

## Accepted Manuscript

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Weili Teng, Jinshu Wang, Junshu Wu, Yucheng Du, Xin-Jian Jia, Hongyi Li, Tianning Wang

PII: S0022-0248(18)30220-3

DOI: <https://doi.org/10.1016/j.jcrysgr.2018.05.008>

Reference: CRYG 24596

To appear in: *Journal of Crystal Growth*

Received Date: 30 January 2018

Revised Date: 8 May 2018

Accepted Date: 9 May 2018

Please cite this article as: W. Teng, J. Wang, J. Wu, Y. Du, X-J. Jia, H. Li, T. Wang, Rapid synthesis of alpha calcium sulfate hemihydrate whiskers in glycerol-water solution by using flue-gas-desulfurization gypsum solid waste, *Journal of Crystal Growth* (2018), doi: <https://doi.org/10.1016/j.jcrysgr.2018.05.008>

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**Rapid synthesis of alpha calcium sulfate hemihydrate whiskers in  
glycerol-water solution by using flue-gas-desulfurization gypsum solid waste**

Weili Teng, Jinshu Wang\*, Junshu Wu\*, Yucheng Du, Xin-Jian Jia, Hongyi Li,

Tianning Wang

College of Materials Science and Engineering, Beijing University of Technology,  
Chaoyang District, Beijing 100124, China

\* Corresponding author. E-mail: wangjsh@bjut.edu.cn; Tel: +86-10-67391101

\* Corresponding author. E-mail: junshuwu@bjut.edu.cn; Tel: +86-18810370731

**Abstract:** The feasibility of fabricating alpha calcium sulfate hemihydrate ( $\alpha$ -CSH) whiskers by using flue-gas-desulfurization (FGD) gypsum as source materials was studied. Crystal phase- and morphology-controlled crystallization of gypsum were realized in the designed glycerol-water reaction system. L-glutamic acid was found to accelerate the conversion of calcium sulfate dihydrate (CSD) into  $\alpha$ -CSH whiskers by intercalating into layered CSD structure. The time-dependent experiments indicate rod-like CSD first splits into layered structure and then fascicular structure and finally single crystals. The splitting crystallization owing to lattice expansion of CSD generates  $\alpha$ -CSH whiskers with a high aspect ratio ( $\sim$ 1:200). The facile method to convert FGD gypsum solid waste into CSD and finally  $\alpha$ -CSH whiskers may prove particularly useful in the design of recyclable FGD gypsum with significant environmental impact, and it is particularly important in environmental remediation and green economics.

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