Water Insertion in Kaolinite under Moderate Pressure and Temperature

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Kaolinite is the major minerals in the oceanic sediments, but its role in the subduction environments is not known well. *In-situ* high pressure synchrotron X-ray diffraction and infrared spectroscopy experiments have been performed on kaolinite($Al_2Si_2O_5(OH)_4$) in order to investigate water insertion in to the interlayer under moderate pressure and temperature condition. Synchrotron X-ray powder diffraction patterns measured at ~2.56 GPa after heating at 250°C show the appearance of the 10Å reflection which indicates interlayer water insertion and the formation of halloysite($Al_2Si_2O_5(OH)_4 \cdot H_2O$). As a result, the unit cell volume increases by ca. 31% which is driven by the expansion of the *c*-axis by ca. 32%. Based on the in-situ high pressure infrared spectroscopy, the transition of kaolinite seems to proceed with the formation of disordered kaolinite before the water insertion and formation of halloysite take place. This indicates that disorder between kaolnite layers reduce the interlayer force prior to the water insertion which is in line with the process using alkali acetates or dimethylsulfoxide. Transmission X-ray microscopy is underway yo observe morphological changes during the formation of halloysite phase under pressure. Our result has direct implication on water transport into the mantle.