SILICATE MELT INCLUSION STUDY ON PLAGIOCLASE FROM OLIGOCENE DACITE, ZALA BASIN, WESTERN HUNGARY

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Silicate melt inclusions are small samples of magma drops that are trapped during crystal growth at magmatic temperature and pressure. They are very useful tools in petrologic research because they provide direct information about the composition of melt and physical parameters of crystallization at various stages in the evolution of magmatic systems.

In this paper we use silicate melt inclusions to study composition and crystallization history and temperature of dacitic melt from Zala Basin, western Hungary. The Zala Basin, situated in the ALCAPA block West to the Lake Balaton and North to the Balaton Line, is the north-eastern continuation of the Periadriatic Line and Igneous Belt. The basement of Zala Basin is made mostly up by Mesozoic sedimentary formations followed by Eocene sedimentary sequences. A thick effusive and explosive andesitic-dacitic volcanic sequence occurs in the northern part of the Zala Basin, in the Bak–Nova depression, where the youngest Eocene sediments (Padrag Marl) intercalate with the oldest products of the volcanic rocks. Age of the andesitic-dacitic rocks ranges from 34.9±1.4 to 26.0±1.2 Ma (BENEDEK *et al.*, 2004). The studied Söjtör dacite is only know in drill cores. The volcanic rock shows porphyritic texture with large amount of plagioclase and amphibole phenocrysts. Plagioclase is the dominant phenocryst; the size of the crystals is 0.5–5.0 mm. They are euhedral, zoned, mostly fresh, but some of them are slightly altered. The anorthite content varies between An81 and An51 and gradually decreases from cores towards rims. Plagioclase contains numerous silicate melt inclusions (Fig. 1). Amphibole phenocrysts, forming euhedral–subhedral grains, are significantly less abundant than plagioclases. The groundmass is made up fine-grained plagioclase, quartz, amphibole, oxides, and glass. The glass is partially altered to clay minerals.

Plenty of silicate melt inclusions are trapped in the plagioclases. Their distribution is sometimes randomly; sometimes follows zones of plagioclase (Fig. 1). The silicate melt inclusions, which sizes are between 20–50 μm, show negative crystal shape. They contain glass and a large bubble (Fig. 1). All of theses are characteristic of primary silicate inclusions (ROEDDER, 1984). Besides these constituents, accidentally trapped euhedral apatite crystals can also be observed associated with the silicate melt inclusions. Apatite also occurs as single inclusions in both phenocrysts.

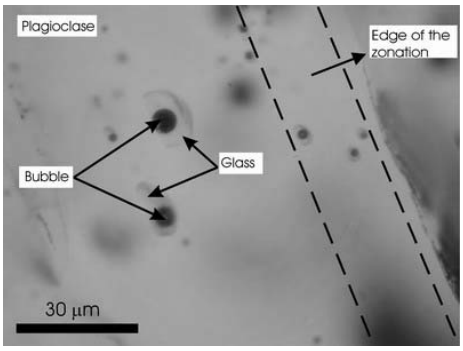

Fig. 1: Silicate melt inclusions in plagioclase next to zonation.

Chemical composition of glass in silicate melt inclusions shows high SiO_2 and K_2O content (up to 77.8 wt% and 5.51 wt%, respectively). The other major elements, particularly Al_2O_3, CaO, MgO and FeO are strongly depleted (down to 11.2 wt%, 2.13 wt%, 0.75 wt%, 1.08 wt%, respectively). This composition is extremely different from the dacitic composition of the bulk rock; the glass could not be in equilibrium with the crystallizing host plagioclase crystals. Therefore, significant post-entrapment crystallization can be considered within the silicate melt inclusion, which took away the majority of CaO and Al_2O_3 and formed plagioclase on the wall of inclusions with the same composition as the host.

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