

[EE] Evening Poster | S (Solid Earth Sciences) | S-GC Geochemistry

## [S-GC45] Volatile Cycles in the Deep Earth - from Subduction Zone to Hot Spot

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Volatile geodynamics and chemical differentiation in the mantle and crust by drastically changing mineral stability and rheological behavior. Fractionation-processes such as partial melting, hydration, and dehydration are all controlled by volatiles in the rocks. A significant portion of the volatiles in the Earth has been thought to be present in the atmosphere and oceans as a consequence of extensive degassing during accretion and subsequent mantle degassing. On the other hand, it has been recently recognized that substantial amounts of volatiles are recycled back into the mantle at subduction zones, where intensive devolatilization of descended materials during arc magma generation was once thought to act as an effective "subduction barrier". However, fundamental questions still remain, such as: how are volatiles species distributed throughout the early and present Earth? What are the mechanisms for, and rate at which, volatiles are fluxed between the atmosphere, crust, and mantle? And what role have volatiles played in driving the evolution of the Earth? The possible role of the core in storing primordial volatiles is also poorly constrained. We therefore welcome contributions from experimental, observational, and modeling studies that help shed light on the deep cycles of volatiles, such as hydrogen, carbon, nitrogen, noble gases, halogens and sulfur. We particularly encourage studies linking the behavior of multiple volatile elements and their isotopic compositions. Studies investigating the linkage between volatile and solid geochemical tracers, the phase equilibria of volatile-bearing mantle assemblages, and the effect of volatiles on the physical properties of the mantle are also welcome.

## [SGC45-P04] Externally heated lever type diamond anvil cell: application in high-pressure experiments involving COH components

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In recent years, increasing attention has been paid to the stability of hydrous and carbon-bearing solid phases in the Earth's mantle, since these phases can play an important role as the sources of volatiles in the deep Earth (e.g., [1-4]). Though the phase diagrams of silicate rocks with pure H<sub>2</sub>O component are thoroughly established in the wide pressure and temperature ranges (e.g., [5-9]), there is a lack of high-pressure data for the complex systems of silicates with COH components.

In this study, we employed a lever type diamond anvil cell with a designed external heating system for the investigation of phase relationships in the basalt–C<sub>2</sub>H<sub>2</sub>O<sub>4</sub> system using *in situ* Raman spectroscopy as an analytical probe in the experiments at temperatures up to 900 °C and pressures up to 6.5 GPa. The quenched experimental products were further examined by the electron microprobe analysis and FTIR spectroscopy. At the highest experimental conditions, garnet, clinopyroxene and coesite were observed among the silicate phases and were coexisting with the carbon-rich polymeric phase. The absence of fluid phase in this assembly indicates that polymerization phenomenon can affect the phase boundaries in the carbon-rich silicate systems at high pressures.

## References

- [1] Ohira I., Ohtani E., Sakai T., Miyahara M., Hirao N., Ohishi Y., Nishijima M. (2014) *Earth Planet. Sci. Lett.* 401, 12-17; [2] Walter M.J., Thomson A.R., Wang W., Lord O.T., Ross J., McMahon S.C., Baron M.A., Melekhova E., Kleppe A.K., Kohn S.C. (2015) *Chem. Geol.* 418, 16-29; [3] Li Z., Li J., Lange R., Liu J., Militzer B. (2017) *Earth Planet. Sci. Lett.* 457, 395-402; [4] Nishi M., Kuwayama Y., Tsuchiya J., Tsuchiya, T. (2017) *Nature* 547 (7662), 205; [5] Stern C.R., Huang W.L., Wyllie P.J. (1975) *Earth Planet. Sci. Lett.* 28, 189-196; [6] Ohtani E., Litasov K., Hosoya T., Kubo T., Kondo T. (2004) *Phys. Earth Planet. In.* 143, 255-269; [7] Kessel R., Ulmer P., Pettker T., Schmidt M.W., Thompson A.B. (2005) *Earth Planet. Sci. Lett.* 237, 873-892; [8] Litasov K.D., Ohtani E. (2007) *Advances in High-Pressure Mineralogy. Geol. Soc. Amer. Spec. Pap.* 421, 115-156; [9] Mibe K., Kanzaki M., Kawamoto T., Matsukage K.N., Fei Y., Ono S. (2007) *J. Geophys. Res.: Solid Earth* 112, B03201.