**Magma Emplacement and Crystallization during Regional Stress: an Example from the Sul-Rio-Grandense Shield (Southern Brazil)**

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During the last decades increasing amount of data revealed the syntectonic character of numerous granitoid bodies in young or old continental crust. Integrated geological, petrological and structural investigations point to the syntectonic nature of magmatic rocks which were previously interpreted as metamorphic basement formed solely during solid-state deformation. However, comprehensive studies on syntectonic magmatic bodies are rare and details of their development during emplacement and crystallization are not well understood. In shield areas from southern Brazil, several transcurrent shear zones are described and interpreted as important conduits for magma ascent and emplacement (Bitencourt & Nardi 2000). Data from the syntectonic Butiá Granite are presented, which prove the presence of regional stress during crystallization and cooling. This sillimanite-bearing leucogranite shows a strongly foliated margin with anastomosing, cm- to m-thick high-strain zones. Deformation of a crystal mush is indicated by (i) the magmatic nature of the foliation, expressed by the locally strong alignment of igneous sillimanite crystals, subhedral feldspars and quartz with no pressure shadows, and (ii) termination of C' shear bands, formed by biotite and sillimanite, against quartz and feldspars, with only weak solid-state deformation features. Evidence of subsolidus high-T deformation is given by observations as follows. (i) The magmatic quartz contains few recrystallized and deeply sutured grains. The fractal dimension of the grain-boundary geometry is ca. 1.13 which can be correlated with deformation-T of ca. 600-650°C (Kruhl & Nega, 1996). (ii) Where C' shear bands terminate at quartz, strong chessboard subgrain patterns are developed. Given a moderate intrusion depth of 12-15 km, these patterns point to a deformation-T of ca. 650° as a minimum, in accordance with the wet solidus T for such compositions. (iii) Grain boundaries in K-feldspar aggregates are coarsely sutured. (iv) Along C' shear bands in or at K-feldspars, coarse undeformed myrmekites occur, indicating that deformation was active at high temperatures before myrmekite formation. Weak solid-state deformation at greenschist facies conditions is indicated by wavy extinction in K-feldspars and flame albitization. Based on these indications of partly strong magmatic to subsolidus and lower-T deformation, we argue that the Butiá Granite intruded during strong regional stress and, together with neighbouring syntectonic magmatic rocks, promoted larger-scale regional movement and reorganization of the continental crust.

References:

Bitencourt MF, Nardi LVS (2000) Tectonic setting and sources of magmatism related to the Southern Brazilian Shear Belt. Revista Brasileira de Geociências 30:186-189

Kruhl JH, Nega M (1996) The fractal shape of sutured quartz grain boundaries: application as a geothermometer. Geol Rdsch 85: 38-43

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