POLSKIE TOWARZYSTWO MINERALOGICZNE – PRACE SPECJALNE
MINERALOGICAL SOCIETY OF POLAND – SPECIAL PAPERS
Zeszyt 20, 2002; Volume 20, 2002

Justyna DOMAŃSKA[1], Ewa SŁABY[2], Robert BACHLIŃSKI[1]

NON-GENETIC, GEOCHEMICAL CLASSIFICATION OF SELECTED VARISCAN GRANITIC ROCKS FROM SUDETES

INTRODUCTION

Granite may crystallise from melts derived in different way. They may be formed:

- from melts derived entirely from crustal components
- from differentiated mantle-derived melt,
- from a melt being a mixture of both crustal- and mantle-derived melts (often of more than two sources).

Sudetes comprise many Variscan granitic plutons. Modal and chemical composition of the rock consisting the plutons differs significantly not only between different magma chambers, but also within a single one in a batholith. The differences appear due to various petrologic processes involved in magmas generation as well as magmas crystallisation. The aim of the work is to compare chemical composition of granitic rocks from selected Variscan plutons in order to show possible differences in magma sources. For the purpose the classification by Frost et al (2001) has been chosen. Frost et al (2001) scheme is geochemical, non-genetic, non-tectonic classification. It is based on Fe-number (or FeO_{tot}/FeO_{tot} + MgO), modified ALI (alkali lime index) and ASI (aluminium saturation index).

SOURCES OF DATA

The data introduced into diagrams have been collected from: Borkowska (1966) and Klominsky (1969) for Karkonosze pluton, Bachliński (2002) for Kudowa granitoids, Puziewicz (1990) and Majerowicz (1972) for Strzegom-Sobótka massif and Bereś (1969) and Klimas-August (1991) for Strzelin massif.

RESULTS

The results have been shown at two diagrams: FeO/(FeO+MgO) *vs* SiO_2 and K_2O+Na_2O+CaO *vs* SiO_2 (see Fig. 1). The ASI index has been calculated for all the granitoid groups.

[1] *Institute of Geological Sciences, Polish Academy of Sciences, 00-818 Warszawa, Twarda 51/55*
[2] *Institute of Geochemistry, Mineralogy and Petrology, University of Warsaw, 02-089 Warszawa, Al. Żwirki i Wigury 93*

Strzegom-Sobótka granitoids with the ASI indices of 0.82 to 1.46 (rock types from granodiorites to alkali granites) present the most diversified group. They are magnesian and ferroan.

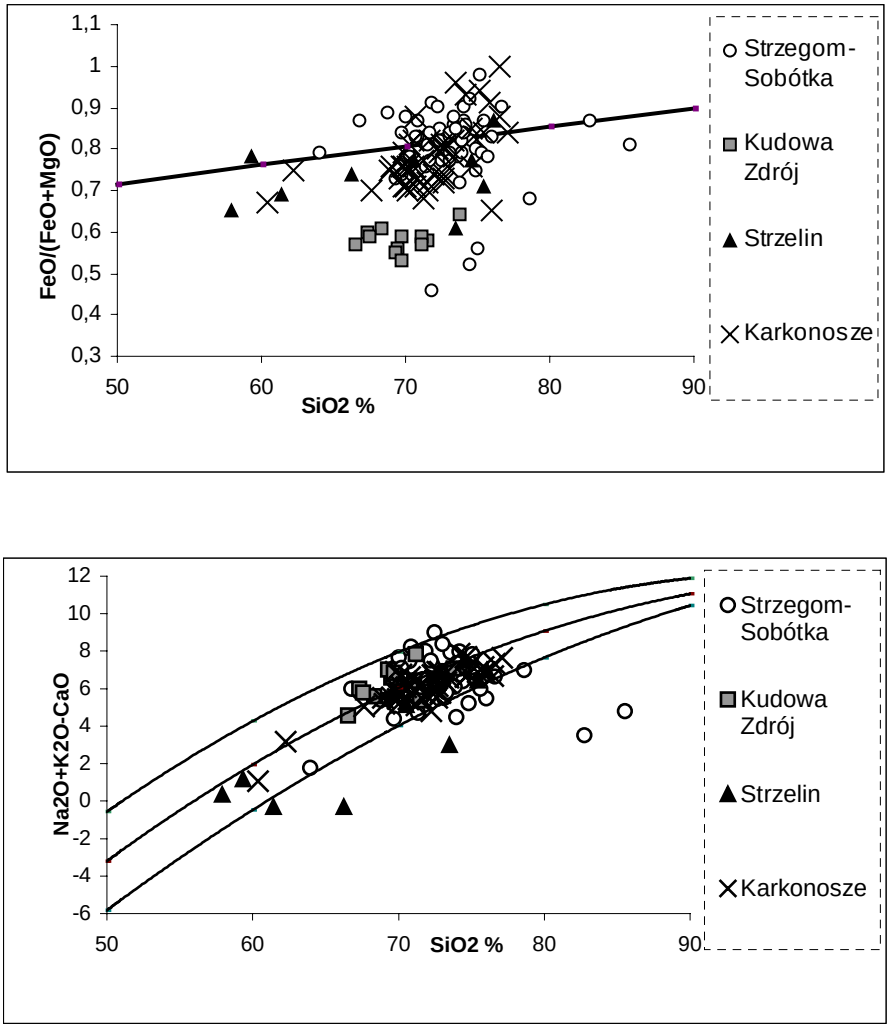

Fig. 1. The FeO/(FeO+MgO) *versus* SiO_2 and K_2O+Na_2O+CaO *versus* SiO_2 plots for the selected granitoid plutons from Sudetes.

The MALI index covers the whole range from calcic, through calc-alkalic, alkali-calcic till slightly alkalic. The ASI values point to metaluminous-peraluminous composition (0.82-1.46). Kudowa Zdrój granites are peraluminous (ASI 1-1.33), magnesian and alkali-calcic till alkalic. The rocks from Strzelin massif (tonalite, granodiorite, monzodiorite to granite) fit almost to calc-alkalic field. They are mostly magnesian, seldom slightly ferroan; ASI 0.9-1.2.

Karkonosze pluton (mostly granite, seldom granodiorite) is composed of peraluminous (seldom metaluminous) rocks, which are usually calc-alkalic with some types of alkali-calcic geochemistry.

DISCUSSION AND CONCLUSION

The classification proposed by Frost et al (2001) gives very rough information, which is not very much useful for the purpose outlined in the introduction. It is very probably, that melts for every suite of presented rocks involved at least a mixture of crustal and mantle derived elements. Strzegom-Sobótka granitoids cross all the trend lines on FeO/(FeO+MgO) *vs* SiO_2 and K_2O+Na_2O+CaO *vs* SiO_2 diagrams. The explanation for this could be magma mixing. Another explanation is, the melt for some of the plutons may be derived from different sources (Puziewicz, 1990), but the Harker's diagrams abnegate this hypothesis. The suite of rocks from Karkonosze pluton follow almost sub-parallel the trend along calc-alkalic and alkali-calcic composition. This trend is mainly caused by differentiation history. With the progression in differentiation the composition tends to be more calc-alkalic. *Fe*-number shows relatively big scatter for more differentiated granites from ferroan to magnesian. Less differentiated links are more magnesian. The scatter of data for the most differentiated granitoids can't point to differentiation alone. The differentiation should than produce more alkalic composition instead of more calcic. The variation in composition may be related to differences in source rock (for instance to water content) but also to mixing. Similarly trends are observed for granitoids from Strzelin massif. The mixed origin of the granitoids has been shown by many reports (see for review Oberc-Dziedzic, 1999), although the trends on Frost et al. classification do not reflect contrasting source material. Primary composition of Kudowa granitoids seems to be much obscured by post-magmatic processes, which modified significantly geochemistry. The classification scheme for the suite is unreliable.

The research work was supported by KBN 6PO4D02118.

REFERENCES

BACHLIŃSKI R., 2002: Petrographical, geochemical and geochronological study of igneous rocks from Kudowa Zdrój vicinity. (unpubl. PhD dissertation Archives of the Institute of Geological Sciences, Polish Academy of Sciences).

BEREŚ B., 1969: Petrography of granite from Strzelno and its surrounding. Arch. Mineralog., 27 (2), 5–105 (in Polish).

BORKOWSKA M., 1966: Petrography of Karkonosze granite. Geol. Sudetica, 2, 7–119 (in Polish).

FROST B.R., BARNES C.G., COLLINS W.J., ARCULUS R.J., ELLIS D.J., FROST C.D. 2001. A geochemical classification for granitic rocks. Journ. Petrology, 42, 2033–2048.

KLIMAS-AUGUST K., 1991: Preliminary data on petrogenetic investigations on zircons from selected gneisses and Strzelin granitoids. Acta Univ. Wratisl., 1374. Prace Geologiczno-Mineralogiczne, 29, 271–295 (in Polish).
KLOMINSKY J., 1969: Krkonošsko-jizersky granitoid massif. Sbornik Geologickich Ved, Geologie, 15, 7–132 (in Czech).
MAJEROWICZ A., 1972: Strzegom-Sobótka granitoid massif. Geol. Sudetica, 6, 7–92 (in Polish).
OBERC-DZIEDZIC T., 1999: The geology of the Strzelin granitoids (Fore Sudetic Block, SW Poland). Min.Soc. of Poland, Special Papers, 14, 22–32.
PUZIEWICZ, J. 1990. Strzegom-Sobótka granitoid massif – current state of investigations. *Arch. Mineralog.,* 45 (1-2), 135–153 (in Polish).