In situ study of hydrogen isotopes fractionation between silicate melts and aqueous fluids: Implications for subduction zone processes

CÉLIA DALOU[1], CHARLES LE LOSQ[2] AND BJORN O. MYSEN[2]

[1]Department of Earth Sciences, University of Minnesota, Minneapolis, MN 55455, USA

[2]Geophysical Laboratory, Carnegie Institution for Science, Washington, DC 20015, USA

Hydrogen isotopic ratios allow tracking water cycle in the Earth's interior. In subduction zones, D and H isotopic fractionation between silicate melts and aqueous fluids governs the δD values recorded in the superficial observables. In this study, new *in situ* data show that such D/H isotopic fractionation between silicate melts and aqueous fluids can reach values as high as 1000 ln ($\alpha_{melt\text{-}fluid}$) ~ -600 ‰.

Raman measurements were performed in Hydrothermal Diamond Anvil Cell on fluids and melts, at equilibrium at temperature and pressure ranging between 300-800°C and 200-1500 MPa, respectively. Bulk D/H ratios in the closed HDAC system were varied from 0.05 up to 2.67.

The temperature-dependence of D/H fractionation factors between melt and fluid is similar in all the experiments. In addition, the $\alpha_{melt\text{-}fluid}$ values are independent of bulk D/H ratios of the melt + fluid system. This suggests that such fractionation may occur at ‰ level, and therefore, affect δD values recorded in geochemical observables and their interpretations.