Sr AND Nd SYSTEMATICS OF ROCKS FROM THE GABBROAMPHIBOLITE MASSIF OF NEUKIRCHEN–KDYNĚ (NE BAVARIA–CZECH REPUBLIC)

A. MIETHIG, V. VON DRACH, H. KÖHLER

Institut für Mineralogie, Petrologie und Geochemie, Theresienstr. 41, 80333 München, Germany

The Gabbroamphibolite Massif of Neukirchen–Kdyně (GAM) is situated at the western margin of the Bohemian Massif, building the southern part of the Teplá–Domažlice (Taus) Zone. Two prominent faults (Bohemian Pfahl, Central Bohemian Shear Zone) form its boundary against the Moldanubian Unit. The GAM is made up of a polymetamorphic volcano-sedimentary sequence and up to eight individual intrusive bodies with different stages of differentiation (olivine gabbro to quartz diorite). The degree of metamorphic overprint decreases from HT/MP in the SW to low grade in the NE. The aim of this study was to determine intrusion ages and origin of the magmas of GAM. To date, we have analyzed more than 50 samples of major rock types for Rb–Sr and Sm–Nd isotopic composition.

$^{87}Rb/^{86}Sr$ values of the rocks are generally very low (< 0.10) and their correlation with the $^{87}Sr/^{86}Sr$ ratios was observed only in two cases:

— Analyses of five gabbros from the Orlovice Complex (OK) gave an isochron age of 734 ± 102 Ma (2σ errors) and an initial ratio of 0.70267 ± 4.

— The data for six quartz diorite samples from the Kdyně Complex (KK) defined an isochron yielding an age of 504 ± 30 Ma and an initial ratio of 0.70416 ± 45.

As there is no indication of magma mixing in either of the cases, the age values are interpreted as intrusion ages.

Sm–Nd results plotted in a isochron diagram point to a genetic relationship of the individual plutonic bodies and origin from similar parental magmas. There is a rough correlation, defining a regression line corresponding to an age of 709 ± 68 Ma and an ε^i_{Nd} of +5.6 ± 2. This date is in agreement with the mean of the Nd model ages (T_{DM} ~ 700 Ma) and is interpreted as time of separation from the Depleted Mantle source.

In a ε^i_{Sr} vs. ε^i_{Nd} diagram, recalculated to 700 Ma, all samples plot within a section of the "mantle array" which at present is covered by Mid-Ocean Ridge and Ocean Island basalts. Initial Sr isotopic ratios for most of the rocks vary between ε^i_{Sr} = -24 (0.7020) and zero (0.7036), the range of ε^i_{Nd} is +5 to +7, with some exceptions. The ε^i_{Nd} values for samples from the Všeruby Complex (VK) are significantly lower (+4.2 to +5.3), whereas those for two small gabbro bodies significantly higher (+7.8 to +8.3).

From the available isotopic data we conclude:

— Plutonic activity in GAM started already in Late Proterozoic (around 700 Ma) and ended in Early Cambrian times (around 500 Ma).

— Mantle origin of the magmas is obvious. Based on the Sr and Nd isotopic data, we infer three different parental magmas, either reflecting primary inhomogeneities in the mantle source or contamination by varying amounts of lower crustal material.

— The discrepancy between the time of magma separation from the Depleted Mantle (around 700 Ma) and the emplacement age of voluminous plutons (KC, 504 ± 30 Ma) gives evidence of an approximately 200 Ma lasting inactivity of primary magmas located probably at the boundary Upper Mantle/Lower Crust. Whereas minor magmatic pulses intruded shortly after their separation from the mantle, remelting and intrusion of voluminous primitive magmas was initiated by subsequent Upper Cambrian crustal thinning.

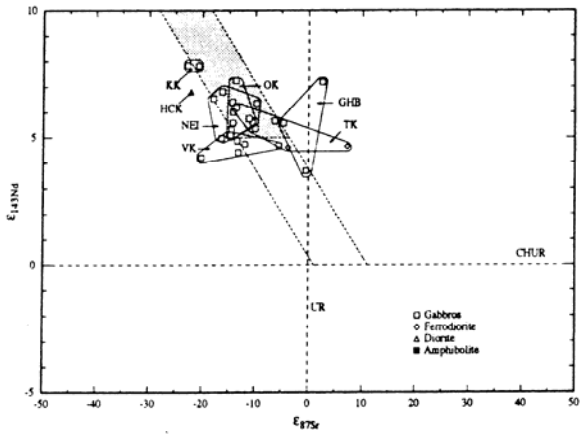

Fig. 1: ε^i_{Sr} vs. ε^i_{Nd} diagram for basic intrusive rocks, age-corrected to 700 Ma. KK: Kdyně Complex; OK = Orlovice Complex; HCK = Hyršov–Chodská Lhota Complex; NEI = Neukirchen–Eschlkam Intrusion; VK = Všeruby Complex; TK = Teufelsberg Complex; GHB = Gabbroamphibolite Hoher Bogen.