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POLYCYCLE STRUCTURE OF THE TONALITE-DIORITE DYKES IN THE STRZELIN MASSIF: A RESULT OF MAGMATIC DIFFERENTIATION OR SEPARATED MAGMATIC PULSES?

The Strzelin igneous rocks are represented by synkinematic granodiorites, quartz diorites, tonalites, biotite granites (347±12 Ma) and biotite-muscovite granites (330±6 Ma) (Lorenc 1994, Oberc-Dziedzic et al. 1996). They form small isolated bodies, mostly stocks and flat dykes, within metamorphic rocks which were deformed and metamorphosed during the Late Devonian and Early Carboniferous. The size, shape and internal structure of the intrusions were defined on the basis of the interpretation of the borehole material (Oberc-Dziedzic 1999).

The tonalite and quartz diorite dykes are several metres to several tens of metres thick. They are always internally differentiated into four main varieties (B, C, D, E) which differ in colour, structure, main mineral contents and chemical composition. The colour of the rocks depends on the dark mineral content and on the way of their arrangement in the rock. The rock seems to be lighter and more coarse-grained when dark minerals are gathered into clusters than in the case when they are uniformly distributed. Among the quartz diorites three varieties can be identified: medium-grained diorite (B), fine-grained diorite with biotite phenocrysts (C) and microdiorite (D). These varieties gradually pass into one another, or can be differentiated into sub-varieties containing more or less dark minerals than the main variety. Tonalite (E) is usually a grey, fine-grained rock in the southern part of the massif, and medium-grained in the northern part.

The medium-grained quartz diorite (B) displays allotriomorphic or hipidiomorphic texture. Plagioclases are twinned and normally zoned (68-44% An in the darker sub-variety, and 52-38% An in the lighter sub-variety) with amoeboid shaped cores, sometimes strongly altered. Green hornblende forms single grains or groups of grains together with biotite. Xenomorphic quartz grains show spotty or undulose extinction.

Variety C, fine-grained quartz diorite, is a dark grey-greenish rock with black or brown spots of biotite up to 3 mm in size. This rock often contains relics of pyroxene.

Microdiorite (D) is a dark grey or black very fine-grained rock with small flakes of biotite up to 0.5 mm in size. Plagioclase laths are arranged in a manner resembling ophitic texture or show more or less visible parallel alignment. This variety always contains more hornblende than biotite, and is very poor in quartz.

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Tonalite (E) shows hipidiomorphic or ophitic texture. Plagioclase forms uneven laths usually 0.8 x 0.3 mm in size or bigger idiomorphic zoned grains up to 1.2 mm. Tonalite usually contains more biotite than hornblende, and can be rich in titanite.

The outer parts of the thin dykes, which correspond to chilled margins, are usually composed of microdiorite (D) whereas the inner part consists of grey, fine to medium-grained tonalite (E) or diorite (B).

The inner structure of the several tens of metres thick dykes is more complicated. It was more strictly known in dykes from RG-2 (60.0-136.6; 76.6 m thick) and GL-1 (102.4-184.8; 82.4 m thick).

The RG-2 dyke is inclined at an angle of 45^{o}. Generally, toward the bottom of dyke, diorite is increasingly darker and a the grain size diminishes. Besides such a tendency, six cyclic sequences of B and C or D varieties are also visible. The thickness of one cycle is 20-6 m. Each cycle has a fine-grained quartz diorite (C) or microdiorite (D) at the bottom and a medium-grained diorite (B) at the top. Inside the C variety, a thin layer with a parallel texture is usually present. The zones of schliren and leucocratic dykes are visible 1/3 or 1/2 way from the top of each cycle.

The GL-1 dyke differs from the other dykes because its inner part is more basic than its outer parts. At the top, up to 131.9 m and at the bottom, since 172.4 m it consists of the inhomogeneous medium-grained quartz diorite (B) with schlieren and thin leucocratic dykes. The inner part is composed of fine-grained quartz diorite with biotite phenocrysts (C). This rock contains uneven, tabular grains of plagioclase with high contents of anortite (up 75% in core and 45% in outer rim) and two kinds of hornblende: brown and green. The brown hornblende can be overgrown by the green one. The green hornblende contains relics of pyroxene.

Chemical analyses of the fine-grained (C) and medium-grained (B) quartz diorites from RG-2 borehole confirm presence of the magmatic cycles. A rapid increase of the SiO_2 contents on the border between the cycles and a general tendency towards an inrease in the amount of this constituent to the top of the dyke are visible. In the same direction, the contents of FeO, MgO, CaO decrease.

Chemical analyses of rocks from the GL-1 borehole show that they become more and more basic from the upper part to the middle of the dyke, and next, to the bottom, they gradually become even more acidic than at the top.

Multi-element diagrams made for several samples from the RG-2 and GL-1 dykes show similar patterns. This indicates a common source of magma.

In the light of the above-presented data, one can suppose that varieties B and C as well as their sub-varieties came into existence due to magmatic differentiation. This differentiation took place after the emplacement of the dykes.

The RG-2 dyke can be interpreted as a multiple dyke which was injected as 6 pulses of magma, coming from one magma chamber. Differentiation in the chamber prior to emplacement caused the pulses to become more and more acidic. The presence of the fine-grained quartz diorite and microdiorite, which can be interpreted as chilled margins and zones of diorites with parallel texture close to them, permit the supposition that each pulse solidified as an individual dyke intruded alongside the others.

The origin of the GL-1 dyke is not clear. It could also be interpreted as a multiple dyke, in which a more basic dyke with a fine-grained texture (C) was intruded into a more acidic with a medium grained texture (B). Such an interpretation is supported by the zones of diorite with parallel texture situated near the border between variety B and C. A parallel texture often comes into existence close to chilled zones (McBirney 1984). It cannot be excluded that the GL-1 dyke represents a simple pulse of magma, differentiated after emplacement. The light, more acidic constituents migrated towards the top and bottom part of the dyke and reacted with the earlier consolidated border part or even with the country rocks. Such a scenario well explains the presence of schlieren in the outer parts of the dyke.

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