Electronic Supplementary Information (ESI)

Lipid-Inspired Biomimicking Morphosynthesis of Series of Complex Concave Silica Architectures

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Experimental Section

Synthesis of concaved silica architectures: All the chemicals were obtained from Aladdin Industrial corporation and used as received, unless otherwise stated. Deionized water was prepared with a Milli-Q puritysystem (18.2 MΩ). The detail synthetic procedure of **1** has been described previously.[1] To get the aqueous solution of **1**, **1** (1.0 mg, 2.34 μmol) were dissolved in 1 mL of methanol in a round-bottom flask, and then the solution was evaporated at 40 °C with rotary vacuum evaporator for 30 min, followed by further drying in vacuum for 1 h at room temperature for complete removal of the residual methanol. To a lipid thin film formed on the glass wall was added 20 ml of Milli-Q water in the flask. The solution was refluxed at 100 °C for 2 h, and then cooled to 60 °C slowly and stood for 12 h. Finally, the solution was allowed to cool to room temperature. The treated **1** self-assembled into well-defined lipid nanotubes (LNTs) in almost 100% yields in aqueous solution *via* intermolecular hydrogen bonding among the sugar head groups and amide units (shown in Fig. S1, ESI†). To this aqueous dispersion (10 mL) was added tetramethoxysilane (TMOS, 10 μL) at room temperature. The reaction mixture was adjusted to certain pH and stood for 24 h to precipitate. The precipitates were collected by ultracentrifugation, followed by repeated washing with water, and finally dried in vacuum at room temperature.

Characterizations: Small angle X-ray diffraction (SAXRD) was conducted on a Bruker D8 Advance diffractometer using Cu Kα radiation (λ = 0.15406 nm), where the data was collected in the 2θ range of 20–80° at a step size of 0.02°. Field-emission scanning electron microscopic (FE-SEM) images of solid products were measured on a Nova Nanosem 200 system operated at an acceleration voltage of 15 kV. Both scanning transmission electron microscopic (STEM) were performed on JEOL-3010

instrument. FT-IR spectra were measured with a Thermo Nexus 870 FTIR spectrometer (Thermo Nicolet USA).

References

(S1) S. Kamiya, H. Minamikawa, J. H. Jung, B. Yang, M. Masuda, T. Shimizu, *Langmuir*, 2005, 21, 743-750.

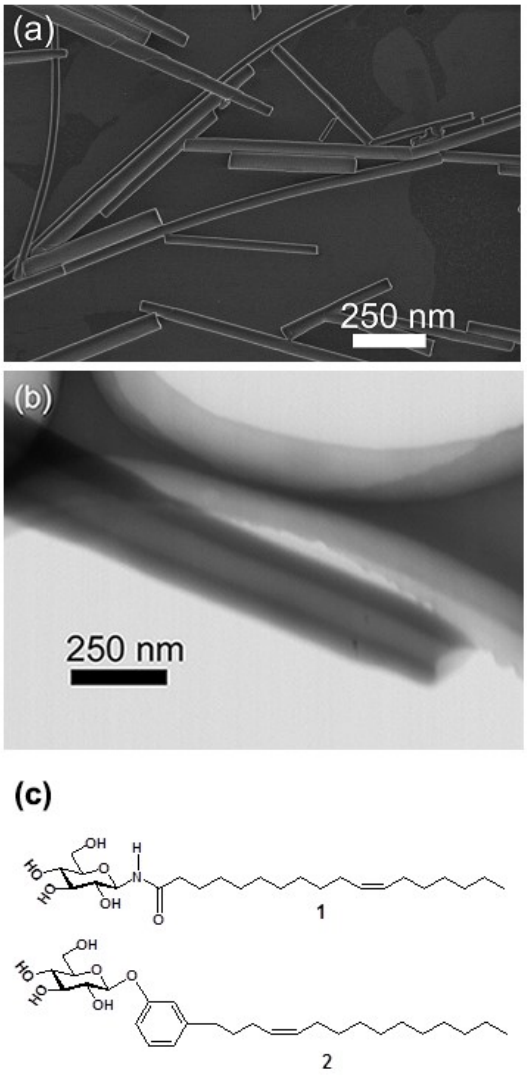

Fig. S1. (a) FE-SEM and (b) STEM images of the tubular assembly of **1**. (c) the structural formula of **1** and **2**.

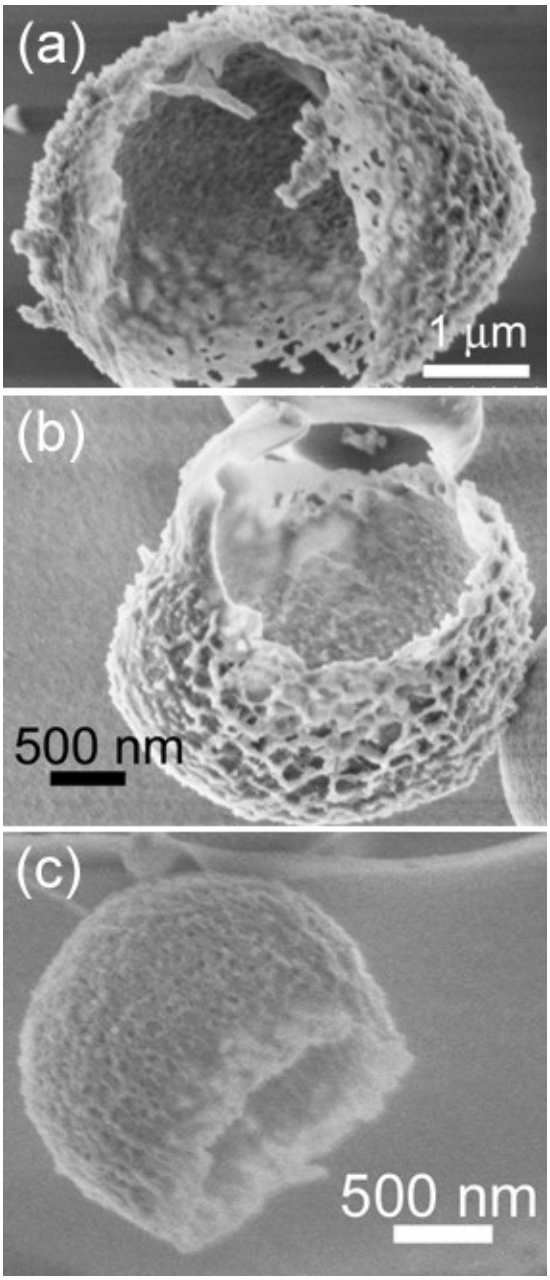

Fig. S2. FE-SEM images of porous network-like intermediate of silica architectures.

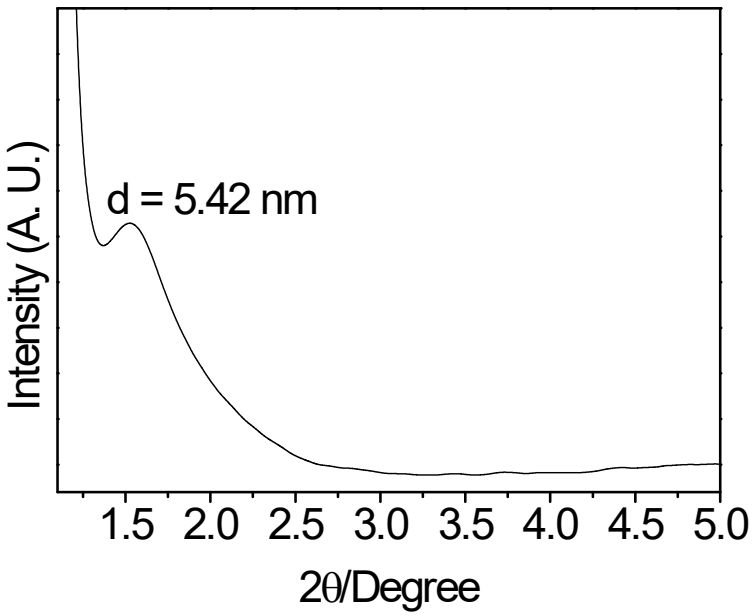

Fig. S3. SAXRD pattern of the nanobowl.

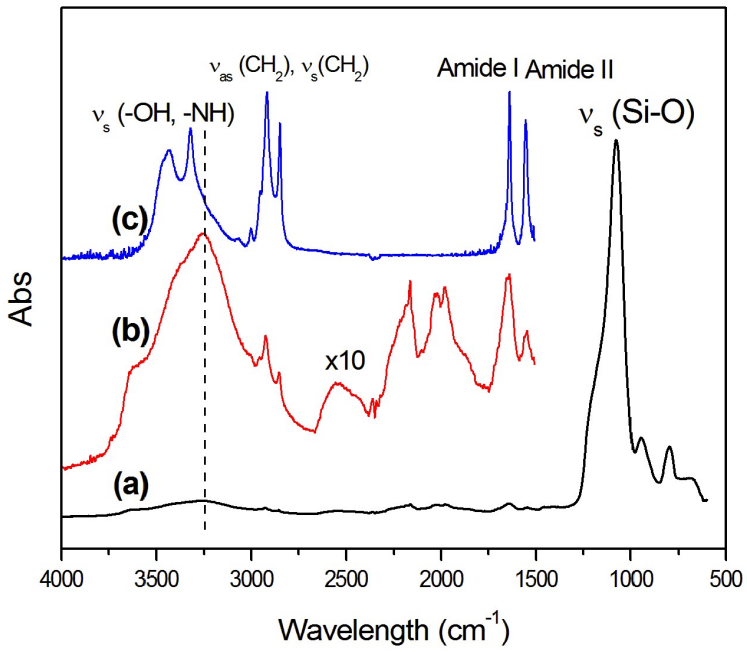

Fig. S4. FT-IR spectra of (a) the nanobowl, (b) enlarged spectrum of (a) and (c) pure **1**.

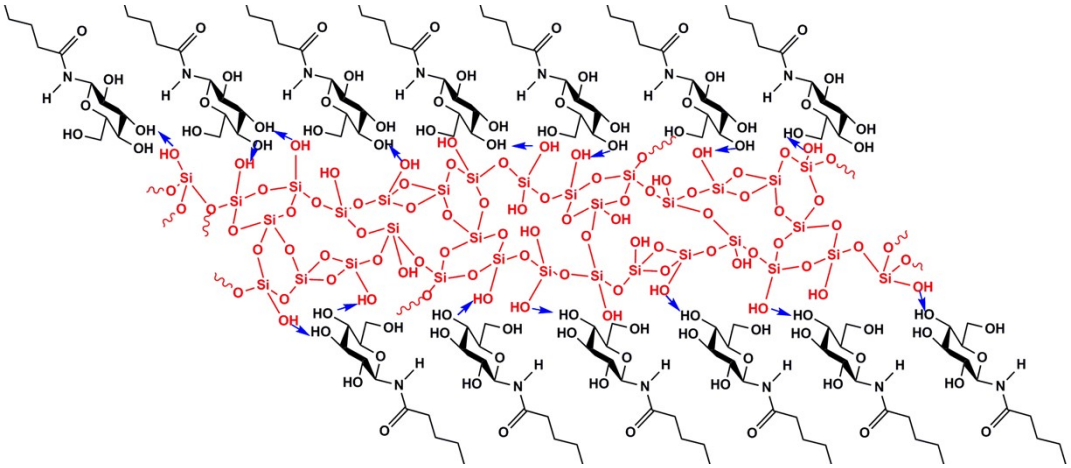

Fig. S5. Schematic illustration of the hydrogen bonds formed between **1** and silica.

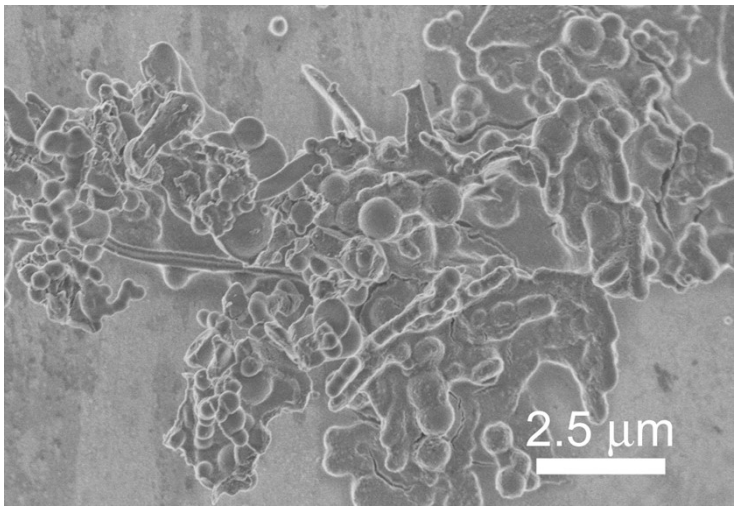

Fig. S6. FE-SEM image of the unshaped silica formed with **2**.

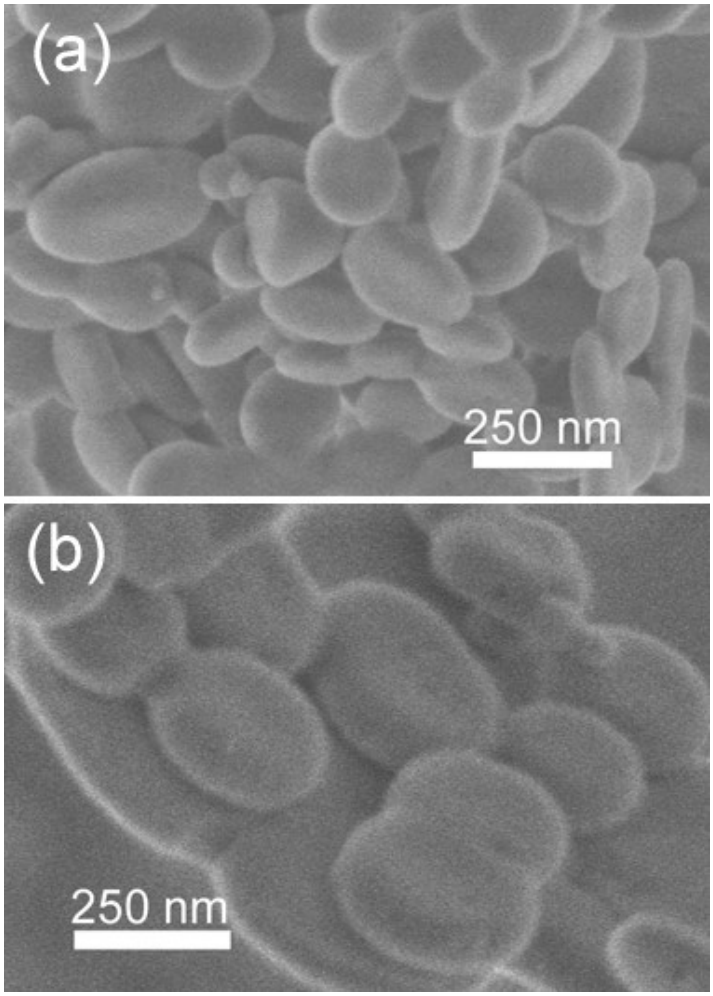

Fig. S7. FE-SEM images of the silica nanodish.

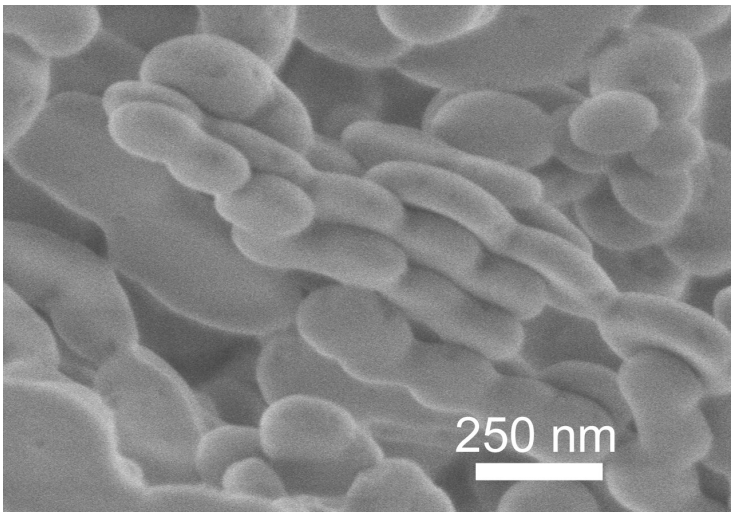

Fig. S8. FE-SEM image showing nanodishes face-to-face stack to self-orient each other.

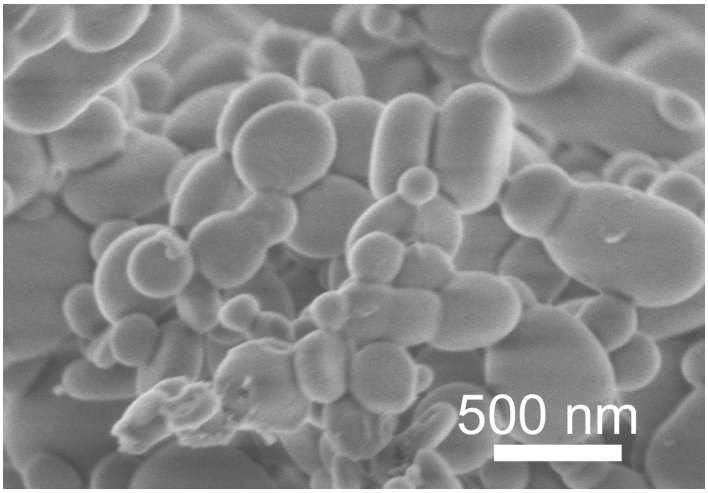

Fig. S9. FE-SEM image of the silica spherical particles formed at pH of 11.

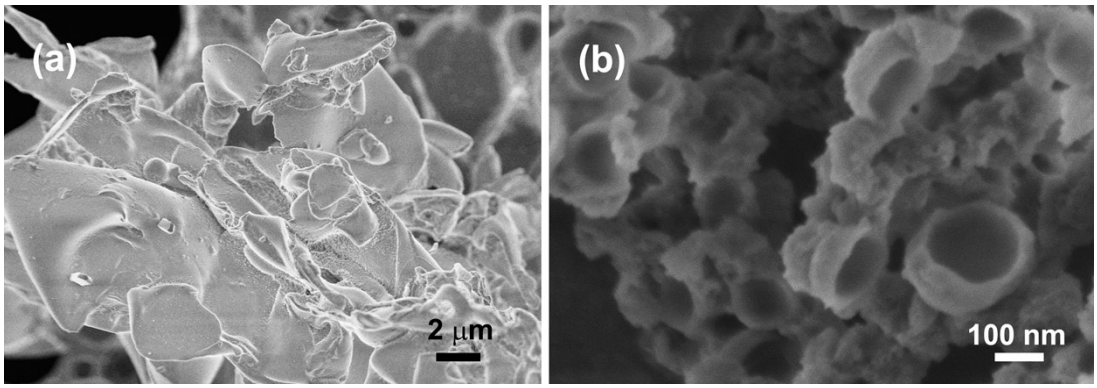

Fig. S10. FE-SEM image of the silica spherical particles formed at pH of (a) 2 and (b) 6.