

Measurement of water contents in olivine using Raman spectroscopy

NATHALIE BOLFAN-CASANOVA^{1,*}, GILLES MONTAGNAC² AND BRUNO REYNARD²

¹Clermont Université, Université Blaise Pascal, Laboratoire Magmas et Volcans, CNRS, IRD, 5 rue Kessler, 63038 Clermont-Ferrand Cedex, France

²Université Claude Bernard Lyon 1, 43 Bd du 11 Novembre 1918, F-69622 Villeurbanne Cedex, France; CNRS, France; Ecole Normale Supérieure de Lyon, Site Monod, 15 parvis René Descartes BP7000, Lyon, F-69342, France

ABSTRACT

We have measured the water contents in forsterites and olivines synthesized in the multi-anvil press using confocal Raman spectroscopy. These samples were previously characterized for water contents by polarized FTIR and contain from 75 to 1300 ppm wt H₂O. We find that both forsterite and olivine follow the same trend in water content vs. integrated Raman OH/Si intensity. In addition three synthetic enstatites also display a linear trend in water vs. OH/Si integrated Raman intensity but with a different slope than for olivine, indicating that the calibration for measuring water by Raman is matrix dependent. Three glasses of different compositions (two rhyolites and one basalt) and different water contents were also analyzed. Comparison with the forsterites and olivines shows that the Raman cross-section of these glasses is very different and their intensities must be corrected by different factors. Therefore, to be able to use glasses as external calibrants, prior knowledge of their behavior compared to well-characterized NAM standards is necessary.

Keywords: Raman spectroscopy, quantification, water content, olivine