Hydrothermal transformation of biogenic silica as studied by *in situ* infrared spectroscopy

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Diatom is a common photosynthetic algae which lives in aquatic environments universally. Its biological body is surrounded by amorphous silicate shell called frustule. This biogenic silica is considered to transform from Opal A (amorphous) via Opal CT (cristobalite) to quartz during the burial-diagenesis of sediments.

In the present study, hydrothermal transformation of silica in diatoms was examined at temperatures of 110-190ºC at 3 MPa by *in situ* IR spectroscopy with an original hydrothermal cell (Fig.1). The same experiments were conducted also for an inorganic silica gel (Wakosil), since the structure of diatom silica is considered to be similar to amorphous silica gel.

The obtained results showed decreases of 950 cm^{-1} band area due to Si-OH compared with 800 cm^{-1} band area due to Si-O-Si. Decrease trends of 950 cm^{-1}/800 cm^{-1} band area ratio (Si-OH/SiOSi) were analyzed by reaction kinetics. The reaction rates of transformation of silica for diatoms were generally smaller than those for silica gel.

By combining with data on other band changes, differences of hydrotehrmal transformation of biogenic silica in diatoms, having complex structures including proteins, sugars and lipids, from that of inorganic silica will be discussed.

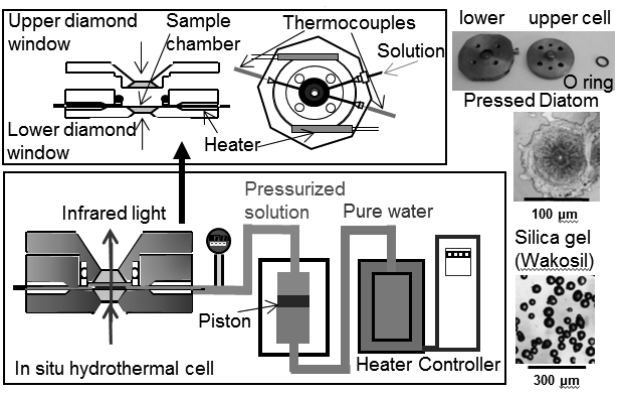

Fig. 1. *In situ* hydrothermal cell with temperature/pressure control systems and optical microscopic images of diatom and silica gel samples.