Supplemental Information

Fabrication of patterned calcium carbonate materials through template-assisted microbially induced calcium carbonate precipitation

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The Supplemental Information includes: Supplementary Materials, Supplementary Figures S1-S8 and Supplementary Table S1.

Supplementary Materials

Materials: Beef extract (Solarbio); Tryptone (Thermo Fisher); Sodium chloride (Li'an Longbohua Pharmaceutical Chemical Co., Ltd.); Ammonium sulfate (Best Chemical Co., Ltd.); Yeast extract (Thermo Fisher); Tris(BBI Life Sciences); Agar powder (Dingguo Changsheng Biotechnology Co., Ltd.); Urea (Jiangtian Chemical Co., Ltd.); Calcium chloride (Jiangtian Chemical Co., Ltd.); Calcium carbonate (Huasheng Tianhe Chemical Trading Co., Ltd.); 0.22 μm syringe filter membrane(Millipore); 0.5 μm colloidal dispersion of polystyrene microspheres(Junyijia Technology Co., Ltd.); Glass bottom Petri dish(NEST); Acrylic board(Oudifu Flagship Store); Microscope slides (Fan Yi Co.); Photosensitive adhesive (Norland NOA81).

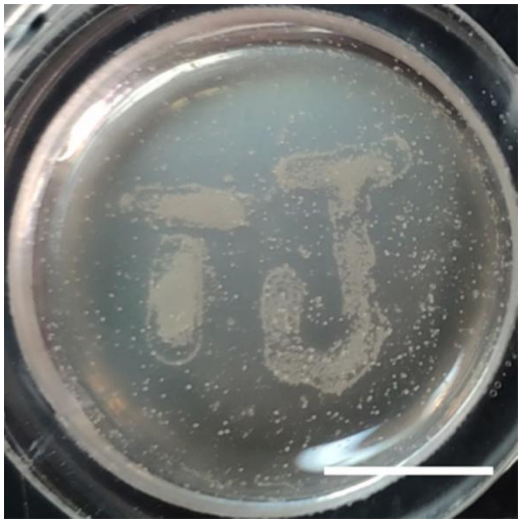

Figure S1. A photograph of a templated glass surface using hand-drawn letter-shaped templates after 48h incubation in bacterial culture. Scale bar is 6 mm.

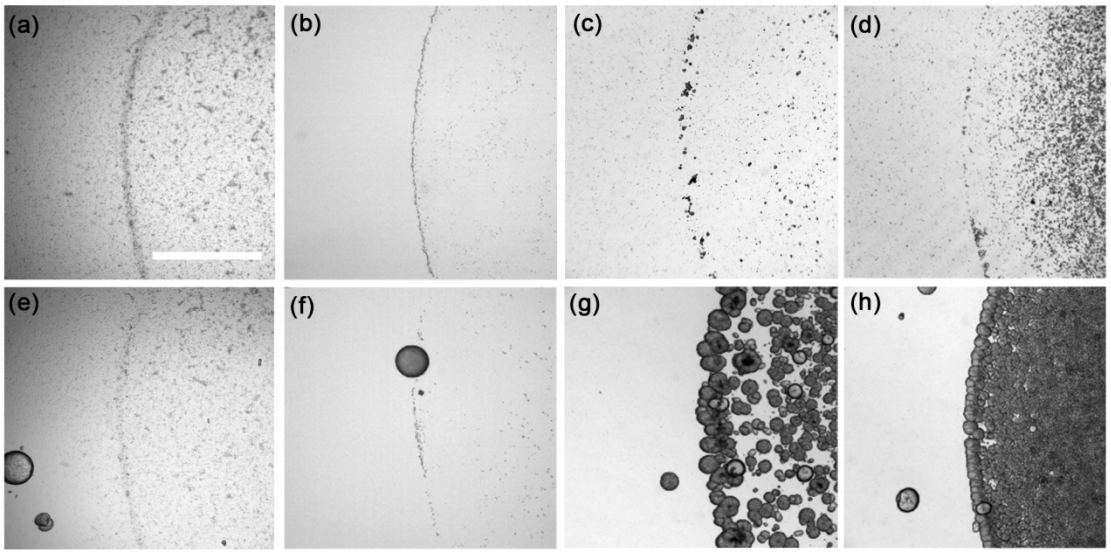

Figure S2. Optical images showing the distribution of MICP precipitates near the boundary of a disk template at t = 0h and t = 48h after incubated in bacterial culture. The disk template on the glass surface is made of heat-killed *S. pasteurii* cells **(a, e)**, sulfonic group modified polystyrene particles **(b, f)**, heat-treated MICP-induced **(c, g)**, purchased $CaCO_3$ particles **(d, h)**, respectively. Scale bar is 200 μm. Note that in those measurements, the concentration of template for each test was not strictly controlled, because the results here are mainly to show what the main component of the template responsible for the preferred MICP on it is. As we can see, the template used for **d** (t=0h) is more than that used for **c** (t=0h), which can result in higher amount of MICP precipitates in the template region in **h** (t=48h) than in **g** (t=48h).

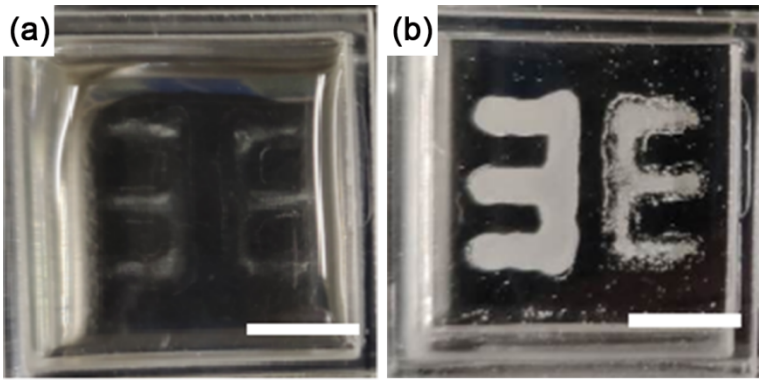

Figure S3. The template-assisted MICP patterns formed by MICP-induced $CaCO_3$ particles (left one) and commercial $CaCO_3$ particles (right one). Photographs were taken at t=0h **(a)** and t=48h **(b)** after incubated in bacterial culture. Scale bars are 6 mm.

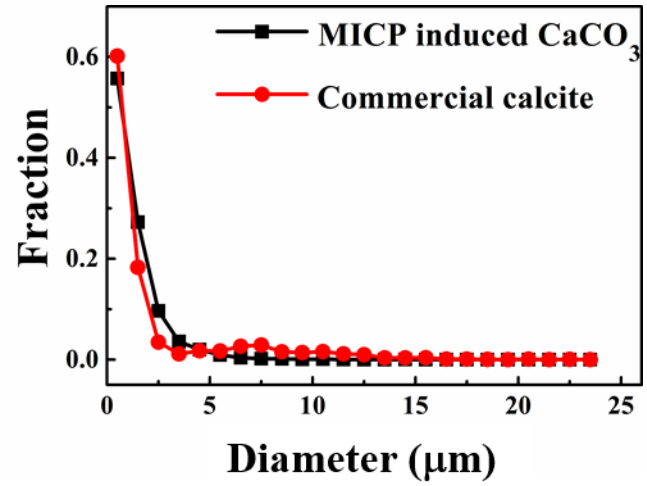

Figure S4. To minimize the effect of particle size, particles used for making templates in Figure 2(c) have a similar size distribution.

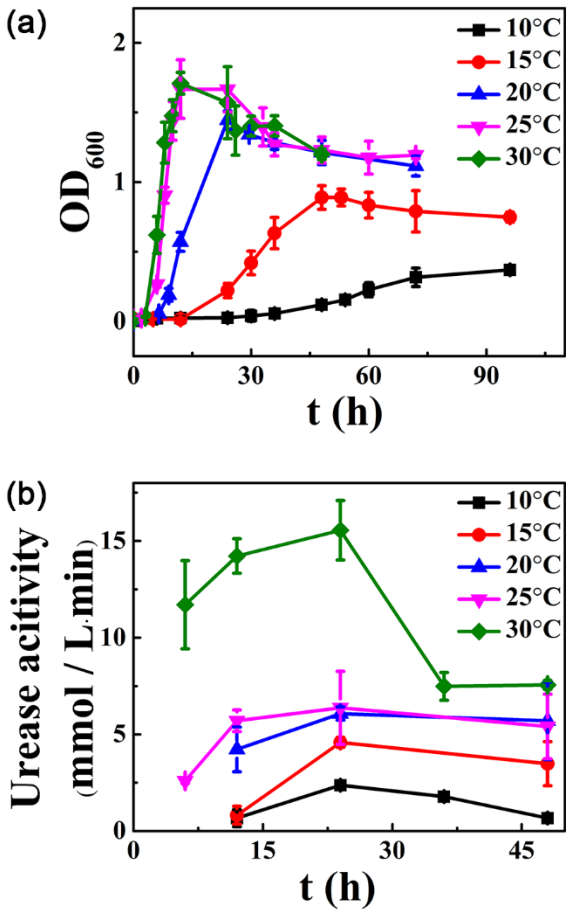

Figure S5. Bacterial growth (a) and urease activity (b) vs. incubation time at different temperatures.

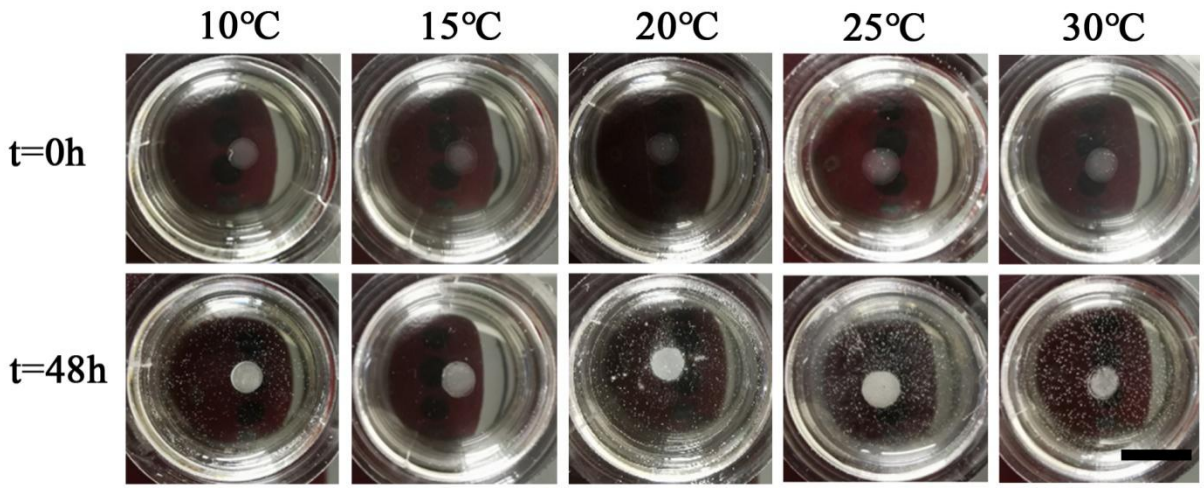

Figure S6. Images showing MICP precipitates with a disk pattern obtained at different temperatures at t=0h (top row) and at t=48h (bottom row). Scale bar is 6 mm.

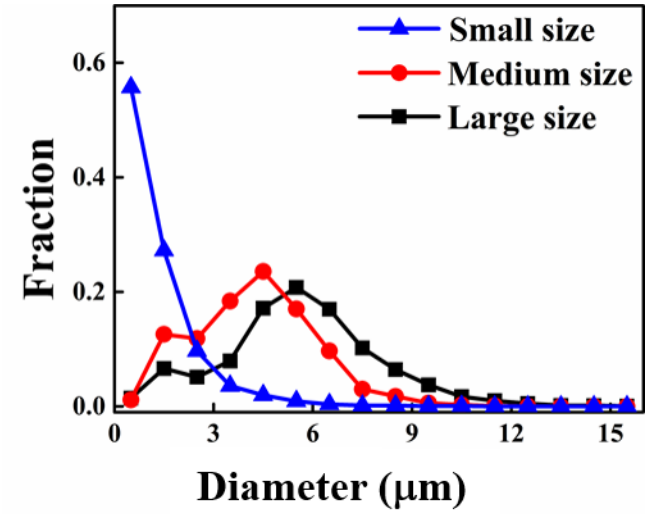

Figure S7. The size distribution of $CaCO_3$ particles used for testing the dependence of the template promoting efficiency on the size of template particles.

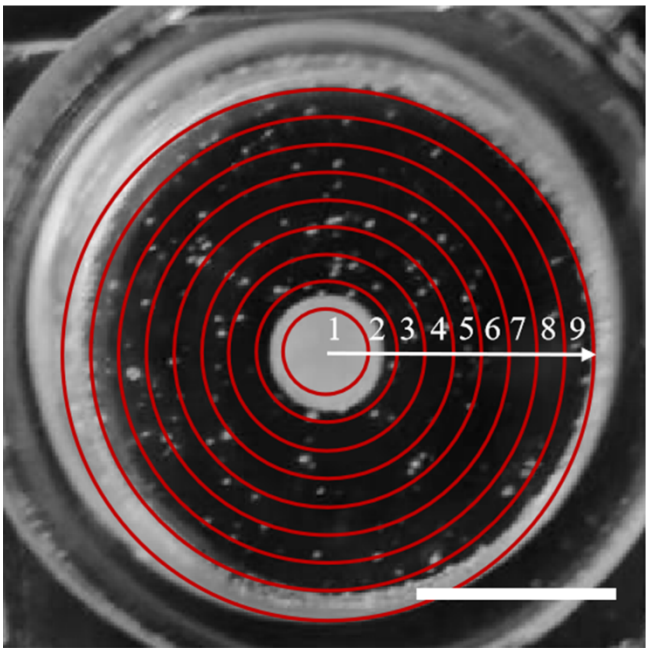

Figure S8. Illustration of concentric rings used for ρ_s measurements. Scale bar is 6 mm.

Table S1. Particles tested as template materials in this study

Particles	Size distribution(μm)	Concentration (mg/mL)	Sources/Note
S. pasteurii cells	~1 wide, ~3-7 long		Cultivated in NB-urea medium, heat-killed and resuspended in water with OD_{600}=1
PS-SO_3H particles	1.3	3.3	Base Line Chrom Tech Research Centre, Tianjin, China.
Purchased calcite	1-12	1.5	Tianjin Yuanli Chemical Co., Tianjin, China.
MICP-induced $CaCO_3$	1-12	1.5	Dispersed in water
Heat-treated MICP-induced $CaCO_3$	1-20	1.5	Dispersed in water