Geophysical Research Abstracts
Vol. 12, EGU2010-9371, 2010
EGU General Assembly 2010

Water quantification in silicate glasses and melts using Raman spectroscopy

Charles Le Losq and Daniel Neuville

Physique des Minéraux et des Magmas, Géochimie et Cosmochimie, CNRS-IPGP, 4 place Jussieu, 75252 Paris Cedex 05, France (lelosq@ipgp.jussieu.fr)

Water plays a fundamental role in the dynamics and evolution of magmas in the deep interior and during volcano eruptions. In particular, extraction of magma can change drastically as a function of dissolved water content. In addition to temperature, pressure and main chemical components, volatiles exert a strong influence on the physical properties of magmas. However their speciation, which is pressure and temperature dependent, must be understood to fully assess their effects on the properties of magmas. Therefore we need to quantify the proportion and speciation of volatile in silicate melts.

To quantify water content in silicate glass or lava, bulk analysis like fire loss or water extraction are very well used and accurate, but they are destructive and a sufficient quantity of material is needed. Raman spectroscopy allows to measure water contents of hydrous silicate glasses. It offers several advantages in the study of natural silicate glasses like pumice: (i) the high spatial resolution of 1-2 μm, (ii) the non-destructive nature of this analysis and (iii) sample preparation is not necessary. Two parts can be distinguished on Raman spectra of a hydrated silicate glass: the low wave-number region, which correspond to vibrations of the silicate network (0-1500 cm^{-1}), and the high wave-number region which correspond to the OH^- stretching vibration and H_2O molecular vibration (3100 -3750 cm^{-1}). Behrens et al. (2006) have shown that water content of a glass can be determined making a ratio between these two parts. However, their calibrations are SiO_2 dependent. We present now a new chemical independent internal calibration. Using cubic-spline baseline to fit the bases of silicate peaks in the low wave-number region of Raman spectra allows us to take into account the changes in this region induced by chemical variations in our set of glasses (basaltic to rhyolitic). That allows us to study basaltic glasses or rhyolitic glasses with the same calibration line.

Ref.: Behrens H., Roux J., Neuville D. R., Siemann M., 2006, Quantification of dissolved H_2O in silicate glasses using confocal microRaman spectroscopy, Chemical Geology 229, 96-112.