

Accepted Manuscript

Dissolution and reaction in a CO₂-brine-clay mineral particle system under geological CO₂ sequestration from subcritical to supercritical conditions

Pil Rip Jeon, Doo-Wook Kim, Chang-Ha Lee

PII: S1385-8947(18)30616-8
DOI: <https://doi.org/10.1016/j.cej.2018.04.052>
Reference: CEJ 18852

To appear in: *Chemical Engineering Journal*

Received Date: 27 December 2017
Revised Date: 6 April 2018
Accepted Date: 7 April 2018

Please cite this article as: P.R. Jeon, D-W. Kim, C-H. Lee, Dissolution and reaction in a CO₂-brine-clay mineral particle system under geological CO₂ sequestration from subcritical to supercritical conditions, *Chemical Engineering Journal* (2018), doi: <https://doi.org/10.1016/j.cej.2018.04.052>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Dissolution and reaction in a CO₂-brine-clay mineral particle system under geological CO₂ sequestration from subcritical to supercritical conditions

Pil Rip Jeon, Doo-Wook Kim, and Chang-Ha Lee*

Department of Chemical and Biomolecular engineering, Yonsei University,

50 Yonsei-ro, Seodaemun-gu, Seoul 03722, Republic of Korea

ABSTRACT

To support effective geological CO₂ sequestration design and operation, dissolution and reaction in CO₂-brine-clay mineral particle systems (sepiolite and montmorillonite) were studied under subcritical to supercritical CO₂ conditions (10 bar to 150 bar at 45 ° C and 65 ° C). The order of ion dissolution from the framework of sepiolite in the brine was slightly different under each experimental condition, whereas the order of dissolved ion concentration from the montmorillonite was not varied. The solubility of CO₂ was lower in the CO₂-brine-clay mineral particle system than in a CO₂-brine system. Precipitation of amorphous silica as a secondary mineral formation was observed after the reaction of both sepiolite and montmorillonite. The CO₂ solubility model, considering ion concentration and aqueous silica, reasonably predicted the CO₂ solubility from subcritical to supercritical conditions. The kinetic rate constant of the dissolution reaction of sepiolite was correlated with the initial pH of the brine. After reaction with high-pressure CO₂-saturated brine, the micro-crystallinity of sepiolite did not change, whereas the basal (001) plane of montmorillonite showed deformation in micro-crystallinity after the dissolution reaction. By contrast, reaction with the CO₂-saturated brine led to a decrease in the surface area of sepiolite and an increase in the surface area of montmorillonite.

Key words: clay mineral; carbon dioxide; dissolution; solubility trapping; supercritical condition

* Corresponding author: C.H. Lee, leech@yonsei.ac.kr; Tel.: +82 2 2123 2762; Fax: +82 2 312 6401

Download English Version:

<https://daneshyari.com/en/article/6578997>

Download Persian Version:

<https://daneshyari.com/article/6578997>

[Daneshyari.com](https://daneshyari.com)