American Mineralogist, Volume 84, pages 1781–1792, 1999

The geometric evolution of structures in granite during continous deformation from magmatic to solid-state conditions: An example from the central European Variscan Belt

STEFFEN H. BÜTTNER

Institut für Angewandte Geowissenschaften, Technische Universität Berlin
Strasse des 17. Juni 135, D-10623 Berlin, Germany

ABSTRACT

Intrusive and in-situ granites of the late-Variscan South Bohemian batholith (Austria) were deformed continuously during crystallization and after solidification by horizontal crustal shortening. When the proportion of melt was relatively high, the granitic magmas accomodated deformation in (low-angle) thrust zones. With decreasing melt content shearing became more localized and the dip angle of shear planes increased during the formation of submagmatic reverse shear zones. During this submagmatic stage the orientation of shear planes was variable. They probably rotated from flat in the magmatic stage to a steeper orientation perpendicular to the shortening direction and/or parallel to post-magmatic conjugated strike-slip zones, that became active at high-*T*, solid state conditions. Thermobarometry and the compositions of plagioclase phenocrysts, subgrains, and recrystallized grains indicate that the magmatic, submagmatic, and high-*T*, solid state strike-slip deformation occurred at similar *P*-*T* conditions. Conjugate strike-slip zones are well known structures of solid-state crustal shortening. In syn-tectonic plutons, they may have magmatic or submagmatic precursors, and because they preferably crosscut the plutons rather than the country rock, this could be the result of earlier magmatic or submagmatic deformation, that evolves to solid state shear zones. Hot (migmatitic) crust during magma emplacement, coupled with low cooling rates and a constant direction of crustal shortening probably aids the generation and preservation of related magmatic, submagmatic, and postmagmatic structures.