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Spectroscopic measurements on dissolution mechanism of quartz in C-O-H fluid under high pressure and temperature.

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C-O-H fluids affect the phase relation and melting of silicate minerals in the Earth's mantle. The mantle is expected to become progressively reduced with increasing depth, so that H_2 fluid is considered to exist in the deep mantle with H_2O fluids.Influence of H_2O fluids to stability and dissolution of silicate minerals have been reported. SiO_2 components dissolved into H_2O fluid as SiOH groups under high pressure and temperature. On the other hand, dissolution mechanism of SiO_2 components in H_2 fluid is still unknown. In this study, stability and dissolution mechanism of quartz in presence of H_2 fluid was examined using a laser heated diamond anvil cell. Dissolution of quartz was observed after heating at 1500 K to 1700 K and 1.7 GPa to 3.0 GPa by SEM observation of the recovered sample. In situ Raman and infrared absorption spectra under high pressure and room temperature indicates that SiO_2 components dissolved in H_2 fluid as Si-H group. The dissolution mechanism in H_2 fluid is differ from that was observed in SiO_2-H_2O system, in which SiO_2 components dissolved in H_2O fluid to form Si-OH groups.

Keywords: C-O-H fluid, quartz, laser heated diamond anvil cells, Raman, IR