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Fertile Magmatism from the Northern Part of the Central Srednogorie Segment of the Late Cretaceous Apuseni-Banat-Timok-Srednogorie Magmatic/Metallogenic Belt

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The Late Cretaceous magmatic activity of the Apuseni-Banat-Timok-Srednogorie magmatic and metallogenic belt formed as a result of the northward oblique subduction of the Vardar-Izmir Ocean beneath Serbo-Macedonian and Rhodope massifs. The southward shifting of the magmatic activity (93–67 Ma) has been interpreted as a consequence of retreating/steepening subducted plate and slab roll-back. The magmatic products of the Apuseni-Banat-Timok-Srednogorie belt are represented by intrusive and extrusive rocks of typical subduction-related signature, highly variable chemistry, and low radiogenic Sr, Nd, and Pb compositions. The present study focuses on the fertile magmatism of the northern part of the Central Srednogorie segment of the Apuseni-Banat-Timok-Srednogorie belt and its relation to porphyry-style mineralizations in the area. These are the economic Elatsite (Cu-Mo-Au) deposit and three subeconomic occurrences (Etropole, Gorna Kamenitsa, and Praveshka Lakavitsa). The mineralization is related to porphyritic subvolcanic stocks and dikes hosted in Varsiscan granitoids, lower Paleozoic anchymetamorphic volcanosedimentary succession, and the northernmost (Praveshka Lakavitsa) in Lower Cretaceous sediments. Some of the porphyry systems (e.g., Elatsite and Praveshka Lakavitsa) are related to multiple magmatic events. The porphyries have monzodioritic to monzogranodioritic composition and high-K to shoshonitic affinity. They are high Al and water rich (up to 4–6%). Plagioclase (andesine to labrador) and amphibole (hastingsite to magnesiohastingsite) are the major phenocrysts represented in all rock types, associated with subordinate sanidine, diopside, and biotite. Typical accessories are apatite, allanite, titanite, zircon, and magnetite. Equigranular mafic enclaves, along with reverse zonation and sieve zones in some of the amphiboles and diopsides, hint at processes of mingling and mixing related to mafic injection(s). High sulfur of the magmas is recorded by the inclusions of magmatic sulfides (pyrrhotite) in some of the mafites. Numerous mafic amphibole-rich cumulitic xenoliths (hornblendite, clinopyroxene-hornblendite, gabbro, and their pegmatoid varieties) have been entrained by the Praveshka Lakavitsa porphyries. They indicate the existence of a large, water-saturated, deep parental magma chamber, the depth of which (16–25 km) was estimated based on Al content in the amphiboles (both in the subvolcanic rocks and the xenoliths). On the primitive-mantle normalized diagram, the subvolcanic rocks show peaks in LILE (U, Th, Pb) and troughs in Nb, Ta, Ti, and P, showing typical orogenic arc characteristics. On the chondrite-normalized diagrams, the rocks exhibit high contents of LILE, steep LREE patterns, and almost flat to listric-shaped HREE profile. The rocks exhibit adakite-like characteristics with a weak negative Eu anomaly (0.80–0.83), $La/Yb_{(N)}$ (13–15), high Sr (900–1,600 ppm), and low Y (14–18 ppm), which is due to amphibole fractionation (Dy/Yb decrease with SiO_2 increase) with suppression of the plagioclase crystallization. The ages (LA-ICP-MS zircon dating) and $^{87}Sr/^{86}Sr_{(i)}$ and $\varepsilon Nd_{(i)}$ of the subvolcanic rocks show slight rejuvenation and

decreasing of primitive affinity from north to the south: Praveshka Lakavitsa (subvolcanics: 93.11 ± 0.38 Ma; 0.70435–0.70419; –0.78/0.38; cumulate xenoliths: 0.70348; 1.92); Etropole (92.38 ± 0.39 Ma; 0.70406; –1.24); Elatsite (92.1 ± 0.3–91.34 ± 0.39; 0.70474–0.70450; –1.12/–0.95); Kashana pass (91.81 ± 0.76 Ma; 0.70579; –2.39). This is in accordance with the southward migration of the magmatism and predominant fractionation combined with mixing and slight effects of the assimilation.