Electronic Supplementary Information

Controlled Synthesis of Monodisperse α-Calcium Sulfate Hemihydrate Nanoellipsoids

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Table S1. The time elapsed for the solution to be turbid after the precursor solutions of Ca^{2+} and SO_4^{2-} solution with different concentrations being mixed in 98.44 mol% glycerol-water solution at 90 °C

$CaCl_2$ concentration / mM	25	32	38	44	50
The time elapsed	8 min	3 min	~10 s	~1s	~1s

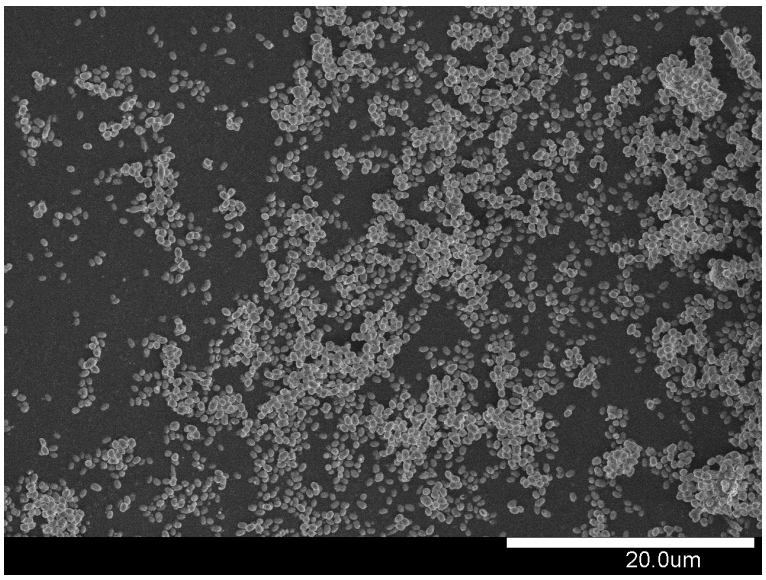

Figure S1. SEM of the as-synthesized α-calcium sulfate hemihydrate nanoellipsoid under a low magnification.

Domain size calculation

The domain size (D) of the α-calcium sulfate hemihydrate (α-HH) nanoellipsoid was estimated from the diffraction peak of (004) plane in XRD pattern using the Debye-Scherrer formula:

$$D = \frac{0.89\lambda}{\beta \cos\theta_{\mathrm{B}}}$$

Here, λ is the wavelength of the incident beam (0.154 nm), β is the half-peak width (rad), and θ_{B} is the Bragg diffraction angle (θ_{B}=14.62°=0.255rad). The β was calibrated before use to subtract the instrument contribution by:

$$\beta = \beta_{\mathrm{measured}} - \beta_{reference}$$

$\beta_{\mathrm{measured}}$ is read from the (004) peak on the XRD pattern of α-HH nanoellipsoid, while the $\beta_{\mathrm{reference}}$ is measured from that of the α-HH single crystalline with a large domain of 30 - 50 μm. which were synthesized according to our previous work [1]. The XRD patterns of α-HH nanoellipsoid and single crystalline are shown in Figure S2.

Figure S2. XRD patterns of the CSH nanoellipsoid and SCH single crystalline.

The $\beta_{\mathrm{measured}}$ and $\beta_{\mathrm{reference}}$ is measured to be 0.703° and 0.120°, so

$$\beta = \beta_{\mathrm{measured}} - \beta_{reference} = 0.703^{\circ} - 0.120^{\circ} = 0.583^{\circ} = 0.0102\mathrm{rad}$$

The domain size

$$D = \frac{0.89\lambda}{\beta \cos\theta_{\mathrm{B}}} = \frac{0.89 \times 0.154\mathrm{nm}}{0.0102\mathrm{rad} \times \cos(0.255\mathrm{rad})} = 14.04\mathrm{nm}$$

Nitrogen adsorption-desorption isotherm analysis

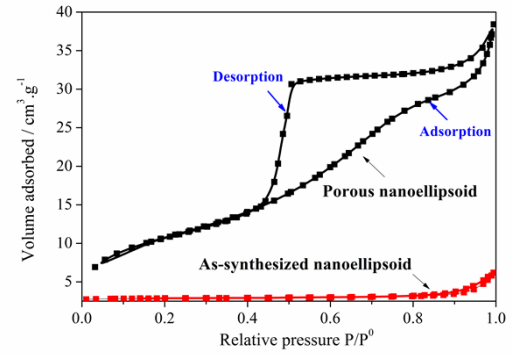

Figure S3. (a) Nitrogen adsorption-desorption isotherm analysis of the as-synthesized α-HH nanoellipsoid and the porous nanoellipsoid; (b) Pore size distribution plots in the porous nanoellipsoid. The isotherms were measured at the temperature of liquid nitrogen using a Quantachrome Autosorb-1 system. The sample was vacuum-dried in 10^{-2} Torr for 2 h at room temperature before measurement. The pore-size distribution was calculated using the Barrett-Joyner-Halendan (BJH) method from the adsorption branch.

Reference:

[1] L. C. Yang, B. H. Guan, Z. B. Wu. Characterization and precipitation mechanism of α-calcium sulfate hemihydrate growing out of FGD gypsum in salt solution. *Sci China Ser E-Tech Sci* **2009**, 52, 2688-2694.