

Electronic Supplementary Information (ESI)

Light-controlled morphological development of self-organizing bioinspired nanocomposites

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Supplementary Figure S1

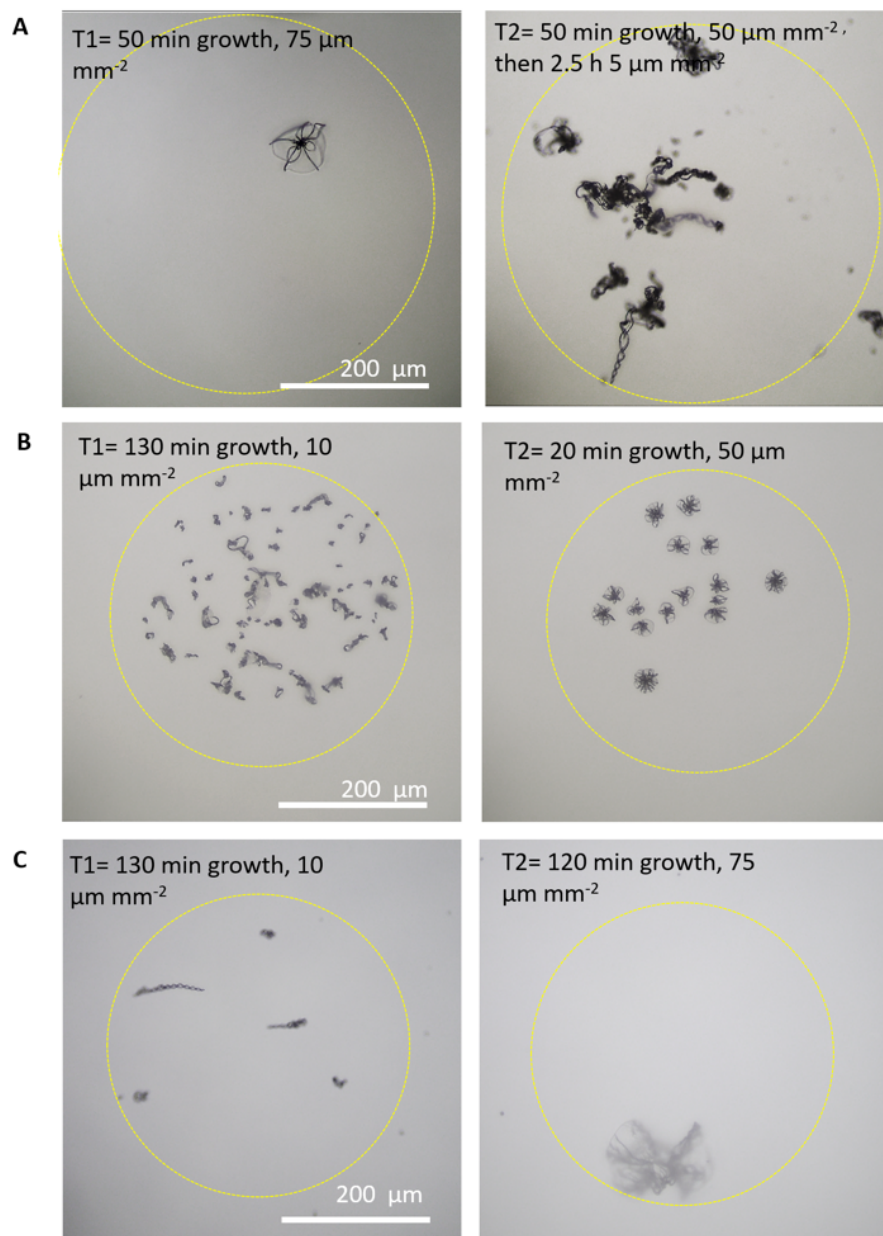


Fig. S1. Light microscope images showing switching between growth regimes due to modulations in light intensity at 275 nm UV in a solution of BaCO₃/SiO₂ precursor solutions (20 mM BaCl₂, 9 mM Na₂SiO₃) with A) 2 mM KP, 20 mM DTAB, pH 10.89, 250 μm radius (coral→helix) ; B) 5 mM KP, 50 mM DTAB, pH 10.89, 200 μm radius (helix→ coral); and C) 2 mM KP, 20 mM DTAB, pH 10.85, 200 μm radius (helix→coral). The yellow circle indicates the illuminated area.

Supplementary Figure S2

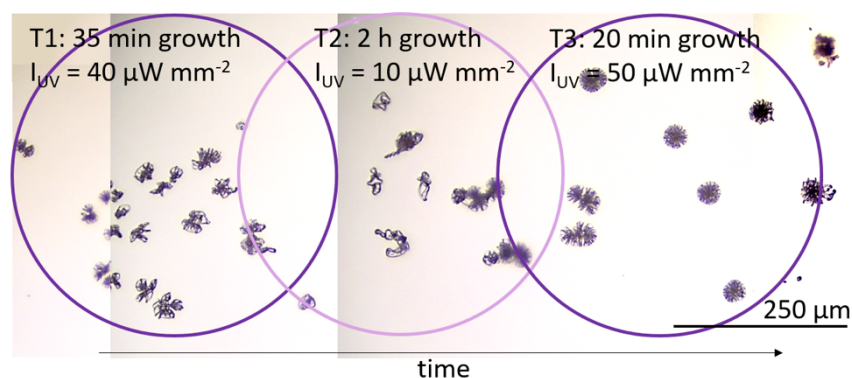


Fig S2. Light-induced nucleation and growth of BaCO₃/SiO₂ structures using low and high light intensity irradiation to induce consecutive switching between coral and helical growth modes. The precursor solution contains 20 mM BaCl₂, 11 mM Na₂SiO₃, 5 mM KP, and 50 mM DTAB at pH 11.3. The circles represent the illuminated areas (250 μm radius) for high (dark purple) and low (light purple) light intensity, moving from T1 to T3.

Supplementary Figure S3

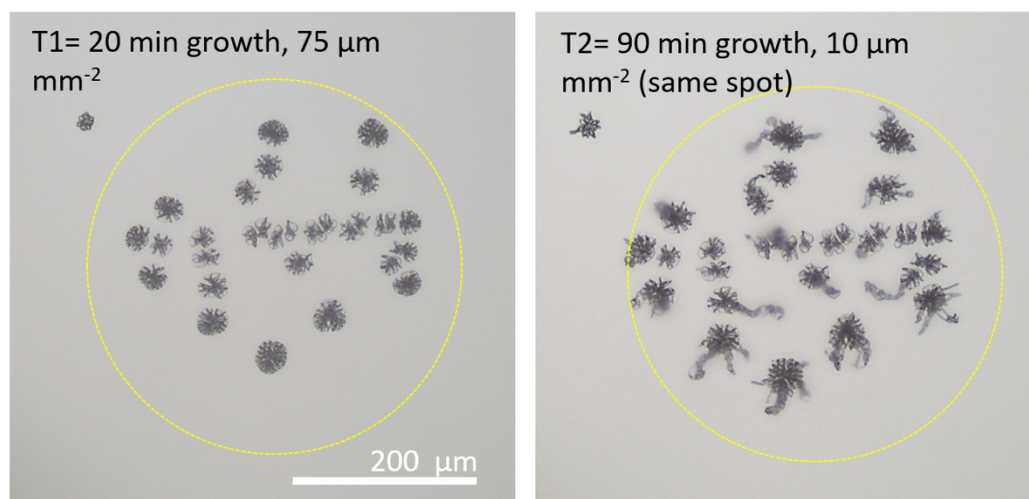


Fig. S3. Switching growth modes with single structures using first (T1) high light intensity irradiation of 275 nm on a precursor solution of 20 mM BaCl₂, 9 mM Na₂SiO₃, 5 mM KP, 50 mM DTAB, pH 10.9, 200 μm radius, followed by (T2) low light intensity irradiation. Consistent transitioning from coral to helical growth is observed upon reduction of the light intensity.

Supplementary Figure S4

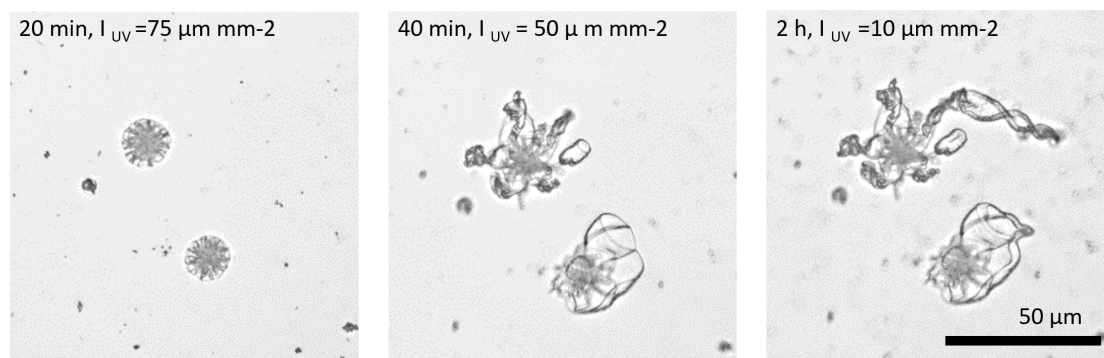


Fig. S4. Switching growth modes with single structures using first high light intensity irradiation of 275 nm on a precursor solution of 20 mM BaCl_2 , 11.5 mM Na_2SiO_3 , 5 mM KP, 50 mM DTAB, pH 10.9, 150 μm radius, followed by low light intensity irradiation.

Supplementary Figure S5

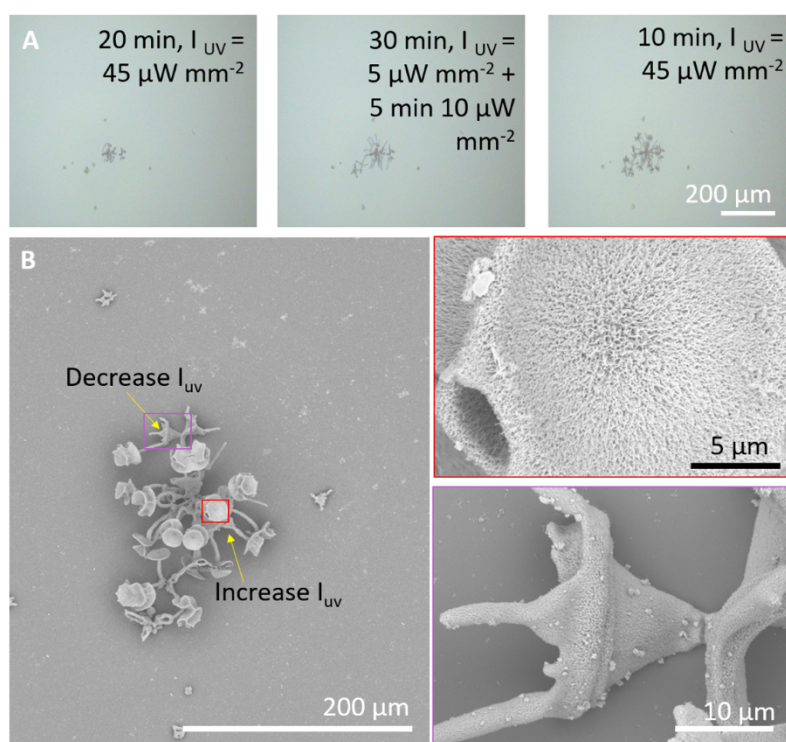


Fig. S5. Sculpting of $\text{BaCO}_3/\text{SiO}_2$ structures by decreasing and increasing the light intensity, causing narrowing and opening of the growth direction respectively. A) Timelapse; and B) resulting SEM images of 275 nm UV irradiation on a precursor solution of 20 mM BaCl_2 , 9 mM Na_2SiO_3 , 5 mM KP, 50 mM DTAB, pH 11.5, 100 μm radius.

Supplementary Movies

- Supplementary Movie 1:** Light-controlled switching from coral to helical growth mode.
In this movie, the light-controlled transition from coral growth to helical growth of a single $\text{BaCO}_3/\text{SiO}_2$ nanocomposite is presented. The movie is a zoom in from a larger illuminated area. The first 2 seconds show the growth of an architecture with light intensity (I_{UV}) = $75 \mu\text{m mm}^{-2}$, yielding growth of a coral shape. Then I_{UV} is reduced to $10 \mu\text{m mm}^{-2}$, inducing helical growth. The purple line is an indicative representation of the light intensity. The movie consists of 78 frames that cover a timespan of 140 minutes real-time growth.
- Supplementary Movie 2:** Light-controlled switching from helical to coral growth mode.
In this movie, the light-controlled the transition from helical growth to coral growth of a single $\text{BaCO}_3/\text{SiO}_2$ nanocomposite is presented. The movie is a zoom in from a larger illuminated area. The first 4 seconds show the growth of an architecture with $I_{UV} = 10 \mu\text{m mm}^{-2}$, yielding helical growth. Then I_{UV} is briefly increased to $100 \mu\text{m mm}^{-2}$, and subsequently set to $50 \mu\text{m mm}^{-2}$ inducing the growth of a coral shape. The purple line is an indicative representation of the light intensity. The movie consists of 35 frames that cover a timespan of 120 minutes real-time growth.