Cost-effective synthesis of CHA zeolites with controllable morphology and size

Ya Guo, Tianjun Sun, Xiaowei Liu, Quanli Ke, Xiaoli Wei, Yiming Gu, Shudong Wang

PII: S1385-8947(18)31948-X
DOI: https://doi.org/10.1016/j.cej.2018.10.007
Reference: CEJ 20070

To appear in: *Chemical Engineering Journal*

Received Date: 4 July 2018
Revised Date: 30 September 2018
Accepted Date: 1 October 2018

Please cite this article as: Y. Guo, T. Sun, X. Liu, Q. Ke, X. Wei, Y. Gu, S. Wang, Cost-effective synthesis of CHA zeolites with controllable morphology and size, *Chemical Engineering Journal* (2018), doi: https://doi.org/10.1016/j.cej.2018.10.007

Cost-effective synthesis of CHA zeolites with controllable morphology and size

Ya Guo[a,b], Tianjun Sun[a,*], Xiaowei Liu[a,b], Quanli Ke[a,b], Xiaoli Wei[a,b], Yiming Gu[a,b], Shudong Wang[a,*]

[a] *Dalian National Laboratory for Clean Energy, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian 116023, China*

[b] *University of Chinese Academy of Sciences, Beijing 100049, China*

ABSTRACT

Cost-effectively develop zeolites with controllable morphology and size is significant in design and optimization of the physical properties for CO_2/CH_4 adsorption separation. Herein, we report the synthesis of CHA zeolites with tunable morphology and size by a facile one-step dual template-directed strategy. A mixture of organic structure-directing agents (OSDA) composed of N,N,N-trimethyl-1-adamantammonium hydroxide (TMAdaOH) and tetramethylammonium hydroxide (TMAOH) was employed and found to function cooperatively in directing the crystallization of CHA zeolites. Additionally, the dual template strategy reduced the consumption of expensive TMAdaOH to a great extent. The crystal morphology and size were remarkably dependent on TMAOH concentration in the dual template-directed synthesis system, regardless of TMAdaOH concentration. We demonstrate that the gradual decrease of TMAOH concentration in the batch composition enables a fine-tuning of the zeolite morphology from cubic to rough sphere crystals, accompanied by the size ranging from *ca*. 3 μm to 400 nm. We speculate that the two organic species work synergistically in the formation of CHA

* Corresponding authors.

Email addresses: suntianjun@dicp.ac.cn (Tianjun Sun). wangsd@dicp.ac.cn (Shudong Wang).