IMPLICATIONS FOR THE PETROGENESIS OF THE BASALTIC ROCKS ERUPTED FROM THE MONOGENETIC KISSOMLYÓ VOLCANIC CENTRE, WESTERN PANNONIAN BASIN, HUNGARY

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The Kissomlyó volcanic centre is located in the Little Hungarian Plain Volcanic Field (Western Pannonian Basin, Hungary) that is one of the post-extensional monogenetic alkaline basaltic volcanic fields in the Carpathian-Pannonian Region. This eruptive centre is a complex monogenetic volcano that consists of different eruptive units. First, phreatomagmatic explosions built up a tuff ring in a terrestrial setting which was followed by the cessation of the volcanism and the formation of lacustrine sediments in a crater lake. However, later the volcanic activity rejuvenated: subaqueous lava flow emplaced within the crater resulted in the formation of pillow lava that intruded into the lacustrine sediments. The time gap between the tuff ring formation and the emplacement of the lava flow is estimated to be a few thousand years (MARTIN & NÉMETH, 2005). Afterwards, subaerial intracrater lava flows took place represented by columnar jointed basalt. In addition, on the top of the volcanic edifice a spatter cone (Királykő) can be found. The $^{40}Ar/^{39}Ar$ age of the subaerial lava flow unit is 4.63 Ma (WIJBRANS *et al.,* 2007). The complex volcanological feature and the rejuvenation of volcanic activity in the same place imply that this monogenetic volcano can be characterized by a complex evolution.

To reveal the magma evolution processes and whether there is significant compositional variability through the succession we carried out stratigraphically controlled sampling, i.e., collected rock samples from the different eruptive units (pyroclastics, pillow lava, columnar jointed basalt, lava spatter). The samples have porphyritic textures containing abundant glomerocrysts of clinopyroxenes, olivines and clinopyroxenes +olivines. The pheno- and microphenocrysts are olivine (with chromian spinel inclusions), clinopyroxene and plagioclase. The groundmass consists of microlitic plagioclase, olivine, clinopyroxene, Fe-Ti-oxides, apatite and some glass. The texture of the columnar jointed lava is much coarser-grained than that of the juvenile basalt fragments of the pyroclastics concerning their phenocrysts (up to 1.2 mm) as well as their groundmass.

Whole-rock major and trace element analyses were performed on samples from each eruptive unit. Based on their total alkalis relative to silica contents the samples are basalts, trachybasalts and basanites. They have Mg#s (54–65), Ni (99–140 ppm) and Cr contents (144–263 ppm) characteristically lower than those of the basaltic rocks from the other volcanic centres in the Little Hungarian Plain Volcanic Field. These together with the abundance of clinopyroxene phenocrysts (which are also rare in this region) suggest that the magma that erupted from the Kissomlyó volcano was more fractionated than those of the other eruptive centres in this region. Concerning the whole-rock major and trace element concentrations of the samples from the distinct eruptive units they do not show significant compositional differences. The compositions of the studied sideromelan glass shards in the pyroclastics can be originated from the whole-rock compositions by magma fractionation.

Textural and chemical investigations of the rock-forming minerals were carried out on selected samples from the pyroclastic unit and from the columnar jointed basalt representing the magmatism before and after the quiescence period. In all samples most of the olivine phenocrysts show normal zoning, however, in the juvenile basalt fragments of the pyroclastics reversely zoned olivines can be also found. These Fo-poor cores do not fit in the trend formed by the dominant olivine compositions (in the plots of CaO, NiO and MnO vs. Fo) suggesting possible open-system processes. Additionally, exotic olivine crystals with completely different compositions also occur. Chromian spinel inclusions found in olivines (and in a few clinopyroxene phenocrysts as well) have diverse compositions, but the majority of them are characterized by Cr#s varying from 45 to 55. Exotic spinel inclusions with distinct compositions can be found in phenocrystic olivines as well as in exotic olivines. Clinopyroxene phenocrysts show sector zoning and usually surround olivine phenocrysts indicating that they crystallized after the olivines. Based on clinopyroxene-melt thermobarometry (PUTIRKA *et al.,* 1996) the studied clinopyroxenes could have crystallized in a melt accumulation zone at the crust-mantle boundary.

References

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