

Geological, petrographic and geochemical peculiarities of the effusive rocks from the area of Zlatusha village (Western Srednogie)

Геоложки, петрографски и геохимични особености на ефузивните скали от района на с. Златуша (Западно Средногорие)

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Резюме. Ефузивните скали от района на с. Златуша са част от т.нар. Бурелски вулкански центрове на Западното Средногорие. Ефузивните скали са представени от латити и андезитобазалти. Образувани са в обстановка на активна континентална крайнина. Характерно за района е редуването на епикластични отложения, експлозивни вулкански продукти и лавови изливи. За формирането на химизма на магмите основно значение са имали процесите на топене и на кристализационна диференциация с фракциониране на магнетит, клинопироксен, плагиоклаз и апатит.

Key words: Western Srednogie, petrology, geochemistry, volcanic center.

Geology

The studied volcanic rocks belong to the Bourel volcanic centers (Dabovski et al., 2008). The volcanic structures are not well preserved. Nevertheless we presume that the products of one volcanic centre build up the area around the Zlatusha village with one main vent and several small parasitic and satellite vents. The volcanic edifice is composed mainly by volcanoclastic (epiclastic and pyroclastic) rocks and less by massive lava flows. In most of the cases we distinguish a sequence of epiclastic rocks overlain by pyroclastic agglomerate, bomb tuff, covered by a lava flow with the same composition as the bombs from the tuff (Fig. 1). Epiclastic rocks predominate. The layers of pyroclastic and effusive rocks are with thickness between 2 and 6 m. In most of the cases they are subhorizontal or with a gentle slope (up to 12–18 °) to the West–Northwest. Several

dykes with different thickness are also established. The two biggest dykes are 4–5 m thick and about 120 m long oriented as the predominant part of the dykes in NW–SE direction. Southern of the Zlatusha village several small dykes have radial disposition probably focusing in a vent. Northern and northwestern of the village are established isometric subvolcanic bodies and intensive hydrothermal alteration areas most probably related with other vent structures.

The lava flows are with basaltic andesite, andesite and latite composition and have porphyritic texture. Phenocrysts are plagioclase (An_{51–68}), clinopyroxene (diopside-augite, En_{37–45}Fs_{12–15}Wo_{43–47}, Mg # 0.71–0.80) and amphibole (chermakite, Mg# 0.73–0.96). Rare altered biotite is also established in the andesite. Small rounded mafic magmatic enclaves are found in dykes and bigger blocks from the volcanoclastic rocks.

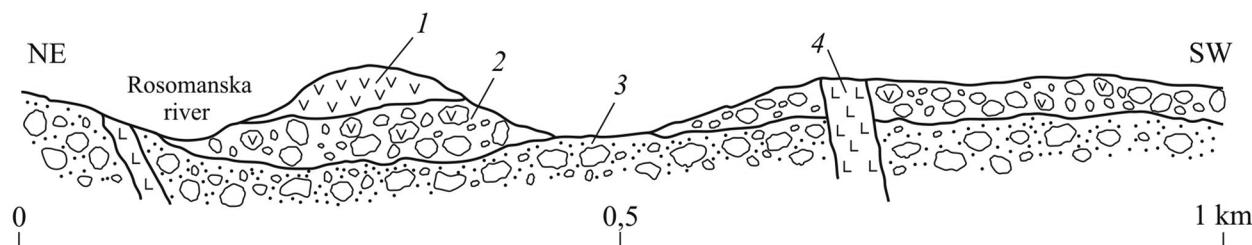


Fig. 1. Cross section across the SW area of the village of Zlatusha
1, lava flows; 2, agglomerate tuffs with volcanic bombs; 3, epiclastic rocks; 4, dykes

Geochemistry

The volcanic rocks of the vicinity of Zlatusha are medium-K to high-K. SiO₂ ranges from 50 to 56 wt.%, and Mg# varies between 34 and 60. Magmatic evolution is characterized by decreasing of TiO₂, FeO+Fe₂O₃, MgO, CaO, P₂O₅, Cr, Ni, Sr, and V, increasing of K₂O, Rb, Sc, Cu and Pb, relative stability of Al₂O₃, Na₂O, Zr, Y, Nb and U and no clear tendencies for Ba and Zn. Chondrite normalized REE patterns are enriched in LRRE and have slight negative Eu anomaly (Eu/Eu* = 0.79–0.95). PM normalized spidergrams show negative anomalies for Nb, Ta, Ti, and P. FMM normalized patterns for the more primitive volcanics have VHI>>Hi>MI and after Pearce and Parkinson (1993) could be the result of a weak to moderate melting degree of a fertile mantle source.

Petrology

The geochemical peculiarities of the volcanic rocks presume fractionation of Cpx, Mt and less Pl during the magma evolution. The temperature of crystallization of the latites (amphibole–plagioclase geothermometer of Blundy and Holland, 1990) is 815–950 °C, for the basaltic andesite it is 870–900 °C and for the magmatic enclaves it is 910–950 °C. The pressure of crystallization of the amphiboles is 4.2–6.9 kbars (after the geobarometer of Johnson and Rutherford, 1989).

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- On the Th/Yb vs. Ta/Yb diagram (Gorton, Schandl, 2000) the less evolved Zlatusha volcanic rocks, belonging to the shoshonitic series, plot in the active continental margin zone.
- The negative anomalies for Nb, Ta, Ti and P on Primordial Mantle normalized patterns are characteristic for synsubduction-related volcanics and are most probably due to residual rutile during mantle melting of the source and to an early apatite fractionation. The Th/La vs. Sm/La diagram (Plank, 2005) let us suppose participation of sediment component during the magma generation.

Discussion and conclusion

The volcanic rocks of the Zlatusha area are products of one complex volcanic center. The magmatic differentiation is due to fractionation of Cpx, Mt, Pl and Ap and to magma mixing in a synsubductional setting at active continental margin. The parental magma is generated during a weak to moderate melting of a fertile mantle source with participation of sediment component and residual rutile during the melting.

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