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

<table>
<thead>
<tr>
<th>CaCl$_2$ concentration / mM</th>
<th>25</th>
<th>32</th>
<th>38</th>
<th>44</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>The time elapsed</td>
<td>8 min</td>
<td>3 min</td>
<td>~10 s</td>
<td>~1 s</td>
<td>~1 s</td>
</tr>
</tbody>
</table>
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:

$$D = \frac{0.89\lambda}{\beta \cos \theta_B}$$

Here, $\lambda$ is the wavelength of the incident beam (0.154 nm), $\beta$ is the half-peak width (rad), and $\theta_B$ is the Bragg diffraction angle ($\theta_B$=14.62°=0.255rad). The $\beta$ was calibrated before use to subtract the instrument contribution by:

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

$\beta_{measured}$ is read from the (004) peak on the XRD pattern of α-HH nanoellipsoid, while the $\beta_{reference}$ 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 $\beta_{measured}$ and $\beta_{reference}$ is measured to be 0.703° and 0.120°, so

$$\beta = \beta_{measured} - \beta_{reference} = 0.703° - 0.120° = 0.583° = 0.0102rad$$

The domain size

$$D = \frac{0.89\lambda}{\beta \cos \theta_B} = \frac{0.89 \times 0.154nm}{0.0102rad \times \cos(0.255rad)} = 14.04nm$$
Nitrogen adsorption-desorption isotherm analysis

Figure S3. (a) Nitrogen adsorption-desorption isotherm analysis of the as-synthesized $\alpha$-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: