

Accepted Manuscript

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PII: S0021-9797(18)30716-1
DOI: <https://doi.org/10.1016/j.jcis.2018.06.068>
Reference: YJCIS 23759

To appear in: *Journal of Colloid and Interface Science*

Received Date: 27 February 2018
Revised Date: 17 June 2018
Accepted Date: 23 June 2018

Please cite this article as: Q. Guan, Y. Hu, H. Tang, W. Sun, Z. Gao, Preparation of α -CaSO₄·½H₂O with tunable morphology from flue gas desulphurization gypsum using malic acid as modifier: A theoretical and experimental study, *Journal of Colloid and Interface Science* (2018), doi: <https://doi.org/10.1016/j.jcis.2018.06.068>

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Preparation of α -CaSO₄· $\frac{1}{2}$ H₂O with tunable morphology from flue gas desulphurization gypsum using malic acid as modifier:

A theoretical and experimental study

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Abstract

Huge amount of flue gas desulphurization (FGD) gypsum not only occupies the farmland but also causes severe pollution to the surrounding environment. The most effective way to achieve a high-value utilization of FGD gypsum is to prepare short columnar α -calcium sulphate hemihydrate (α -HH). Here, malic acid, a prolific, inexpensive and environment-friendly modifier was explored for the first time to effectively tune the crystal morphology of α -HH prepared from FGD gypsum in glycerol-water-NaCl solutions. When the concentration of malic acid reached 18.54×10^{-4} mol/kg, α -HH crystals with an average aspect (length-to-diameter) ratio of 1.9 (compared to 29.4 in the absence of malic acid) were prepared. The selective complexation of malic acid with Ca active sites on different α -HH crystal planes played a dominant role in the α -HH crystal morphology transformation, which was

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