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High-pressure and high-temperature mineral-fluid interface cell for high-resolution x-ray reflectivity measurement[1] CHANGYONG PARK, CURTIS KENNEY-BENSON, HPCAT, Geophyscal Laboratory, Carnegie Institution of Washington — Ordering of water at the mineral-fluid interface is a fundamental process governing mineral hydration, ion-adsorption, dissolution, growth, and charge transfers across the mineral surface. However, the influence of pressure and temperature on this fundamental process is still largely unknown. The experimental determination is limited due to the lack of a sample cell which can properly handle the pressure and temperature of the fluidic component and simultaneously allow measurement of the interfacial structure, e.g., by high-resolution x-ray reflectivity. We recently developed a new high-pressure and high-temperature mineral-fluid interface cell to achieve the high-resolution x-ray reflectivity measurement from single crystalline mineral surfaces under the PT conditions of fluid up to ∼750 K and ∼40 MPa. The interfacial structures at single crystal mineral surfaces interacting with various hydrothermal fluids will promote our understanding of the molecular aspects of hydrous alteration processes of rocks in deep Earth environments. The application can be extended to mineral surface sciences, geological carbon sequestration, and nuclear engineering.

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