Petrographic and geochemical investigation of the pyroclastics from Bondoró volcanic centre (western Pannonian Basin, Hungary)

Zoltán Taracsák
MTA-ELTE Volcanology Research Group Department of Petrology and Geochemisty, Eötvös Loránd University, Budapest, Hungary
(ursus92@hotmail.com)

Bondoró is one of the youngest (~2.3 Ma) and most complex eruptive centres of the Bakony-Balaton Highland Volcanic Field (western Pannonian Basin, Hungary), that belongs to the post-extensional monogenetic alkaline basaltic volcanic fields in the Carpathian-Pannonian Region. The Bondoró volcanic centre consists of different eruptive units, each produced by different eruptive mechanisms: first, phreatomagmatic eruptions built up a tuff ring which was filled by basaltic lava afterwards. In the last phase, magmatic explosive eruptions (and related lava flows) occurred and a scoria cone was formed. This complex volcanic structure and the discordance observed in the succession suggest that Bondoró is a polycyclic monogenetic volcanic centre (Kereszturi *et al*., 2010). Former studies of the lava rocks and basaltic bombs revealed that the Bondoró alkaline basaltic magma is unique among the Pannonian Basin basalts: it contains a vast amount of lithospheric mantle-derived xenocrysts (~30 vol%) and xenoliths (Jankovics *et al*., 2013). This xenocryst enrichment caused the high concentration of refractory elements (13.1-13.9 wt% MgO, 459-490 ppm Cr, 444-570 ppm Ni), therefore the whole-rock composition of this basaltic rock does not represent the original magma composition.

My research focuses on the petrographic and geochemical analysis of the oldest products of the volcanic centre which is represented by the tuff ring sequences built up by tuffs, lapillituffs and lapillistones. Detailed petrographic investigations confirmed that the juvenile basalt fragments of these pyroclastic rocks also contain abundant xenocrysts and xenoliths, thus their whole-rock compositions are modified as well (similarly to the younger products of Bondoró).

To find out the original composition of the basaltic magma erupted to the surface, sideromelane glass shards of the pyroclastics were carefully analysed which represent the quenched, fractionated melt produced by the phreatomagmatic eruptions. Detailed investigation of these glass shards is often the only possible tool to reveal the parental magma composition in the case of basaltic pyroclastics. The glass shards were analysed based on their colour, crystal content and chemical composition. Four different crystal phases were observed: olivine (7.1-15.1 vol%), clinopyroxene (5.4-10.8 vol%), plagioclase (3.5-10.6 vol%) and Fe-Ti-oxides (1.5-2.5 vol%). The glass shards have phonotephritic and tephriphonolitic compositions (2.6-3.3 wt% MgO).

For the major element geochemical modelling, compositions of the olivine phenocrysts ($Fo_{76\text{-}88}$) were measured in the studied glass shards, while in the case of the other crystals, previous mineral chemical data from the Bondoró lava rocks were used (Jankovics *et al*., 2013). In the knowledge of the amount of the different phases, together with their compositions, mass balance calculations were carried out to approximate the major element composition of the parental magma. During this modelling procedure, it is required to assume a chemically closed system and homogeneous glass compositions. The calculated parental magma compositions are tephritic/basanitic and phonotephritic (6.5-9.5 wt% MgO). The measured glass compositions and the calculated compositions fit in the alkaline fractionation trend.

Using sideromelane glass shards for major element geochemical modelling in monogenetic volcanic centres is a useful tool to reveal the composition of the parental magma, when the whole-rock composition (the usual approach) is not adequate. The Bondoró alkaline basalt is a good example for this, because of the significant contamination by the xenocrysts. This geochemical modelling can also be applied in the case of such monogenetic eruptive centres, where no suitable lava rocks or juvenile basalt fragments of pyroclastics are available.

Recent studies suggested that polycyclic monogenetic centres (e.g., Udo, Jeju Island, South Korea; Brenna *et al*., 2010) can be supplied by compositionally different magma batches, thus it is essential to carefully investigate every eruptive unit of a volcanic centre. However, this can be problematic in pyroclastic strata, which contain scarce amount of juvenile basalt fragments. Through the investigation of sideromelane glass shards of the pyroclastics and whole-rock geochemistry of lavas/bombs, it is possible to approximate the parental magma compositions in the different eruptive units of a volcanic centre, enabling us to identify any compositional differences between the erupted magma batches.

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