HFS element minerals in volcanic sanidinite formed from a gaseous phase

D. AßBICHLER, S. HEUSS-AßBICHLER, K. T. FEHR AND D. MÜLLER

Ludwig-Maximilians-Universität München, Department of Earth and Environmental Sciences, Theresienstraße 41, 80333 Munich, Germany, d.assbichler@lmu.de

Sanidinites are rare rocks of igneous origin and are mostly found as ejecta of explosive volcanoes. They are observed in a small number of localities, including Laacher See in Germany, the middle Italian volcanic province, Mt. Vesuvius, and the Azores. It is suggested that they are formed as magmatic cumulates from gas-rich, SiO_2-undersaturated melts. They have to be distinguished from xenoliths in magmatic rocks, which are formed during the metamorphic sanidinite facies.

The geochemistry of sanidinites is comparable to that of syenites or phonolites, but with a higher content of Cl and SO_4. Main minerals are sanidine and sodalite group minerals. Remarkable are large sanidine crystals with mostly interlocking fabric, creating large cavities. Within these pores euhedral crystals are observed, indicating the solvothermal formation of the mineral phase from a gaseous magmatic phase. Characteristic minerals are zircon ($ZrSiO_4$), baddeleyite (ZrO_2) (Fig. 1), and other mineral phases with high contents of incompatible HFS elements like thorite ($ThSiO_4$).

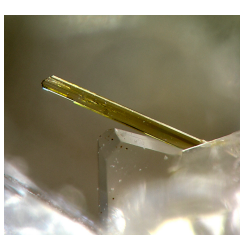

Figure 1: Solvothermally formed baddeleyite in a sanidinite from Laacher See (Germany); photo by Christian Rewitzer

Preliminary results obtained from whole rock analysis from sanidinites from Laacher See (Germany) show a positive correlation between LOI, sulfate, Cl, and Na with the HFSE like Zr. Together with the observed phase relationship we conclude the formation of an exceptional gas phase within the magma chamber enriched in incompatible elements, like HFSE and light volatile elements, in addition to CO_2, H_2O; sulfate and Cl.