GEOCHEMICAL CHARACTERIZATION AND ORIGIN OF GRANITOIDS FROM THE SOUTH BOHEMIAN BATHOLITH IN LOWER AUSTRIA

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Major and 31 minor elements have been determined in 39 large samples of Variscan granitoids from 6 plutons or intrusions from the South Bohemian Batholith (Rastenberg, Weinsberg, Mauthausen, Schrems, Eisgarn and Gebharts). The granitoids include diorites, tonalites, trondhjemites, granodiorites but are mainly granites. Their melts formed at water-undersaturated conditions and intruded at 10 to 15 km depth during late tectonic and post-tectonic phases of the Variscan orogeny (about 330 to 300 Ma ago). Hydrothermal or low temperature alteration is excluded for the majority of samples from a study of oxygen isotopes. δD in a selection of unaltered amphiboles and biotites permits characterization of the water composition at melt formation. The thickness of the plutons is estimated at about 6 km from a heat balance. By analogy with experimental partial melting three different sources of the granitoids can be identified and chemically characterized.

(i) The trondhjemites, tonalites and diorites in the early Rastenberg Pluton are products of 15 to 40 % melting respectively of mafic (amphibolitic) lower crust. Redwitzites from the West Bohemian Massif which are comparable in age partly resemble the Rastenberg rocks. The Rastenberg granitoids and most redwitzites are crustally contaminated as reflected in their Sr-Nd isotopes.

(ii) The very large syntectonic Weinsberg Pluton was formed from about 30 % partial melting of felsic (tonalitic) lower crust at 800 - 850 °C. Its low proportion of ca. 10% restite has a ferrodioritic composition. The post-tectonic finegrained Mauthausen and Schrems granites which tend to a granodioritic mode are very low in restite and are also products of a tonalitic source.

(iii) The youngest (leuco-)-granite in the Eisgarn Pluton (high in Si, P, Li, Rb, Cs, U, $^{87}Sr/^{86}Sr$ and low in Ca, Sr, Ba) reflects a pelitic source. The change from mafic to tonalitic to pelitic source composition for the granite sequence may indicate that the depth of melt formation decreased with time. The concentration of HREE decreased from Weinsberg to Eisgarn which is conformable with an increasing proportion of garnet in the source.

The orogenic heat conformable with a heat flow of about 100 mWm^2 was provided by mafic intrusions. An alternative would be a drastic increase in crustal thickness which cannot be recognized by barometry of the associated metamorphic rocks. Exposed metamorphic country rocks occur in higher amphibolite facies indicating about 5 kb pressure. Mafic intrusions contain gabbros (Kleinzwettl) or have formed diorites (Gebharts), the latter being contaminated by granitic melts from partial melting of the wall rocks (MASH process). Large-scale contamination by crustal materials can be observed in $\delta^{18}O$ and in Sr-Nd isotopes. The major mafic activity

was probably caused by depression of solidus temperatures in the mantle wedge above a subduction zone where water was available from dehydration of subducted ocean crust. This water initiated partial melting of ultramafic rocks and metasomatism in the uppermost mantle above the level of melting. The water also mobilized highly incompatible elements (Ba, Th, U, La, Ce, Pb, Nd, Sr and K) from the uppermost mantle and transported them into the lower crust. An alternate or additonal source of metasomatic fluids may have been dehydration of lower crustal rocks during Variscan high grade metamorphism. A comparison of granulite-facies granitoidal rocks from nearby outcrops with our Variscan granitoids shows a dramatic depletion of Cs, Th, U, and Sr in the former and an enrichment in the latter. Average concentrations of Ba, Th, U, La, Ce, Pb, Nd, Sr, and K in the Weinsberg, Mauthausen and Schrems granites exceed those in average felsic I- and S-type granites by factors ranging between 2.1 and 1.3. Indicators of a nearby subduction zone of late Variscan age in addition to the specific association of granitoidal rocks are abundant upper mantle tectonites.

POLYPHASE INTRUSION OF THE CISTA STOCK (THE BOHEMIAN MASSIF) IN RELATION TO THE REGIONAL TECTONICS

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The Cista stock is a part of the larger Cista-Jesenice plutonic massif that penetrated the Proterozoic low-grade volcanosedimentary sequence in a north-western flank of the Barrandian basin, the Bohemian Massif. The body is built-up of two main igneous components. Biotitic granodiorite forming a subvertical plug is rimmed by biotitic granite which prevails in the rest of the plutonic massif. The contact between these two granitoids is conformable and partially coincides with a significant brittle-ductile shear zone striking NE-SW. Macroscopic observations of the internal structure of the intrusion were complemented with the results of AMS study (CHLUPACOVA et al., 1975). Planar fabrics dip predominantly to NW under medium to steep angles whilst the lineation gently plunges preferentially to SW, with the exception of the N part where it dips steeply to NE. The area affected by this shear zone, containing both magmatites and the country rocks, exhibits a number of clear kinematic criteria indicating a sinistral strike-slip combined with normal faulting.

In a grater detail, strain evolution of the two rheologically different magmatites deformed under roughly the same PT conditions within the shear zone were explored. The granodiorite retains its load-bearing frame for a longer interval before it collapses into interconnected weak layers. At the same time, a less resistant frame of the granite breaks loose readily and deforms chiefly in the field of interconnected weak layers.