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GEOCHRONOLOGY OF PRE-VARISCIAN CRUSTAL REMNANTS AND THEIR GRANITOID HOST ROCKS, SOUTH BOHEMIAN PLUTON, AUSTRIA

by

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Petrological investigations have proven the existence of (lower-) crustal remnants incorporated into the Variscan granitoids of the South Bohemian pluton. Aim of the presented study was the precise dating of the remnant charnockitic and the Variscan granitic parageneses of the px-bearing Weinsberg granite varieties of the vicinity of Sarleinsbach (Mühlviertel, Austria).

On different granite samples with varying amounts of remnant minerals zircon typology studies, U/Pb and Pb/Pb zircon dating of both parageneses were undertaken. To further characterise the remnant charnockitic paragenesis Pb isotopic investigation of megacrystic Kfsp and whole rock were also made. The following results have been established:

Zircon typology studies have positively revealed differences in zircon appearance in both parageneses. Zircons of the charnockitic mineral assemblage show a mean typology of subtype J4, typical for high temperature magmatic rocks whereas zircons belonging to the granitic paragenesis reveal a mean typology of L3-L5, typical for granitic rocks with a S-type granite affinity.

Using the above described typological criteria it was possible distinguish characteristic zircons of either group and thus to individually date the two mineral assemblages. With both single zircon evaporation Pb/Pb dating and conventional single zircon U/Pb dating the formation of the charnockitic paragenesis could be dated at 529 ± 22 and 521 ± 9 Ma (all indicated errors are 2 SE), respectively (Middle to Late Cambrian).

From textural evidence and the typical zircon typology it is argued that the J4 zircons were formed during charnockite formation and thus do not constitute an inherited zircon population from a pre-charnockite precursor. The determined lowermost Palaeozoic age is therefore interpreted as the possible formation age of the charnockitic rocks found as remnants in the Variscan magmatites.

The formation of the Variscan granitic paragenesis is dated at 355 ± 9 and 345 ± 6 Ma, respectively (Early Carboniferous). Although the age results for both methods are identical within error the obvious discrepancy of the age data is not yet resolved. Rb/Sr investigations of the same rocks point to a Rb/Sr errorchron „age" of 330 ± 28 Ma (unpubl. data from S. Scharbert). This fact demonstrates the problems arising in dating complex magmatic systems which involve partial melting and mixing of different sources. Additionally some late stage thermal disturbance leading to a partial rejuvenation of the isotopic systematics probably has to be accounted for. This could well be due to the intrusion of younger fine grained granites of type Mauthausen in the surroundings of Sarleinsbach. These granites have not been dated yet.

Inherited zircon cores with an average age of 630 Ma show the same age range as is found for inherited cores in zircons from the Rastenberg granodiorite (Waldviertel, Austria). This points to the fact that either a common source has contributed to both granitic rock suites or that an inferred Cadomian magmatic event around 630 Ma was more widespread than previously thought.

Common Pb investigations in zircon and Kfsp have shown the presence of an old, relatively low-radiogenic common Pb component in the investigated rocks. A calculated secondary isochron age from zircons lies at 527 ± 83 Ma, identical to the determined formation age of the charnockitic precursors of the Variscan granites. Cores from megacrystic Kfsp exhibit a similar common Pb isotopic composition. Rims of the Kfsp crystals show more radiogenic common Pb composition, well comparable to the common Pb composition of Kfsp from „normal" Weinsberg granite Kfsp samples. The low-radiogenic common Pb found in the px-bearing granites of Sarleinsbach demonstrate that at least some parts (cores !?) of the megacrystic Kfsp have grown during the formation of the charnockitic mineral assemblage in the Early Palaeozoic in an U-depleted lower crustal environment. These Kfsp cores were not completely resorbed or equilibrated during the partial melting event subsequently leading to the formation of the granitic magma during the Carboniferous. Similar conclusions have been drawn for large Kfsp crystals from the Rastenberg granodiorite and on the grounds of trace element distributions in large Kfsp.