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SELECTED SAMPLES OF THE WEST CARPATHIAN GRANITOIDS: CLASSIFICATION AND MODAL COMPOSITION

(Figs. 3)

One of the principal characteristic applied to the samples of the granitoids was the modal (planimetric) analysis. The recognition of a precise mineral composition is always the fundamental information about the rock and, combined with chemical analyses, it is prerequisite for petrogenetic studies.

The modal composition was measured on polished, etched and stained slabs, using the modified method of E. H. Bailey — R. E. Stevens, 1960. Measurements were made on a modified stage (J. Macek, 1981) by the linear method. The length of the measured line ranged from 1000 to 3500 mm (on the average 2500 mm — 25 cm^2) with a step of 1 mm. In some samples muscovite could not be measured on the etched surface and it had to be measured on the thin section. A great number of planimetric analyses have been published by J. Macek et al. (1979).

The modal analyses have shown that the West Carpathian granitoids are prevalently of granodiorite composition (Fig. 1), which results from the predominance of Na_2O over K_2O. The tonalites are the most basic variety; they are often leucocratic ($< 10\%$ of mafic minerals) and thus of a trondhjemite character. Among mafic components biotite predominates, hornblende being accessory. The large amount of biotite—muscovite and muscovite types indicates the peraluminous character of the source rocks.

As the modal analysis is a very painstaking method, particularly in measuring the coarse-grained and porphyritic types, there is a strong tendency to replace the modal analysis by petrochemical calculations. A. Streckeisen, the author of the recommended international Classification of Plutonic Rocks (IUGS) proposed several chemical classifications (A. Streckeisen, 1976; A. Streckeisen — R. W. Le Maitre, 1979). The main purpose of these and similar classifications (M. Stefanova, 1980; O. A. Bogatikov et al., 1981) is the development of a single system of classification and precise nomenclature. More widely spread are the so-called normative recalculations used particularly in application of experimental rock systems to the samples studied, but their usage for classification is negligible (e. g. CIPW). Normative minerals, however, form the basis of the derived chemical classifications (e. g. A. Streckeisen —R. W. Le Maitre, 1979).

In the elaboration of the West Carpathian granitoid complex we have employed the data obtained to the confrontation of individual classification approaches. We have correlated the results of the modal, katanormative and mesonormative classifications. In the mesonormative recalculation the mafic minerals are represented by amphibole and biotite in contrast to the katanormative classification in which pyroxenes are involved, as in CIPW or Barth

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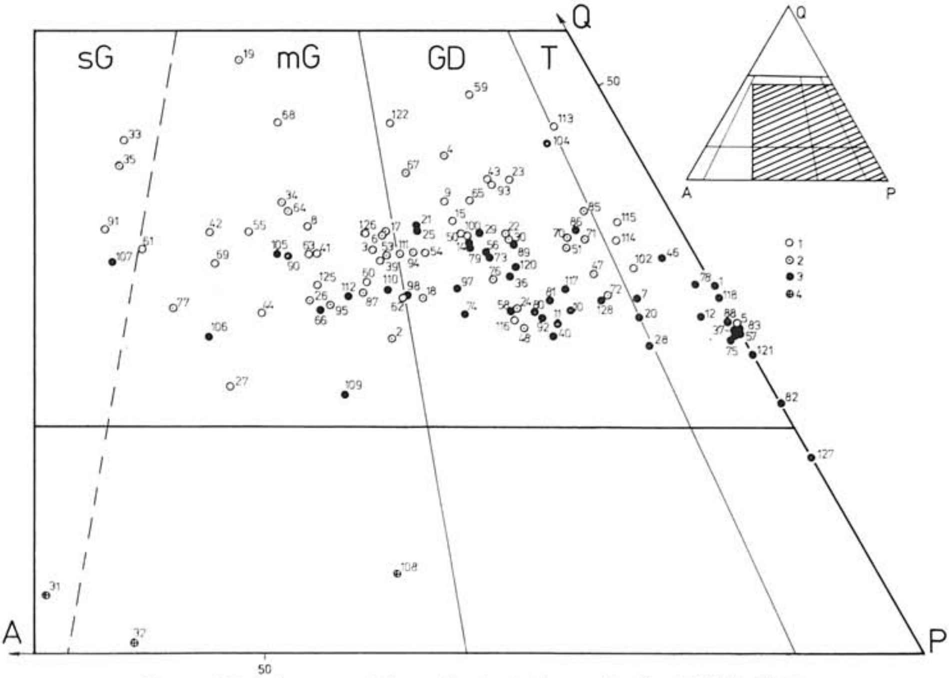

Fig. 1. Modal composition of selected granitoids (IUGS, 1973).
Abb.: 1 — leucocratic varieties, 2 — two-mica varieties, 3 — biotite varieties, 4 — metasomatically influenced varieties.
sG — syenogranite, mG — monzogranite, GD — granodiorite, T — tonalite. Numbers of points refer to ZK hand samples

— Nigli's katanorm. It is obvious that the mesonorm is far more suitable for the granitic rocks especially because: (a) the mesonormative minerals are essentially identical with the mineral paragenesis of granitoids, and (b) the K_2O content is divided equally between K-feldspar and biotite, which removes an excessive formation of K-feldspar in the katanorm.

For the normative classification we have used the modified P. Mielke — H. G. F. Winkler's mesonorm (1979) an the katanorm after T. F. W. Barth (1952), and we confronted the results with the modal classification (IUGS). Both the normative recalculations were applied in the classification system of A. Streckeisen — R. W. Le Maitre (1979). The evaluation has shown that the mesonormative recalculation after P. Mielke — H. G. F. Winkler (op. cit.) can be used for the classification of granitoids of unknown modal composition and that the names of a great majority of samples will be identical with the modal IUGS classification. On the other hand, the application of the Barth—Niggli's katanorm in the system of A. Streckeisen — R. W. Le Maitre (op. cit.) exhibited the following shift: modal granodiorite → katanormative monzogranite, modal tonalite → katanormative granodiorite. The shift was caused by involving total K_2O into the normative K feldspar (Or). This problem was discussed in detail by V. Vilinovič — I. Petrík (1982). The mesonormative minerals (Ab, An, Or, Qz) can be directly

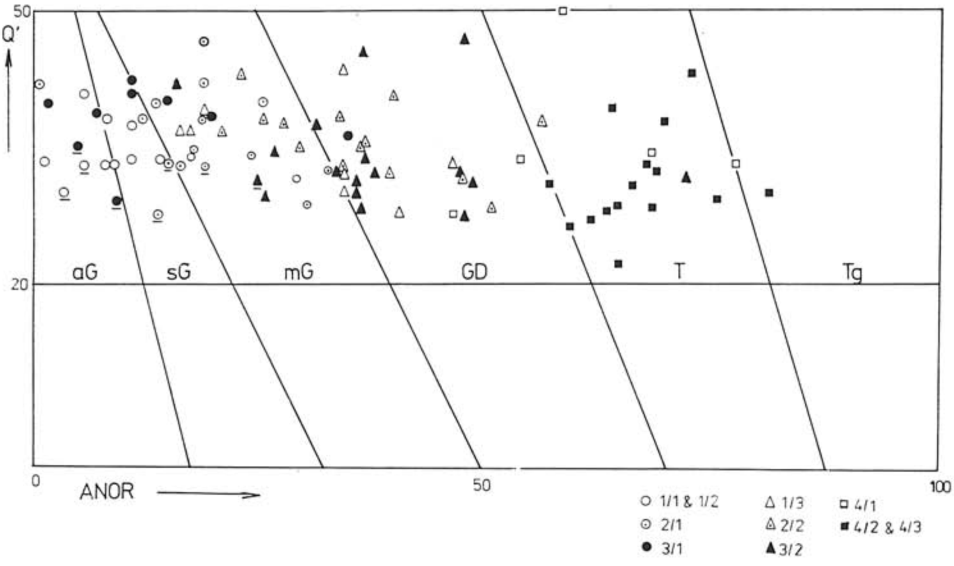

Fig. 2 A. Chemical classification of hand samples compared with modal symbols. According to A. Streckeisen — R. W. Le Maitre (1979), normative calculation according to P. Mielke — H. G. F. Winkler (1979).

Abb.: 1/1 and 1/2 — aplitic and leucocratic granites
2/1 two-mica granites
3/1 biotite granites
1/3 leucogranodiorites
2/2 two-mica granodiorites
3/2 biotite granodiorites
4/1 leucotonalites
4/2 biotite tonalites

aG — alkalic granite, sG — syenogranite, mG — monzogranite, T — tonalite, Tg — gabbrotonalite

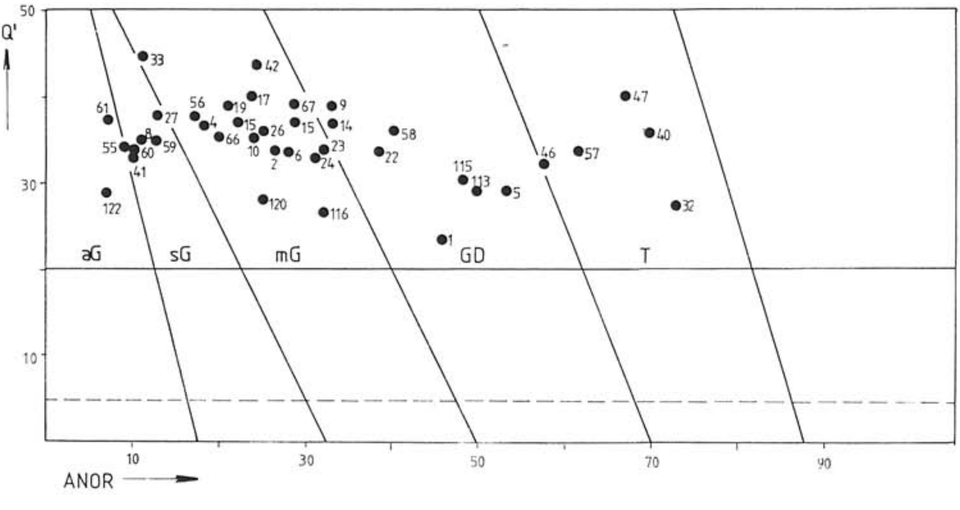

Fig. 2 B. Chemical classification of average (A) samples. Abbreviations see in Fig. 2 A.

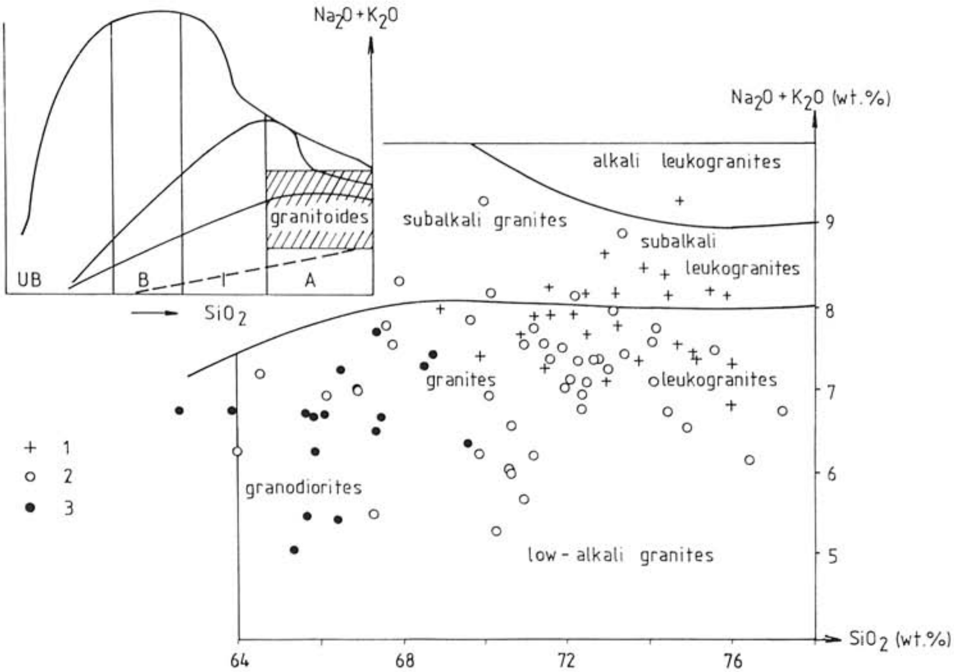

Fig. 3. Chemical classification of selected granitoids in terms of $Na_2O + K_2O$ vs. SiO_2 according to O. A. Bogatikov (1981). Altered and hybrid samples are omitted. Abb.: 1 — granites, 2 — granodiorites, 3 — tonalites

used in the granitic system Qz—Ab—Or—An—H_2O to infer the crystallization and succession relationships, and P—T conditions as well (see e. g. V. Vilinovič, 1981).

In comparing different classification methods we have found out that a special normative recalculation must be employed for every rock group (e. g. granitoids). The application of general systems developed for all plutonic rocks (e. g. M. Stefanova, 1979; O. A. Bogatikov et al,. 1981; H. de la Roche, 1980) does not allow a detailed division within the framework of granitoids (see Figs. 1, 2, 3).

The correlation of modal analyses and normative recalculations has shown that, although the knowledge of the actual mineral composition remains a basic petrographic characteristic, a correct use of the normative recalculation in a suitable classification system enables a prompt and relatively reliable classification of a rock. For the granitoid rocks the mesonorm should be applied, which is also more appropriate in the application of the granitic system.

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