

Direct investigation of physical characteristics of super critical CO<sub>2</sub> and precise monitoring of mineral ions in H<sub>2</sub>O/CO<sub>2</sub> mixture under high pressure.

Shigenori Fujikawa, Roman Selyanchyn (CO<sub>2</sub> capture and utilization division)

, Keigo Kitamura (CO<sub>2</sub> storage division)

For mitigating the amount of CO<sub>2</sub> in atmosphere, carbon capture and sequestration (storage) is a central pathway. In CO<sub>2</sub> storage geological formations, CO<sub>2</sub> will firstly dissolve into saline formation waters (solubility trapping) in short time. Carbonate ion reacts chemically with the surrounding reservoir rocks to form stable minerals in geologically long periods (mineral trapping). This reacted carbonate with cations, such as Ca<sup>2+</sup> and Mg<sup>2+</sup>, is known to be the most stable and safety state. Although this is a simple chemical reaction, its reaction situation depends on the amount of these ions dissolved in water and it generally takes very long time (hundreds to thousands year) to form stable rock under high pressure condition. For safety confirmation of injected CO<sub>2</sub> and predict the CO<sub>2</sub> behavior in reservoirs, precise and in situ monitoring plays important role. Especially, the chemical composition of the formation water is an essential clue to understand the situation of injected CO<sub>2</sub> behavior. There have been many researches to quantify the amount of dissolved CO<sub>2</sub>, i.e. CO<sub>3</sub><sup>2-</sup>, by pH and electrical resistivity measurement. However, there are only a few researches to estimate the concentration of metal ion, such as Ca<sup>2+</sup>, Mg<sup>2+</sup> etc. Precise detection of very small amount of such metal ions under high pressure condition would greatly contribute to develop the numerical mineral trapping model for future safety estimation.

In this study, we try to develop continuous, direct (in-situ) and precise monitoring of metal-ions by Quartz Crystal Microbalance (QCM) with a surface modified electrode under geological high pressure conditions.

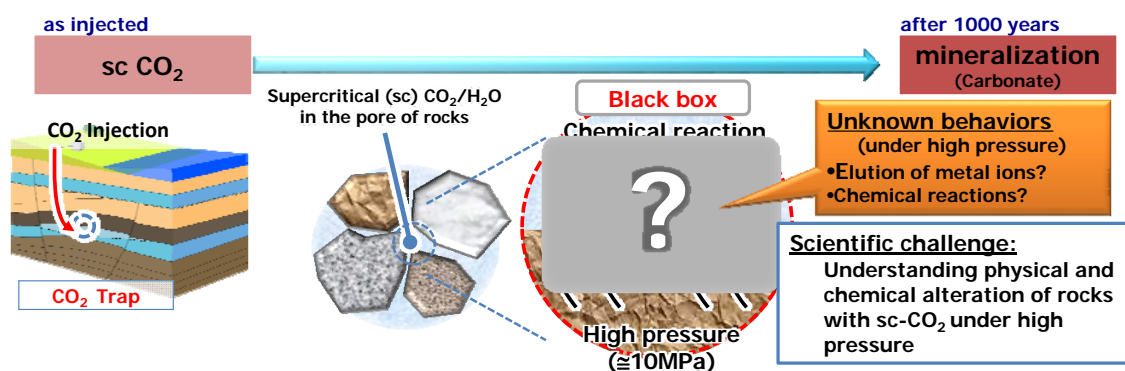


Fig.1 Schematic illustration of super critical CO<sub>2</sub> conversion to carbonate minerals.