Evolution of the Cretaceous magmatism from the Srednogorie zone to the Rhodopes: Constraints from isotope dating and tracing

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The Srednogorie and the Rhodopes are the main ore-bearing Alpine tectonic zones in Bulgaria (e.g. Von Quadt et al, 2005; Marchev et al., 2005 and references therein). To understand the transition from one to the other zone and the change of the deposit style from Cu-porphyry (Au-Mo) to mainly Pb-Zn-Cu (-Au) we made a series of isotope-geochronological and geochemical studies in the border area from Central Srednogorie to Rila-Western Rhodopes and further to South.

The tectonic contact between the Srednogorie and Rhodopes is marked by the SW-SE to E-W orientated Maritsa fault zone (Bonchev, 1946; Ivanov, in press; Sarov et al., this volume). In the studied area it is followed on the northern slopes of Rila and West Rhodope Mountains and described as a dextral strike-slip zone, active from Cretaceous to Late Alpine time (Ivanov, in press). The Northern parts of the Rhodope zone are build up by the metamorphic rocks of the Assenitsa and Arda Units (Ivanov et al., 2000) and by the low-metamorphic Thracian Unit (Sarov et al., 2006), intruded by the granitoids of the Rila-West Rhodopes batholith. The latter consist of three main rock types: hornblend-biotite granodiorites (unit 1), biotite and two mica granites (unit 2) and leucogranites and aplitoid granites (unit 3) (Vulkov et al., 1989; Kamenov et al., 1999). Here we present data for the granodiorites of the Unit 1 (Belmeken and Gruntcharitsa bodies, AvQ159 and V3P), for the main Rila granite (AvQ230) and its strongly mylonitized parts in the fault zone, south of Dolna Banja village (second unit, AvQ164). Additionally we sampled an amphibolite and cross-cutting gneissic vein of the Arda Unit, east of the batholith and about 500 m from the contact to the Assenitsa Unit (AvQ155 and AvQ156), as well as deformed (metamorphosed?) dark (AvQ229) and light (AvQ228) metagranitoid parts of the same unit, closer to the batholith.

High-precision U-Pb single grain ID-TIMS dating of long-prismatic zircons from both granodiorite samples of unit 1 (AvQ159 and V3P) define concordant ages of 69.26 ± 0.26 Ma and 66.79 ± 0.29 Ma respectively, the majority of the analyzed grains lying on or close to the concordia line. Hf isotope characteristics of the dated zircons define mixed, but mantle dominated origin of the Cretaceous magma (εHf of +1.6 to +5.4, corrected for 67 Ma), and this conclusion is supported by the εNd of the whole rock samples between -3.3 to +0.6 and initial ($^{87}Sr/^{86}Sr$) of 0.7064-0.7066. Surprisingly the metagranodiorite AvQ229 from the "hosting metamorphic basement" revealed very close concordia age of 70.77 ± 0.09 Ma and same mantle-crust magma characteristics (initial εHf of +0.3 to +5.2). Compared with the Upper Cretaceous rocks of the adjacent Central Srednogorie these show less positive εHf values infer higher input of continental-crust materials in the magma.

Similar close age relations are defined for the main (second) unit of the batholith and the metagranitic veins and bodies of the metamorphic succession. The granite sample AvQ230 is dated at 39.39 ± 0.21 Ma by concordant zircons, whereas xenotimes are slightly younger (38 to 37 Ma) and magmatic monazites show lead loss with ages ranging between 26-30 Ma. The metagranitic veins from the "metamorphic basement" are dated in the range from 39 Ma (zircons from the closer outcrop AvQ228) to 40-43 Ma (AvQ156). All sampled granites reveal slightly negative to slightly positive εHf characteristics.

Based on *in situ* LA-ICP-MS dating and MC-LA-ICP-MS Hf-tracing the latter are explained mainly by the different origin of the crustal materials, generating and contaminating the granitic magma. The metadiorite (AvQ155) from the Arda unit is ~240 Ma old.

The new isotope data open new perspectives for prospecting of Srednogorie type ore deposits in the Rhodopes, related with Upper Cretaceous deformed/metamorphosed magmatic rocks.