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Experimental Study on Basalt Dissolution for Carbon Dioxide Underground Sequestration

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CO_2underground sequestration is a technique that separates and collects CO_2discharged from large-scale sources like factories, and keeps it in underground. Recently,this technique has been getting a lot of attention as a method of reducing CO_2emissions causing global warming.
This research is a basic study of CO_2underground sequestration to clarify CO_2behavior in the underground, assuming a case of injecting CO_2into an aquifer of about 1000 meters in depth. For understanding the behavior of CO_2, it is necessary to consider water-rock-CO_2reaction. However, there is little research of water-rock-CO_2reaction experiments (CO2 dissolution experiments). The details about the influence of CO_2on the dissolution reaction of the rocks are still uncertain.
In this study, basalt was assumed to be the host-rock of the sequestration site and experiments of basalt dissolution reaction were conducted in a water-rock-CO_2system to examine the capabilities of basalt for CO_2underground sequestration through the experimental reseach and the simulation. It was confirmed that the dissolution rate constant of basalt was larger than that of granite of Ito(2008). In addition, it was found the dissolution rate constant is related to pH and cooling rate of basaltic glass.
For the geological CO_2underground sequestration, we expect the carbon fixation by water-rock-CO_2reaction in underground, basalt can be thought and expected of the host rock by the carbon fixation since it calculates based on the dissolution rate constant obtained from the experiment. In the simulation, basalt could begin the carbon fixation by mineral trapping in about 25 years and fixated about 95% of CO_2injected into underground.

Keywords: carbon dioxide underground sequestration, basalt, the dissolution rate constant, simulation