

# The 427th Geodynamics Seminar

## Reaction between carbonate, silicate and C-H-O fluid under high pressure and temperature

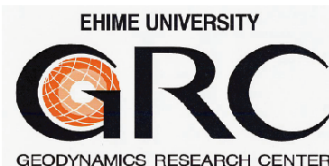
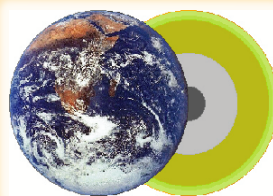
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場所：愛媛大学 総合研究棟 I  
4階共通会議室



### Abstract

Recent studies on diamond inclusions and high pressure experiments suggest that C-H-O fluid composed of a mixture of  $\text{H}_2\text{O}$ ,  $\text{CO}_2$ ,  $\text{CH}_4$  etc. is produced and cycled in the Earth's interior. Experimental studies pointed out that the composition of C-H-O fluid depends largely on the surrounding oxygen fugacity, and  $\text{CH}_4$  is likely dominant in the lower mantle condition (Frost and McCammon, 2008). It is also suggested that the presence of such C-H-O fluids may influence the stability of the surrounding mantle minerals. In this study, we examined the reaction between carbonate, silicate and C-H-O fluid at pressures corresponding to the mantle transition zone to lower mantle condition (18-30 GPa, 1800-2000 K) based on laser-heated DAC experiments.

The result of the in-situ XRD observations show that magnesite decomposed into periclase ( $\text{MgO}$ ), brucite ( $\text{Mg}(\text{OH})_2$ ) and diamond (graphite) in the presence of a reduced C-H-O fluid (methane-rich). Brucite likely formed as a metastable intermediate phase, which would eventually transform to periclase. On the other hand, in the silicate system with the C-H-O fluid, Mg-perovskite decomposed into periclase and stishovite ( $\text{SiO}_2$ ), which was also reported in  $\text{Mg}_2\text{SiO}_4$ - $\text{H}_2$  (more reduced fluid-coexisting) system (Shinozaki et al. 2013). Descriptive studies on inclusions in lower-mantle diamonds reported that the most dominant mineral phase found is periclase (up to about 60%), which contradicts to the relative phase proportion expected from high pressure experiments using pyrolite composition, where Mg-perovskite is far more dominant than periclase (Felix, 2012). The present results suggest that the stability of mantle minerals is significantly influenced by coexisting C-H-O fluid from which diamond forms. This means that mineral assemblages found in diamonds (as inclusions) do not always reflect the average bulk composition of the mantle.