

Accepted Manuscript

Title: Analysis of chemical reaction between Li_4SiO_4 and CO_2 by thermogravimetry under various CO_2 partial pressures—Clarification of CO_2 partial pressure and temperature region of CO_2 absorption or desorption

Authors: Shingo Kaniwa, Masatoshi Yoshino, Eiki Niwa, Masatomo Yashima, Takuya Hashimoto



PII: S0025-5408(17)30291-X
DOI: <http://dx.doi.org/doi:10.1016/j.materresbull.2017.05.054>
Reference: MRB 9373

To appear in: *MRB*

Received date: 23-1-2017
Revised date: 24-4-2017
Accepted date: 29-5-2017

Please cite this article as: Shingo Kaniwa, Masatoshi Yoshino, Eiki Niwa, Masatomo Yashima, Takuya Hashimoto, Analysis of chemical reaction between Li_4SiO_4 and CO_2 by thermogravimetry under various CO_2 partial pressures—Clarification of CO_2 partial pressure and temperature region of CO_2 absorption or desorption, Materials Research Bulletin <http://dx.doi.org/10.1016/j.materresbull.2017.05.054>

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.

Analysis of chemical reaction between Li_4SiO_4 and CO_2 by thermogravimetry under various CO_2 partial pressures – Clarification of CO_2 partial pressure and temperature region of CO_2 absorption or desorption.

Shingo Kaniwa^a, Masatoshi Yoshino^a, Eiki Niwa^b, Masatomo Yashima^b and Takuya Hashimoto^{a,*}

^a Department of Physics, College of Humanities and Sciences, Nihon University, 3-25-40 Sakurajousui, Setagaya-ku, Tokyo 156-8550, Japan

^b Department of Chemistry, School of Science, Tokyo Institute of Technology, 2-12-1 Meguro-ku, Tokyo, 152-8551, Japan

Chemical reaction between CO_2 and Li_4SiO_4 was investigated using thermogravimetry under various $P(\text{CO}_2)$. Under $P(\text{CO}_2)$ of 1.0 bar, weight increase originating from CO_2 absorption reaction was observed from $\sim 500^\circ\text{C}$ and abrupt weight reduction due to CO_2 desorption was detected at $\sim 700^\circ\text{C}$. With decreasing $P(\text{CO}_2)$, the latter temperature decreased. Since fair agreement was observed between the latter temperatures and thermodynamically calculated equilibrium temperatures of $\text{Li}_4\text{SiO}_4 + \text{CO}_2 \leftrightarrow \text{Li}_2\text{CO}_3 + \text{Li}_2\text{SiO}_3$, the latter temperatures could be regarded as approximate equilibrium. Dependence of the calculated equilibrium temperatures and approximate equilibrium temperatures on $P(\text{CO}_2)$ was represented with Ellingham diagram, showing $P(\text{CO}_2)$ and temperature region of CO_2 absorption or desorption. Approximate equilibrium temperature under $P(\text{CO}_2)$ of 1.0 bar agreed with the calculation, whereas deviation was observed under low $P(\text{CO}_2)$, resulted in larger apparent ΔS° and ΔH° than the calculated ones. Using specimen with smaller particle size, the deviation reduced due to enhancement of CO_2 desorption kinetics.

Graphical Abstract

* Corresponding author: Department of Physics, College of Humanities and Sciences, Nihon University, Setagaya-ku, Tokyo 156-8550, Japan.
E-mail address: takuya@chs.nihon-u.ac.jp (T. Hashimoto)

Download English Version:

<https://daneshyari.com/en/article/5442045>

Download Persian Version:

<https://daneshyari.com/article/5442045>

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