VARISCAN GRANITOIDS IN BÄRNAU - ROZVADOV AREA

K. BREITER

Czech Geclogical Survey, Geologická 2, 152 00 Praha 5 - Barrandov, Czech Republic

The Rozvadov-granitoid massif and Bärnau-granite body intruded katazonally metamorphossed Moldanubicum on the both sides of Bohemian-Bavarian border, 20 km ESE of KB-site. Four principal types of granitoids characterised by new geological maping and petrological investigation are as follows:

1, a complex of different varieties of granitoids with cordierite. The primary magma (preserved as small bodies of coarse-grained biotite granite at periphery of the complex) was contamined by high-alumina paragneisses. The extreme product of contamination is the cordierite-rich diorite with 56% SiO_2 and 25% Al_2O_3. The cordierite crystals reach 2x2x5 cm in size.

2, fine to medium-grained two-mica granite "Rozvadov type" constitutes the largest part of the Rozvadov massif. There are, westwards from the main outcrops, many dyke-like apophyses, many of them leucocratic and aplitic and/or pegmatitic in character. Pericontact parts of aplite-pegmatite dykes and/or lenses show often paralel fabric. For this reason, aplite dykes in Bavaria were described as "metaaplite". New technical works including boreholes on the Bohemian territory proved magmatic origin of this fabric.

3, medium- to coarse-grained two-mica granite "Bärnau type" forms an equidimensional body NNW of foregoing types, which is deeply rooted according to gravity data. This granite body is compact, without apophyses, dyke rocks are very rare.

4, fine to medium-grained albite-zinwaldite granite with topaz, "Křížový kámen/Kreuzstein-type" formssome stocks and dykes within a NNW-SSE oriented zone between the Bärnau- and Flossenburg-massifs between Altglashütte in the north to Weidhaus in the south. Granite is geochemically highly specialised (Rb about 1000 ppm, Li about 500 ppm, F about 0.5%) and enriched in Sn and Ta. Characteristic is high-P content, mineralogically expressed as PO_4-bearing albite in granites and phosphates in adjacent pegmatites.

In the northern part of the zone (Silberhütte-Entenbühl-Havran) there are, through an advanced erosion, exposed the bottom parts of stocks with only rare stockcheiders, but with indications of disseminated cassiterite-columbite mineralization.

In the southern part, less afected by erosion, there are some of stocks preserved including apical parts of copula, where famous phosphate pegmatites developed (Hagendorf, Weidhaus, Pleystein)

TEMPERATURE ESTIMATION FROM AUTHIGENIC PHYLLOSILICATES IN PERMIAN VOLCANICLASTIC ROCKS, N CHILE

C. BREITKREUZ[1], S. TH. SCHMIDT[2]

[1] *Department of Geology, The University of Kansas,120 Lindley Hall, Lawrence, KS 66045, USA*

[2] *Mineralogisch-Petrographisches Institut, Universität Basel, Bernoullistr. 30, 4056 Basel, Switzerland*

XRD and microprobe measurements of phyllosilicates and fluid inclusion measurements were carried out to estimate the temperature which affected a volcanisedimentary succession duríng diagenesis, incipient very low-grade metamorphism, and hydrothermal alteration.

The succession comprises the Peine Fm. and Chunar Beds, 2 km thick, which crop out at the eastern margin of the Salar de Atacama in N Chile. Here, during the Permian an extensional intra-arc basin accommodated basalto-andesitic to dacitic lavas and silica-rich pyroclastic deposits. The associated mainly volcaniclastic sediments formed in lakes, flood plains, and alluvial fans (Breitkreuz 1991).

Burial metamorphism, accompanied by strong, differential compaction led to the formation of a zeolite facies assemblage. The main phases are calcite, quartz, laumontite, prehnite, illite, and chlorite. This assemblage is present in nearly all lithologies in contrast to kaolinite and analcime, which are restricted to certain silica-rich clastic rocks. Albitisation of plagioclase is advanced but incomplete. In the albitized areas the percentage of Ab ranges from 91 to 98%. Later hydrothermal epidote and piemontite formed dispersed in the rocks and in joints. Epidote is present in all rock types in various levels throughout the succession.

The phyllosilicates replace intermediate to silica-rich volcanic lithic and crystal fragments and fill pores. XRD measurements of 25 samples show 10% or less of smectite layers mixed with illite, chlorite and kaolinite. Illite 001 crystallinity (IC) covers a wide range in the diagenetic zone (Fig. 1a). Within one level in the succession a strong variation of IC occurs (Fig. lb). However, the maximum ICs of each level increase systematically with depth. The highest IC values were observed in samples from the base of the succession (Fig. 1b). They plot close to the diagenetic-anchizone boundary, which represents a temperature of approximately 200 °C (Frey 1986). The high variation of the IC values is inferred to be caused by varying permeability during burial, different amounts of mixed-layered smectite, and sample preparation. More data are needed to confirm the positive correlation of the IC with the chlorite crystallinity (ChC) found in samples which contain both clay minerals (Fig. 1c). XRD data collection and analysis of results followed recommendations of Kisch (1991) and Arkai (1991).

The composition of chlorite in 10 samples from various levels in the succession was analyzed with an ARL-SEMQ microprobe. Fe/(Fe+Mg) ratios vary between 0.17 and 0.47. Formation temperatures, calculated on the basis of the Al^{IV} abundance in chlorite (Cathelineau and Nieva, 1985; Bevins et al. 1991), range from 178 to 251 °C, showing no correlation with the sample position in the succession.

Measurements of secondary fluid inclusions in calcite show that the base of the succession was exposed to temperatures of at least 230 °C. Homogenisation temperatures of 260 °C have to be confirmed by further data. Other trains of secondary inclusions in the same sample yielded homogenisation temperatures around 130 °C, witness of cooler fluids. Likewise, analcime from a sample in the middle of the succession preserved fluid inclusions which homogenized at temperatures between 110 and 170 °C.

The maximum ICs and ChCs, the chlorite geothermometer, and the fluid inclusion data indicate that the north Chilean succession was exposed to temperatures of 200 °C or more, with possible maximum temperatures of 260 °C. However, the lower IC and ChC values and low-temperature mineral assemblages like analcime contrast with the high temperatures obtained from the chlorite geothermometer and the abundance of epidote. More data are needed to evaluate the observed discrepancy between the low temperatures indicated by the ChC and the higher temperatures of the Al^{IV} geothermometer in the same samples.

From the observed differences in authigenic mineral assemblage and temperatures we conclude, though preliminarily, that the succession experienced low-grade burial metamorphism of the zeolite facies and later has been affected by hydrothermal fluids as hot as 250 °C.

References
Arkai (1991): J. metam. Geol., vol. 9, p. 723–734
Bevins et al. (1991): J. metam. Geol., vol. 9, p. 711–722
Breitkreuz (1991): Sedim. Geol., vol. 74, p. 173–187
Cathelineau – Nieva (1985): Contrib. Petrol. Mineral., vol. 91, p. 235–244
Frey (1986): Schweiz. mineral. petrograph. Mitteil., vol. 66, p.13–27
Kisch (1991): J. metam. Geol., vol. 9, p. 665–670
Warr – Hugh (1993): unpublished report.

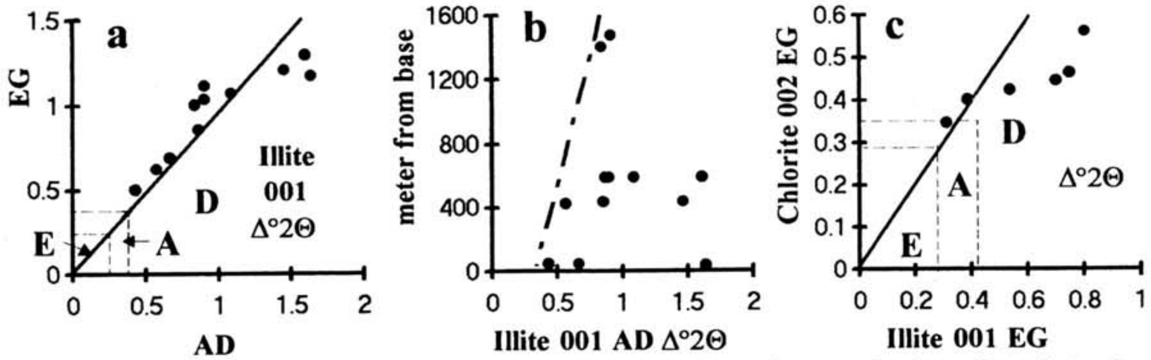

Fig.1: Half peak widths of the illite 001 and chlorite 002 refractions, calibrated against the Crystallinity Index Standard (CIS) of Warr and Hugh (1993); AD = air dried, EG = ethylene glycol; diagonal line in a and c is the diagram cutting line; D = diagenetic zone, A = anchizone, E = epizone (limits taken from Arkai 1991); a: Illite crystallinity, AD versus EG; b: Illite 001 crystallinity versus position of the sample in the succession: the dash-dotted line marks an increase of the maximum crystallinity with depth; c: samples which contain both illite and chlorite; more data are needed for an improvement ofthe correlation and the CIS calibration for chlorite is not well constrained.