Magmatic petrology and ore generating potential of the Zidarovo center, Eastern Srednogorie, Bulgaria.

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The Zidarovo magmatic center is situated 15-20 km southward of the Bourgas town, Bulgaria. The magmatic center is in the easternmost part of the Apuseni-Banat-Timok-Srednogorie Late Alpine belt. The center is close to the border between the Strandja Collage Unit (SCU – to the south) and the Eastern Srednogorie Volcanic Zone (ESVZ – to the north). The Zidarovo volcanic edifice is asymmetric, with a larger and SE-elongated eastern part and a smaller and isometric western part. The eastern part of the volcano is subsided and is built up mainly by basaltic to trachybasaltic lavas (with abundant pillow lavas) and a small amount of pyroclastic and epiclastic rocks. The western part consists of a relatively larger part of pyroclastic and epiclastic rocks (up to 30-40%) generally with red colouring, evidence for a higher oxygene potential during the subaerial or shallow water volcanic activity. The subvolcanic dyke rocks occupy a large horse-tail splay structure probably due to the westward moving of the SCU, which was a dextral strike-slip in transpressional tectonic event. The dyke swarm was the main magmatic conduit for lava effusions in the eastern part of the volcano. The volcanic and subvolcanic rocks are crosscut by the multi-phase Zidarovo differentiated small intrusion, exposed over an area of 3-4 km^2, and elongated in a SE direction.

Major elements in volcanic and subvolcanic rocks display similar trends, and indicate that the rocks belong to the medium-K to high-K series. The trends of Na_2O and K_2O for the intrusive rocks differ from those of the volcanic and subvolcanic rocks. Two trends are distinguished in the intrusive rock samples: a low-K and a high-K to medium-K one. The potassic trend for volcanic and subvolcanic rocks shows a steep increasing of K_2O in a narrow SiO_2 interval. A similar magmatic evolution is interpreted by Meen (1987) by a differentiation mechanism due to the fractionation of Ol and Px from a relatively anhydrous melt at 10 kbars (30 km depth) in a Moho level chamber. The derived magmatic liquids are strongly enriched in K_2O. During this evolution the evolved magmas were also enriched in water, to a level to form amphiboles in the more evolved basic subvolcanic rocks (more than 4 wt% water for basalts when amphiboles appear). The magmatic evolution of the intrusive complex occurred at a shallower depth with respect to relatively hydrous melts. Water contents in the more primitive basaltic magmas were about 0-2 wt% according to the geohydrometer of Merzbacher and Eggler (1984). The more evolved magmas of the volcanic rocks (latites and trachytes) have water contents up to 5 wt%.

The temperature of clinopyroxene phenocryst crystallization was 1185-1140^{o}C. Crystallization of CPx from the ground mass was at 1100-1110^{o}C (approximately the temperature of the basaltic lava at the earth surface). The hornblende-bearing intrusive rocks (monzodiorite, diorite, monzogabbro) crystallized at temperatures of 820-890^{o}C and at pressures of 4.5 – 5.4 kbars.

Small sulfide magmatic inclusions of pyrrhotite and chalcopyrite are present in the pyroxenes of the volcanic and subvolcanic rocks. The calculated fS_2 is 3.5-5 at the respective magmatic temperatures. Interstitial anhydrite (late magmatic (?)) is present in monzodiorites and in quartz-diorites, which is evidence for the high S potential of the magma and the relatively high fO_2 (oxidized intrusive magma). Magmatic activity evolved in a volcanic arc tectonic setting.

Isotopic compositions ($^{86}Sr/^{87}Sr$ and $^{143}Nd/^{144}Nd$) of the basalts and monzogabbros from the Zidarovo magmatic center plot in the mantle array between the fields of BSE and HIMU, closer to HIMU and PREMA. Those are pure $^{86}Sr/^{87}Sr$ mantle characteristics (0.70370-0.70378) without crustal contamination.