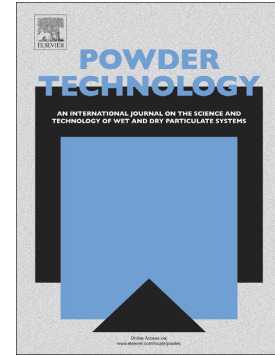


Accepted Manuscript

Controllable synthesis of all the anhydrous CaCO₃ polymorphs with various morphologies in CaCl₂-NH₃-CO₂ aqueous system

Yang Ding, Yunyi Liu, Yangyang Ren, Hongxu Yan, Ming Wang, Dan Wang, Xiao-Ying Lu, Bin Wang, Tianbo Fan, Hongfan Guo



PII: S0032-5910(18)30337-1
DOI: doi:[10.1016/j.powtec.2018.04.056](https://doi.org/10.1016/j.powtec.2018.04.056)
Reference: PTEC 13357
To appear in: *Powder Technology*
Received date: 27 November 2017
Revised date: 7 April 2018
Accepted date: 20 April 2018

Please cite this article as: Yang Ding, Yunyi Liu, Yangyang Ren, Hongxu Yan, Ming Wang, Dan Wang, Xiao-Ying Lu, Bin Wang, Tianbo Fan, Hongfan Guo , Controllable synthesis of all the anhydrous CaCO₃ polymorphs with various morphologies in CaCl₂-NH₃-CO₂ aqueous system. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Ptec(2017), doi:[10.1016/j.powtec.2018.04.056](https://doi.org/10.1016/j.powtec.2018.04.056)

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.

Controllable synthesis of all the anhydrous CaCO_3 polymorphs with various morphologies in $\text{CaCl}_2\text{-NH}_3\text{-CO}_2$ aqueous system

Yang Ding,^a Yunyi Liu,^a Yangyang Ren,^a Hongxu Yan,^a Ming Wang,^a Dan Wang,^a Xiao-Ying Lu,^b Bin Wang,^c Tianbo Fan,^a Hongfan Guo^{*a}

^aCollege of Chemical Engineering, Shenyang University of Chemical Technology, Shenyang 110142, PR China

^bFaculty of Science and Technology, Technological and Higher Education Institute of Hong Kong, Hong Kong, China.

^cGreen Energy, Sensing & Integration Group, Hong Kong Applied Science and Technology Research Institute Company Limited, Hong Kong, China.

Abstract: Polymorphism- or morphology-controllable synthesis of CaCO_3 is of significance. Usually only calcite CaCO_3 can be obtained from the ordinary $\text{CO}_2\text{-Ca(OH)}_2$ solution route; the very low solubility of Ca(OH)_2 also causes many defects with this route. The route by CaCl_2 and Na_2CO_3 exhibits some advantages, but the consumption of Na_2CO_3 is a deficiency. Therefore, this work studies the precipitation of CaCO_3 with CaCl_2 in $\text{NH}_3\text{-CO}_2$ aqueous solution, which will make the overall reaction “ $\text{CaCO}_3 \rightarrow \text{CaCO}_3$ ” if tracing the origin of the reactants. A main focus of the present work is to elucidate how to obtain various CaCO_3 polymorphs with different morphologies through this synthesis system and the corresponding crystal growth mechanism. The results show that, just by simply regulating the reaction conditions, all three anhydrous CaCO_3 polymorphs with various morphologies (e.g., cubic, lamellar, spherical, needle-like and branched) can be obtained in the absence of any additives. The crystal growth process can be well explained based on either Ostwald ripening or dissolution-recrystallization mechanism, depending on the reaction conditions. In addition, the rare phase transition of metastable vaterite to metastable aragonite can also be obtained from the present synthesis system, besides the usual phase transition of vaterite to the most thermodynamically stable calcite. This work provides the essential theoretical support for

*Corresponding author. Tel: +86 24 89383760; Fax: +86 24 89383760. E-mail address: hongfanguo@126.com (H. Guo).

Download English Version:

<https://daneshyari.com/en/article/6674758>

Download Persian Version:

<https://daneshyari.com/article/6674758>

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