New manifestation of the intrusive K-alkaline Variscan magmatism from Shipka, Stara Planina Mts., Bulgaria

Ново проявление на интрузивния К-алкален херцински магматизъм в района на гр. Шипка, Стара планина, България

Momchil Dyulgerov
Момчил Дюлгеров

Sofia University "St. Kliment Ohridski", 15 Blvd. Tzar Osvoboditel, 1504 Sofia; E-mail: momchil@gea.uni-sofia.bg

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A new manifestation of K-alkaline magmatism was discovered in a quarry 3 km NW from the town of Shipka, near Golyama Varovita River. It outcrops as a small, dyke-like or stock-like body with sharp intrusive contacts, hosted in Devonian low-grade metasediments. The size of the outcrop – 25×15 m infers that this is either a small dyke or apophyses of a bigger body, not exposed on the surface.

The rocks are fresh, grayish-reddish, and medium to coarse-grained, with a massive structure. The rocks are syenite and composed of K-feldspar (65%), mica (20%), pyroxene (7%) and sodic amphibole (6%); apatite and zircon are abundant accessories.

Pyroxene is phenocrystal, always euhedral, often chloritized. Its composition is diopside with slight variation toward augite. Pyroxenes have low amount of Ti, Cr, Na and significant X_{Mg} from 0.94 to 0.88.

Mica is fresh, euhedral and pale brown, often mantled by amphibole. Its composition is phlogopite-biotite with X_{Mg} 0.86–0.75. Micas is characterized by low Cr, moderate Ti (1–3 wt. %) and a relatively import of Al (13–15 wt. %).

Potassium feldspar forms platy, sub to – anhedral crystals, slightly perthitic. Na, Ca and Fe contents are low, but it contains significant Ba (up to 4.7 wt. % BaO) and Sr (up to 2.2 wt. % SrO).

Amphibole is the last crystallized phase, interstitial and forms prismatic and fibrous tiny crystals, mainly arfvedsonite, rarely magnesio-arfvedsonite, eckermannite or magnesioriebeckite. The amphiboles have important Ti content (up to 0.41 apfu); X_{Mg} varies from 0.32 to 0.6. [A]-site is filled from 0.47 to 1 by Na and K in equal proportions. The lack of significant [A]-site vacancy is indication for the relatively high temperature of crystallization (above 800° C) and the magnesium number <0.5 is an evidence for moderately oxidizing conditions of crystallization, probably around or just above QFM buffer.

This syenite has relatively low SiO_2 (51.76 wt. %) and Al_2O_3 (12.67 wt. %), but very high K_2O (9.61 wt. %), Na_2O (4.27 wt. %) and TiO_2 (1.2 wt. %). The rock is strongly peralkaline (AI: 1.38) with important X_{Mg}: 0.76. Contents of MgO (5.73 wt. %), Cr (246 ppm) and Ni (116 ppm) are high, but a melt with such composition is not in equilibrium with upper mantle peridotite. Thus, this syenite crystallized from a slightly evolved fluid and does not represent a primary melt (s. s.).

The rocks show extreme enrichment in LIL elements, most outstanding of which are Ba (11000 ppm), Sr (1719 ppm) and Rb (398 ppm). Concomitant with the peralkaline character, the rocks have important values in some HFS elements: Zr (692 ppm), Th (137 ppm) and U (22 ppm). RE elements (ΣREE: 498 ppm) present very steep tendency on chondrite-normalized diagram (Fig. 1) with La_N/Lu_N – 58 and strong enrichment in LREE. Eu anomaly is weak (Eu/Eu*: 0.75) and does not attest for im-

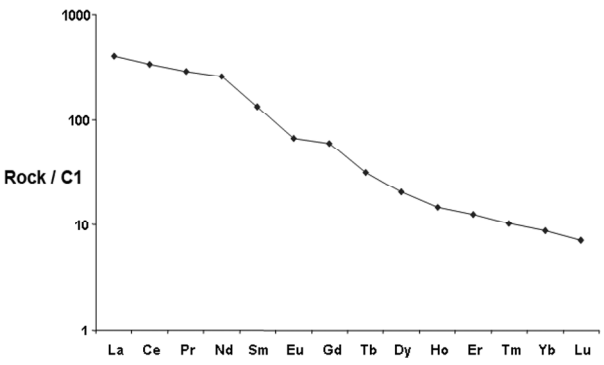

Fig. 1. Distribution of REE on chondrite-normalized diagram

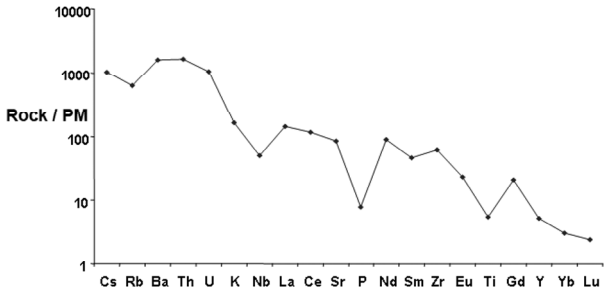

Fig. 2. Spiderdiagram showing trace elements distribution

portant feldspar fractionation during the evolution of the melt.

Preliminary isotopic results (time-corrected: 320 Ma) show that syenites are characterised by $^{87}Sr/^{86}Sr$ – 0.708 ratio and $^{143}Nd/^{144}Nd$ – 0.51194 (εNd: –5.6) ratio, plotting the rocks in the enriched quadrant of the isotopic systematic.

All observed compositional features clearly distinguish these syenites from the neighboring Shipka monzonites. These rocks represent an independent magmatic pulse during the Variscan orogeny. The chemical features of the rocks are consistent with a metasomaticaly enriched upper mantle source (Fig. 2). Introduction of crustal materials could be responsible for the high values of generally considered as incompatible elements: Rb, Sr, Ba, Th, U. This process explains the observed isotopic signature: significant ratio of radiogenic Sr and unradiogenic Nd. Low-degree melting of mica and/or richterite – bearing peridotite will produce primitive magma with observed particularities. Chemical composition – high potassic content, very high LILE, negative anomalies in Ti and Nb support the idea that the rocks are formed in a post orogenic geodynamic setting.