

## Stability of Mg(OH)<sub>2</sub> brucite at high pressure and high temperature

\*Koki Masuda<sup>1</sup>, Izumi Mashino<sup>1</sup>, Kei Hirose<sup>1,2</sup>

1. The University of Tokyo, 2. Earth-Life Science Institute, Tokyo Institute of Technology

Water is transported into Earth's deep interior via hydrous minerals in subducting slabs. Chemical and physical properties of Mg(OH)<sub>2</sub> brucite have been widely studied to understand the nature of the hydrous minerals under deep mantle condition, because of its simple crystal structure and chemical composition in comparison with other hydrous minerals in the Earth's mantle. Previous studies (e.g., Mookherjee and Stixrude, 2006, *Am. Mineral.*; Ma et al., 2013, *Am. Mineral.*) suggested that pressure-induced transition from dynamic proton disorder at lower pressures to static disorder at higher pressure may occur in brucite, leading to the lowering of the trigonal symmetry from  $P3\text{-}m1$  to  $P3\text{-}bar$ . The more recent theoretical study by Hermann and Mookherjee (2016) predicted the stability of a new high-pressure polymorph of Mg(OH)<sub>2</sub> with tetragonal symmetry ( $P4_12_12$  space group) between 20 and 33 GPa. However, these structures have not been confirmed by experiments yet. In this study, we have conducted high-pressure and -temperature *in-situ* X-ray diffraction measurements of Mg(OH)<sub>2</sub> at 21 to 27 GPa using a laser-heated diamond-anvil cell (DAC) at BL10XU, SPring-8. The results demonstrate that 1) the  $P3\text{-}bar$  phase is stable at least up to 27 GPa, 2) the recently predicted  $P4_12_12$  phase is not formed, and 3) the phase boundary between brucite and periclase + liquid exhibits a negative slope, consistent with previous studies (Fei and Mao, 1993, *J. Geophys. Res.*; Fukui et al., 2005, *Eur. J. Mineral.*).

Keywords: Mg(OH)<sub>2</sub>, brucite, hydrous minerals, high-pressure