Electronic Supplementary Material (ESI)

Controllable Synthesis of Nanostructured $BaSO_4$ and $BaSO_3$ Crystals on the Basis of DMSO's Oxide Chemistry

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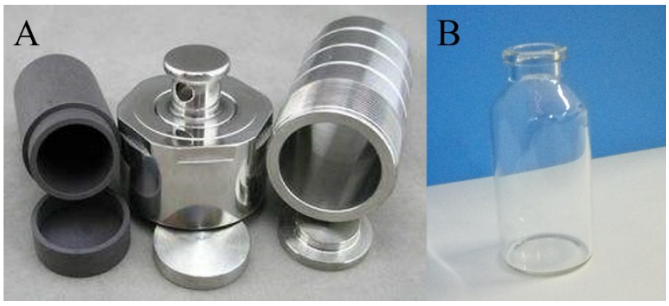
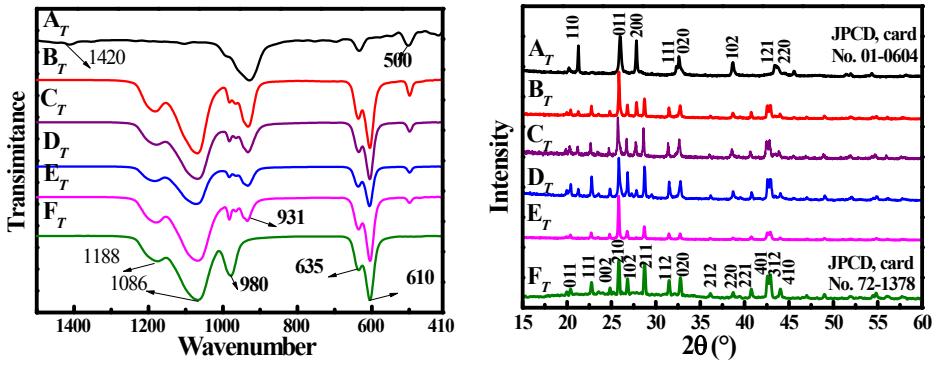
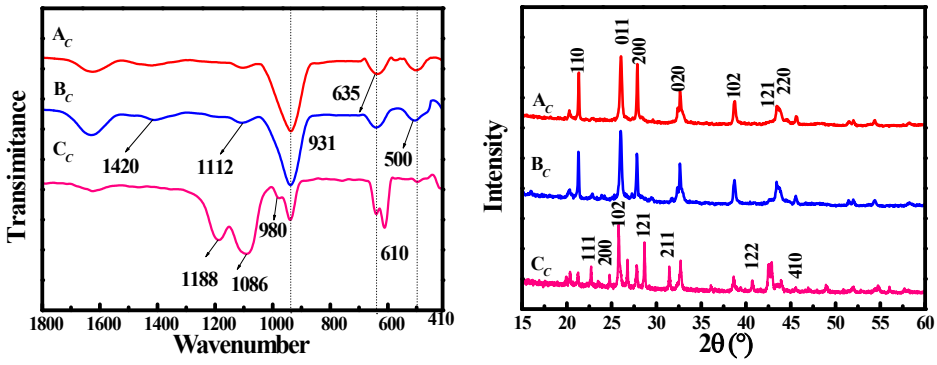


Fig. S1 A and B represent the hydrothermal reactor (100 mL) and penicillin bottle (40 mL).



(a) (b)

Fig. S2 FTIR spectra (a) and XRD patterns (b) of sample A_T-F_T. A_T = 80 °C; B_T = 100 °C; C_T = 120 °C; D_T = 140 °C; E_T = 160 °C; and F_T = 180 °C



(a) (b)

Fig. S3 FTIR spectra (a) and XRD patterns (b) of as-obtained crystals prepared at different $Ba(OH)_2$ concentrations at 80 °C for 3 h. A_c = 1/2 saturated; B_c = 1/4 saturated; and C_c = 1/8 saturated

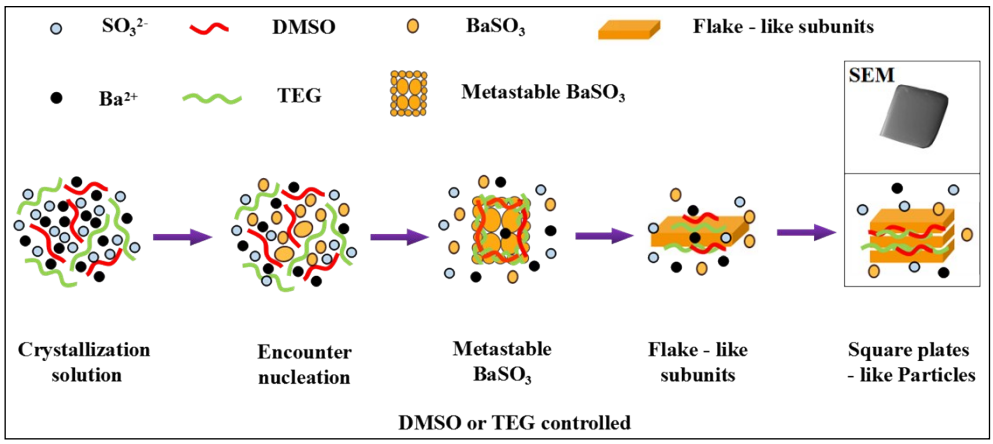


Fig. S4 Diagram of possible growth processes for $BaSO_3$ crystals

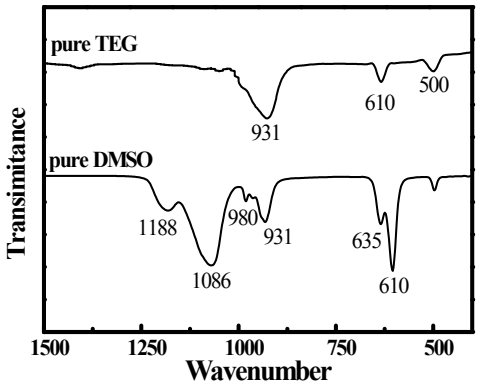


Fig. S5. A blank experiment that the pure TEG and DMSO absorbing SO_2 was used to synthesize product, respectively. Pure TEG and DMSO absorbed SO_2 for 3 min (with the 60 mL/min flow rate for 3 min), and other parameters were set at 25 mL 1/2 $Ba(OH)_2$ clear saturated solution, 20 g SO_2 absorbents, and 5 h.

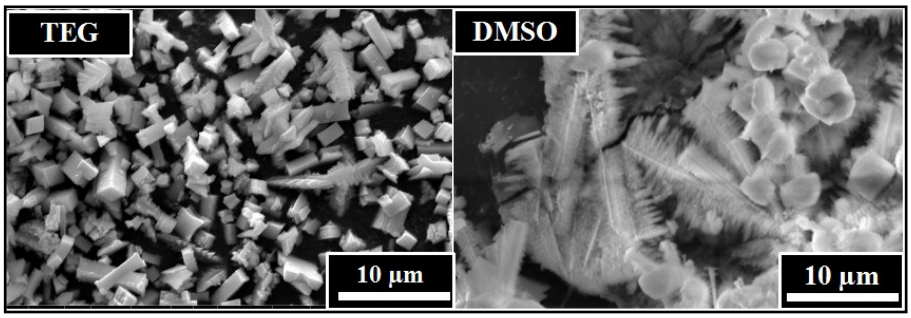
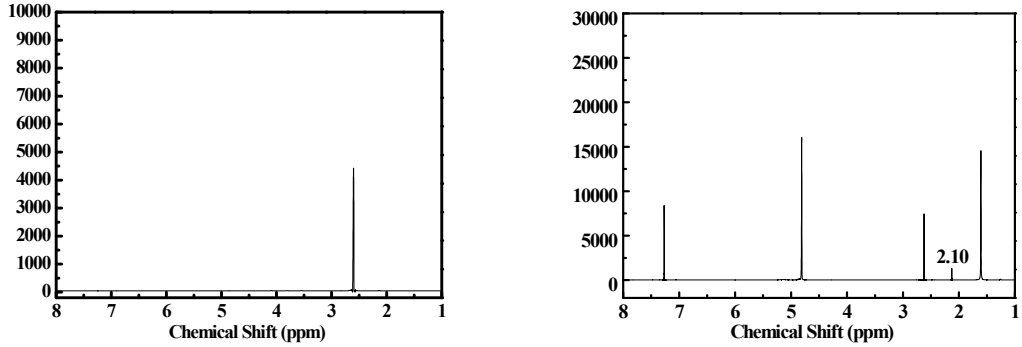


Fig. S6. A blank experimental SEM images that the pure TEG and pure DMSO absorbing SO_2 was respectively used to synthesize crystals



(a) (b)

Fig. S7 (a) The ^{1}H-NMR of pure DMSO ($CDCl_3$ as an external reference); (b) ^{1}H-NMR spectra clear crystallizing solution when reaction time was 50 h. ($CDCl_3$ as an external reference)

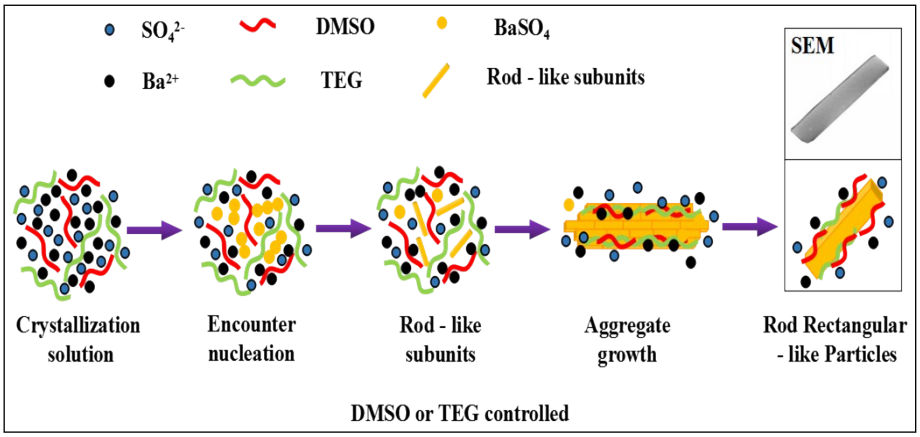


Fig. S8 Diagram of possible growth processes for $BaSO_4$ crystals

Table S1. Standard Enthalpies and Gibbs energies of formation, Entropies of the reaction compounds

Substance	Physical state	$\Delta_f G^{\ominus}$ (kJ·mol^{-1})	$\Delta_f H^{\ominus}$ (kJ·mol^{-1})	$S^{\ominus}$ (J·K^{-1}·mol^{-1})
DMSO	lq	-99.2	-204.2	188.3
SO_4^{2-}	aq	-744.5	-909.34	18.50
H_2SO_3	aq	-537.90	-608.81	232.2
HSO_3^-	aq	-527.8	-626.22	215.3
DMS	lq	5.8	-65.4	196.4

Table S2. The pH value of clarification crystallization solution under different reaction conditions. *T*, *t*, C_{Ba} represents reaction temperature, reaction time, $Ba(OH)_2$ solution concentration.

T	80	100	120	140	160	180
pH	10.82	3.59	2.53	2.35	1.97	1.91
t	3	5	8	15	24	50
pH	10.82	3.57	1.95	1.91	1.88	1.87
C_{Ba}	1/2		1/4		1/8	
pH	10.82		8.77		2.88	