected by the input of felsic magma, resulting in the formation of reaction rims transitioning from greenish to strong green aegirine-augite (types 3 and 4), until reaching the aegirine composition (type 5). We propose that the Pariquera-Açu suite undergo magma mixing and recharge, with the previous emplacement of magma with crystal cargo (melt+antecrysts) within the plumbing system context.

PALAVRAS-CHAVE: MAGMA MIXING AND RECHARGE, PARIQUERA-AÇU K-ALKALINE SUITE, OPEN-SYSTEM, TEXTURAL DISEQUILIBRIUM AND ZONING PATTERNS