Electronic Supplementary Information (ESI)

Synthesis of Chiral Mesostructured Titanium dioxide Films

Fenping Zhang,[†,a] Jing Ai,[†,b] Kun Ding,[†,a] Yingying Duan,[*,b] Lu Han[*,b] and Shunai Che[*,a,b]

[a.] *school of Chemistry and Chemical Engineering, State Key Laboratory of Composite Materials, Shanghai Key Laboratory for Molecular Engineering of Chiral Drugs, Shanghai Jiao Tong University, 800 Dongchuan Road, Shanghai, 200240.*

[b.] *School of Chemical Science and Engineering, Tongji University, 1239 Siping Road, Shanghai, 200092, P. R. China. † These authors contributed equally to this work.*

[*]*E-mail: chesa@sjtu.edu.cn; yyduan@tongji.edu.cn; luhan@tongji.edu.cn*

[†] *These authors equally contributed to this work.*

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Experimental Section

In a typical synthesis: Titanium foils with thickness of 0.3 mm were cut into small pieces with size of 33 mm×12 mm, then a piece of titanium foil was ultrasonically cleaned in acetone, ethanol and water for 15 min. NaOH (0.1 g, 2.5 mmol) and the symmetry breaking agent L (D)-

mannitol (0.5 g, 2.7 mmol) were dissolved in 25 mL H_2O, after stirring for 30 min, the homogenous solution was transferred into a 40 mL Teflon-lined autoclave and a piece of titanium foil was immersed in the solution to react under static conditions at 180 °C for 20 h. After the hydrothermal reaction, titanium foil was immersed in 1 M HCl solution for 10 min to replace Na^+ with H^+. Then, the titanium foil was removed from HCl solution and rinsed with water, ethanol and dried in ambient condition. The chiral TiO_2 films were obtained after heat in a muffle furnace at 550 ℃ for 6 h with a ramping rate of 2℃/min. Finally, the CMTFs were formed.

Self-assembly of the guest molecules on CMTFs: The synthesized L/R-CMTFs were immersed in the TPPS hydrate solution with concentration of 0.2 mg/mL for 24 hours and then drying in the natural environment, the DRCD spectra of the hybrid materials was measured.

Characterization.

Powder XRD patterns were recorded on a Rigaku X-ray diffractometer (D/max-2200/PC) equipped with a Cu Kα radiation source (40 kV, 30 mA, λ = 0.15418 nm). SEM images were conducted on a Hitachi SU 9000 electron microscope operating at 0.7 kV, TEM observations were performed using a JEOL JSM-F200 microscope. The DRCD spectra were taken on a JASCO J-815 spectropolarimeter fitted with DRCD apparatus.

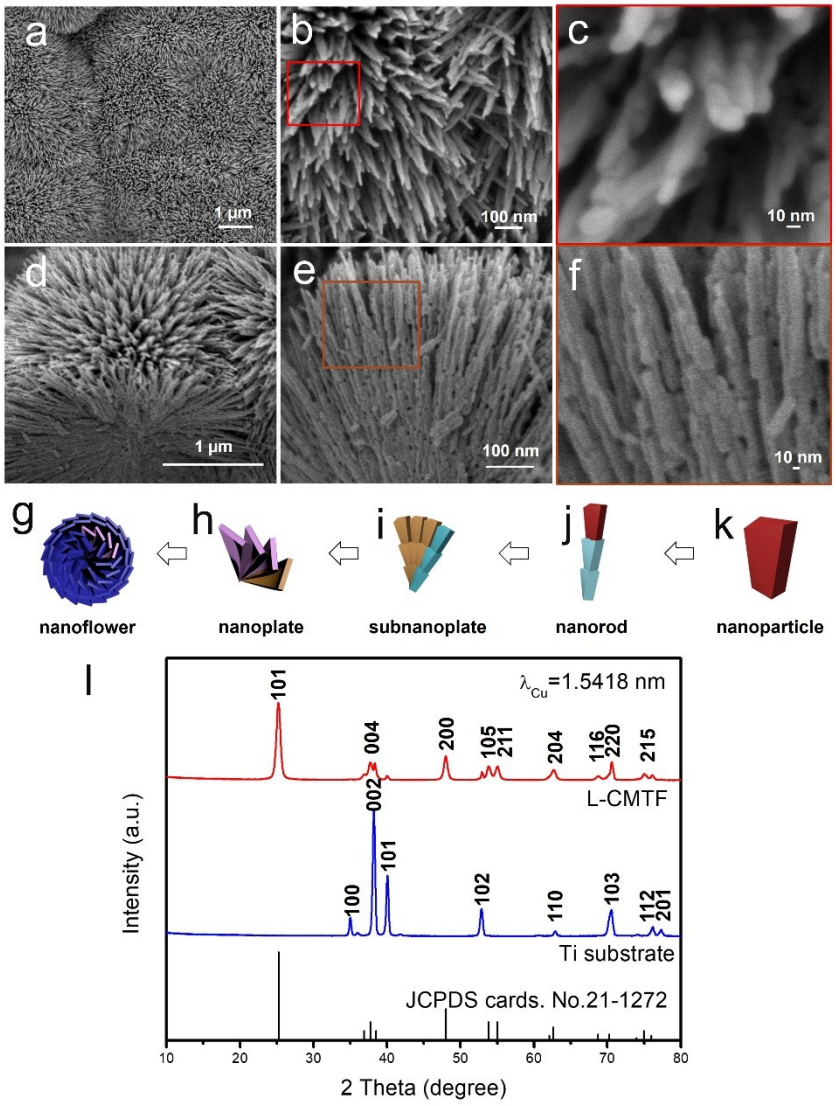

Fig. S1. Top-view (a–c) and side-view (d–f) SEM images of R-CMTF with varying magnifications, a schematic drawing of the hierarchical chirality in L-CMTFs (g–k), XRD patterns of L-CMTF and Ti foil (l).

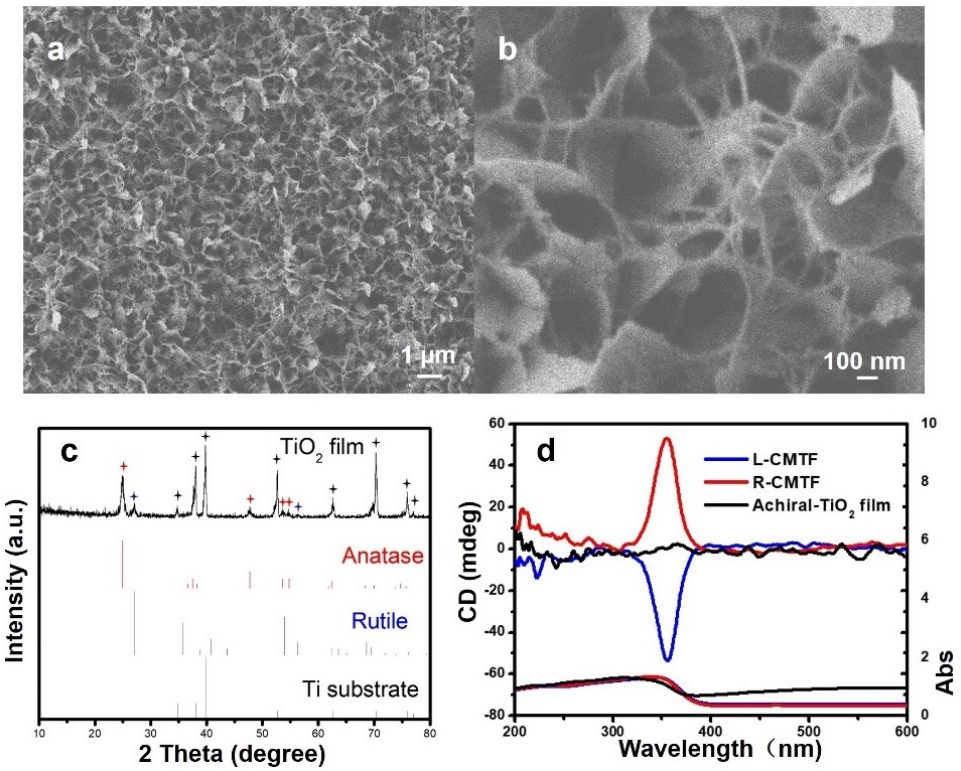

Fig. S2. SEM images of achiral-TiO_2 film synthesized without L/D-mannitol with varying magnifications (a, b), XRD pattern of achiral-TiO_2 film (c), DRUV-Vis and DRCD spectra of achiral-TiO_2 film (d).

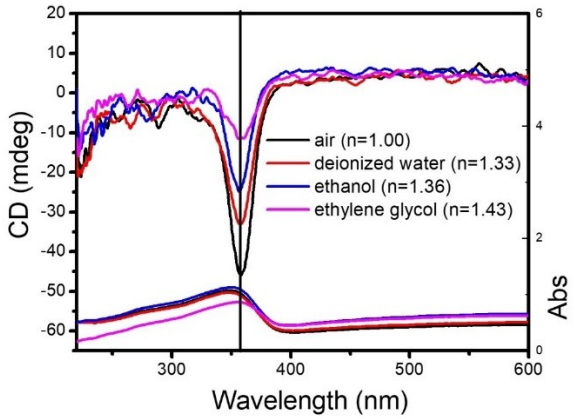

Fig. S3. DRUV-Vis and DRCD spectra of L-CMTF saturated with various solvents.

Chiral inorganic materials with scattering-based OA must satisfy with circular Bragg resonance theory ($\lambda=P\bullet n_{average}$, where λ is the maximum absorption wavelength of the chiral material, P is the pitch length of chiral material, $n_{average}$ is the refractive index of the chiral material and environments[1]). The average refractive index was changed by adding different solvents in the CMTFs, as shown in Fig. S3, the maximum absorption wavelength of the sample was constant, which indicating that the CMTFs do not exhibit scattering-based OA. The increasing refractive index of solvents was negative to the multiple reflections inside the

L-CMTF, thus the light harvesting ability of L-CMTF weakened[2]. Consequently, the selective absorption to the circularly polarized electromagnetic wave was decreased, and the intensity of CD signal weakened.

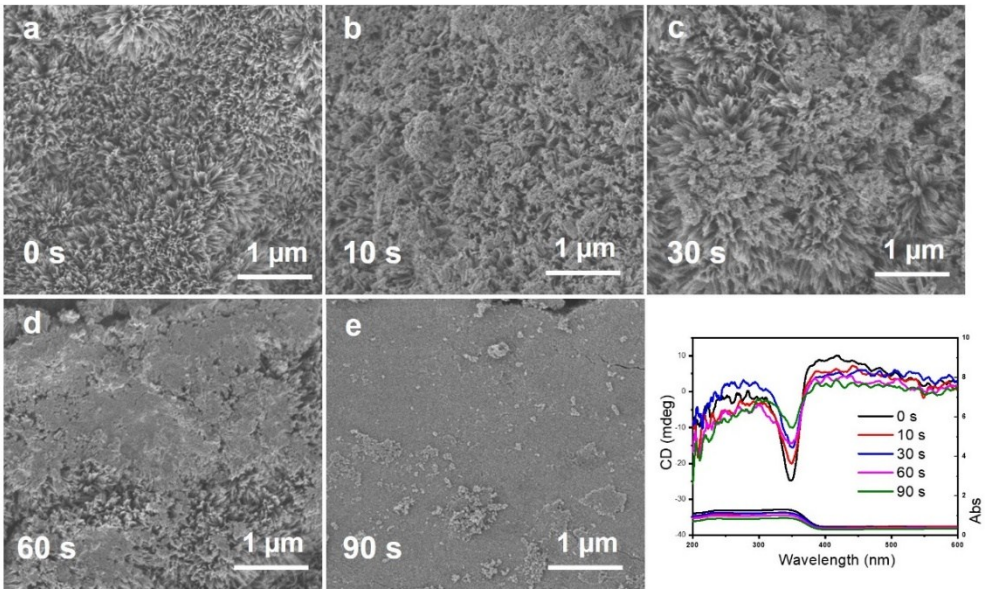

Fig. S4. SEM images and DRCD spectra of the L-CMTFs with a peening time of 0 s, 10 s, 30 s, 60 s, and 90 s.

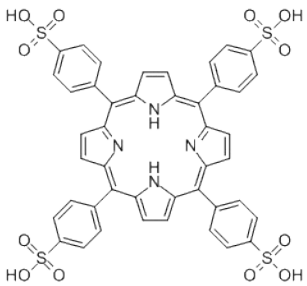

Fig. S5. Structure of TPPS hydrate.