Water Diffusion in Phonolite Melts

Schmidt, Burkhard C.[1] Flagmeier, Jens[1] Blum-Oeste, Nils[1]
[1]Experimentelle und Angewandte Mineralogie, GZG, Georg-August Universität Göttingen

Water diffusion in a Na-rich phonolitic melt of Montaña Blanca, Tenerife, was investigated experimentally at 2 kbar in the temperature range of 800 to 1000 °C, for water contents between 1 and 6 wt%. Diffusion couple experiments were performed in rapid quench cold-seal pressure vessels. The experimental setup allowed rapid heating and quenching of the samples within seconds. Compared to the run durations of 30 to 90 minutes, these short heating and cooling periods can be neglected. Thus, no corrections have to be applied for the calculation of the diffusion coefficients. After the experiments, water diffusion profiles were determined by FT-IR micro-spectroscopy on doubly polished glass sections. Diffusion coefficients were determined by Boltzmann-Matano analysis.
Water diffusion increases with increasing water content and temperature. At 1000 °C, log D_{water} ranges from about –6.4 to –5.8 cm^2/s for water concentrations between 2 to 6 wt%. The positive effect of water concentration slightly increases with decreasing temperature. The temperature dependence follows Arrhenian behaviour, with the activation energy decreasing from about 80 to 50 kJ/mol for water concentrations from 2 to 6 wt%.
These results present the first data on water diffusion in phonolitic melts. The applied experimental conditions are directly relevant for magmatic processes of phonolite erupting volcanoes. Further experiments are in progress to determine water diffusion coefficients in other phonolite compositions such as Laacher See or the K-rich phonolite composition of the 79AD eruption of Mt. Vesuvius.

→

Abs. No. **193**
Meeting: **DMG 2008**
submitted by: **Schmidt, Burkhard**
email: **burkhard.schmidt@geo.uni-goettingen.de**
date: **2008-05-29**
Req. presentation: **Vortrag**
Req. session: **S06**