Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Plasmon-Enhanced Unidirectional Charge Transfer for Efficient Solar Water Oxidation

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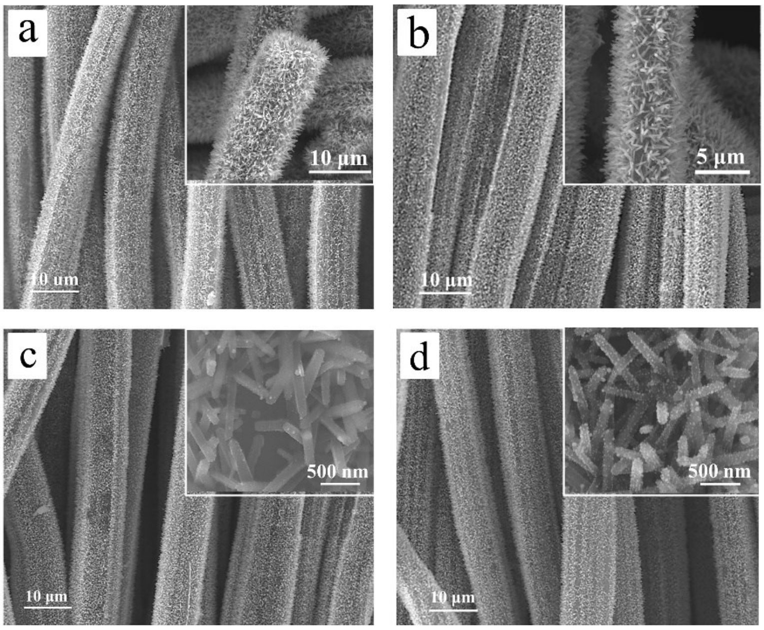

Fig. S1 SEM images of (a) CC@TiO_2, (b) CC@TiO_2@$SrTiO_3$, (c-d) CC@TiO_2@$SrTiO_3$-Au with photochemical reduction time of 5 min and 15 min, respectively.

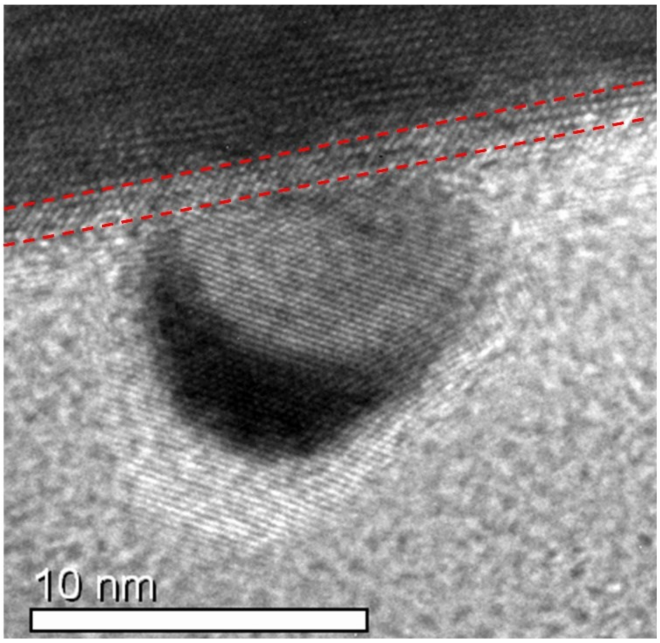

Fig. S2 Enlarged TEM image of CC@TiO_2@$SrTiO_3$-Au.

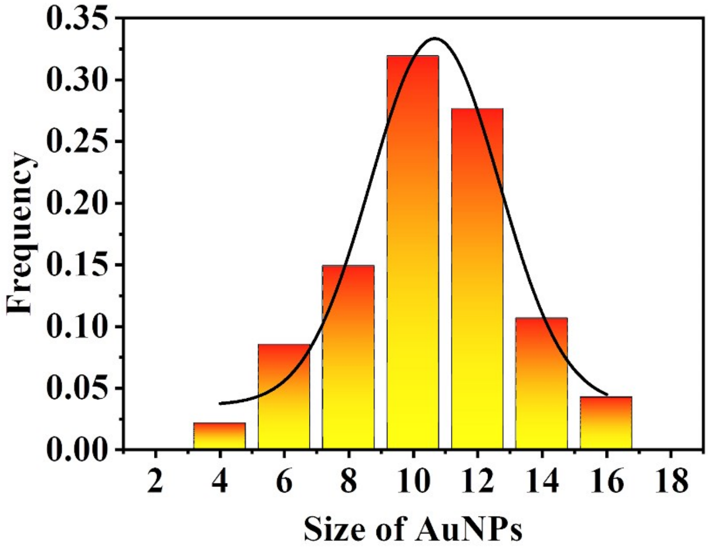

Fig. S3 The size distribution of deposited AuNPs. The standard deviation is 2.67 nm.

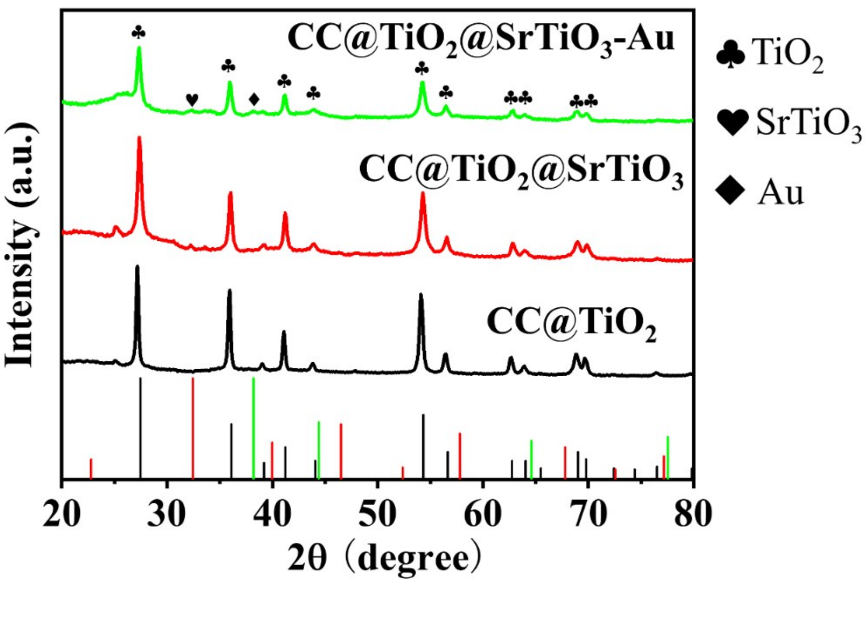

Fig. S4 XRD spectra of CC@TiO_2 (black), CC@TiO_2@$SrTiO_3$(red), and CC@TiO_2@$SrTiO_3$-Au (green).

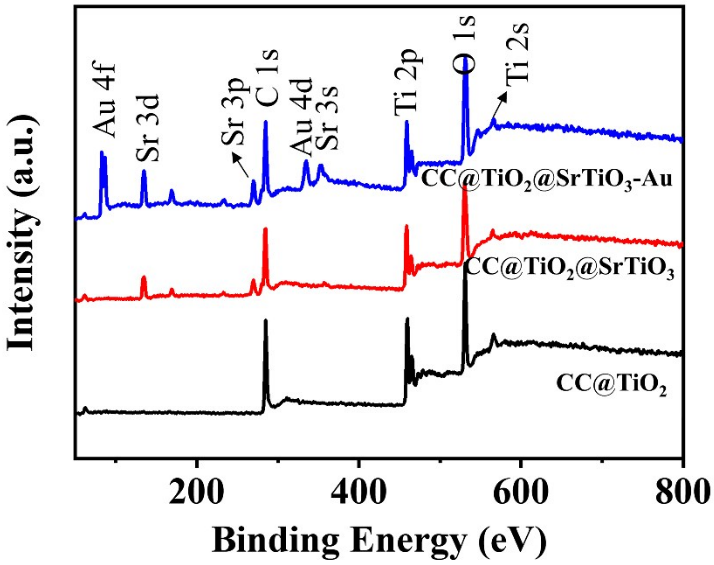

Fig. S5 Full-scan XPS spectra of the samples.

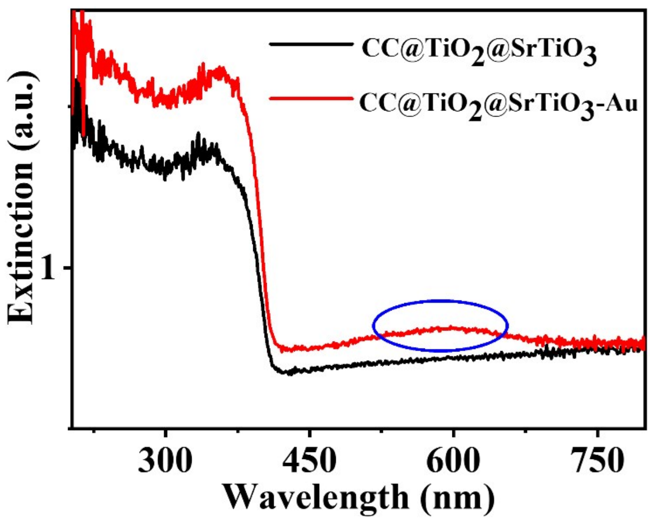

Fig. S6 UV-Vis spectra of $CC@TiO_2@SrTiO_3$ and $CC@TiO_2@SrTiO_3$-Au.

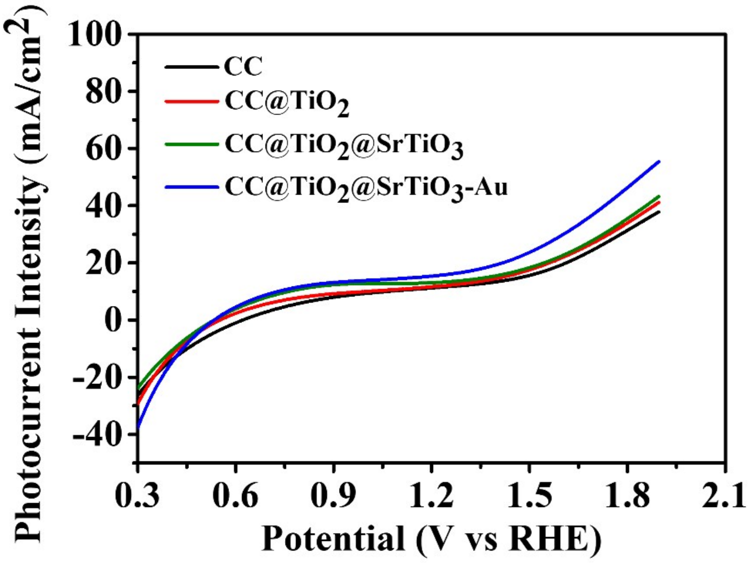

Fig. S7 LSV of different samples in dark.

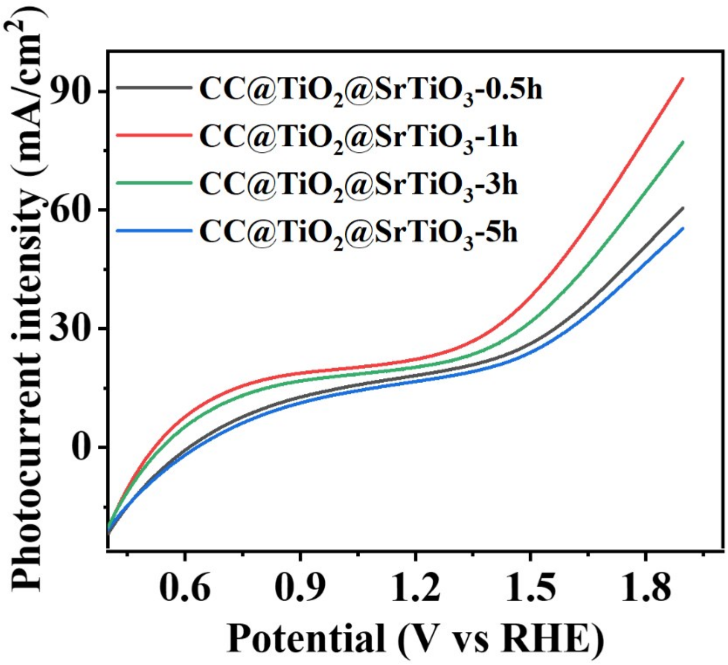

Fig. S8 LSV of CC@TiO_2@$SrTiO_3$ with different hydrothermal time.

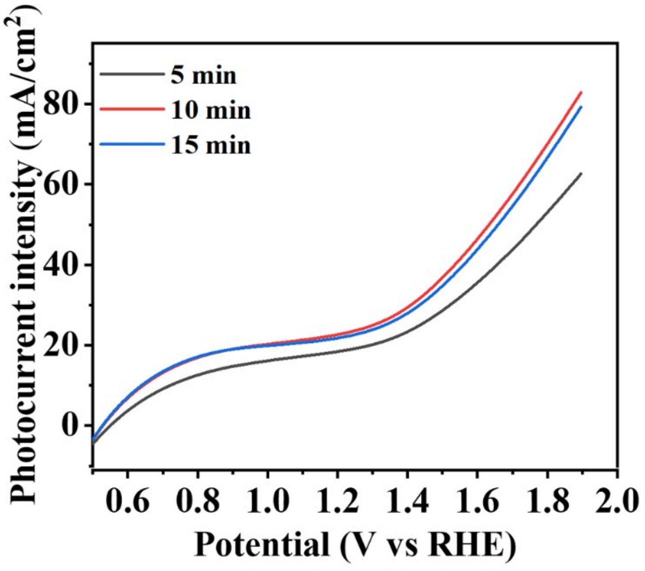

Fig. S9 LSV of CC@TiO_2@$SrTiO_3$-Au with different photochemical reduction time.

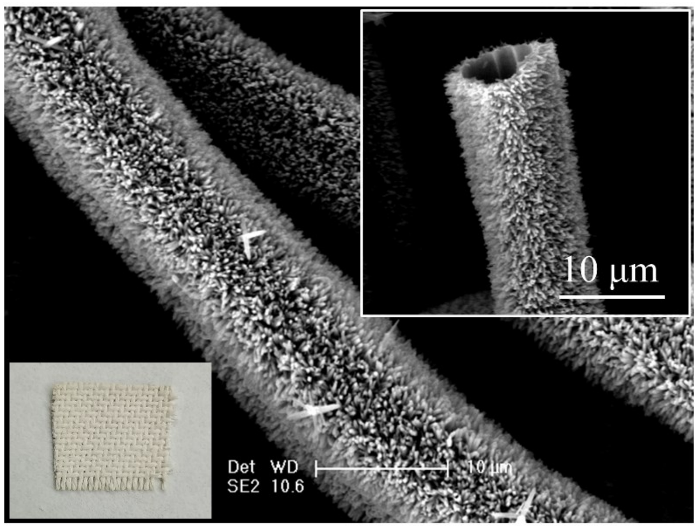

Fig. S10 SEM image of TiO_2@$SrTiO_3$-Au nanotubes. Inset: Digital photograph of nanotubes.

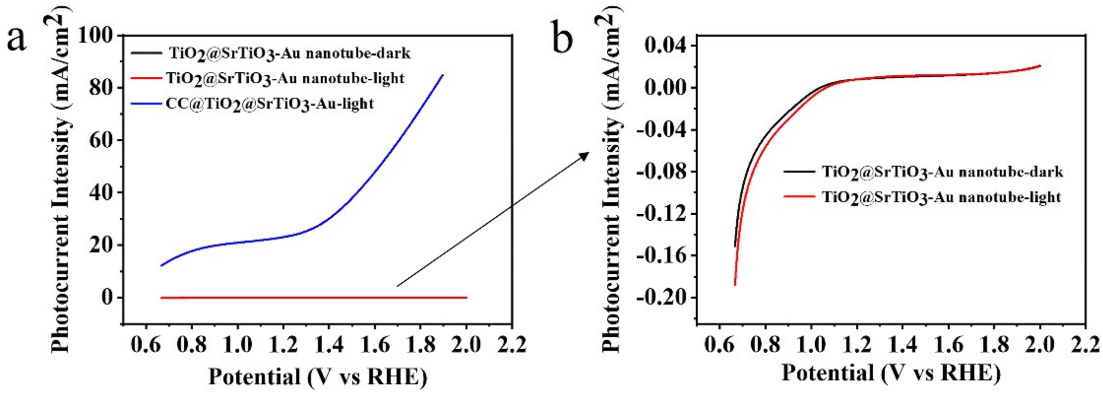

Fig. S11 (a) LSV of CC@TiO_2@$SrTiO_3$-Au and TiO_2@$SrTiO_3$-Au nanotubes. (b) enlarged LSV plots of TiO_2@$SrTiO_3$-Au nanotubes under the illumination of light and in dark.

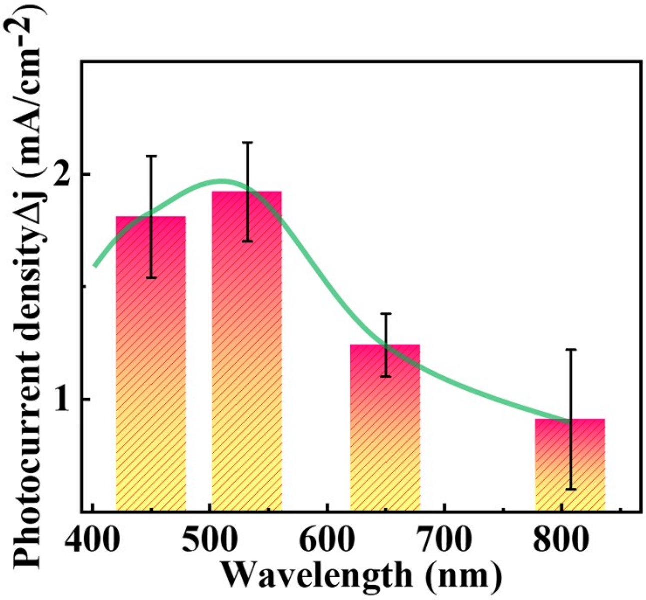

Fig. S12 Photocurrent densities of CC@TiO_2@$SrTiO_3$-Au under the illumination of different wavelengths.

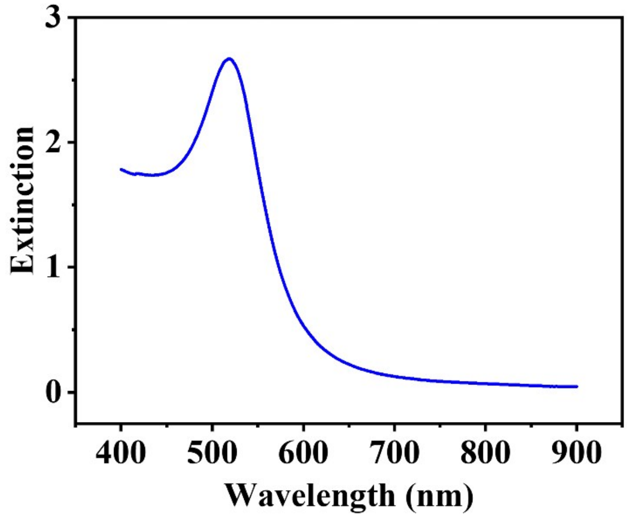

Fig. S13 Extinction spectra of 12 nm AuNPs.

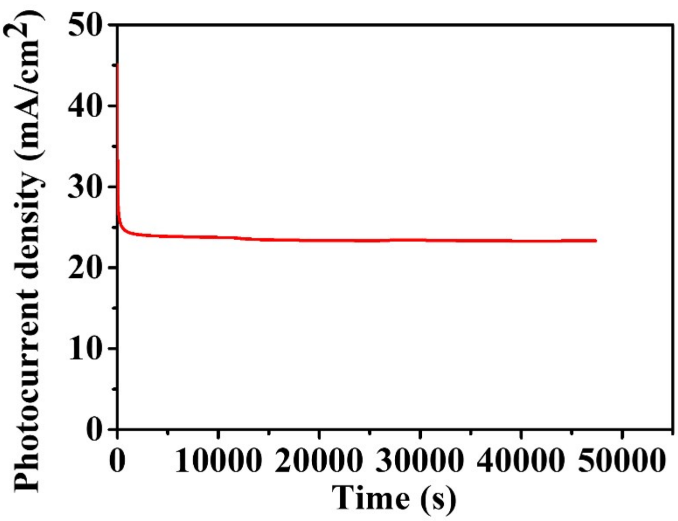

Fig. S14 Stability of CC@TiO_2@$SrTiO_3$-Au.

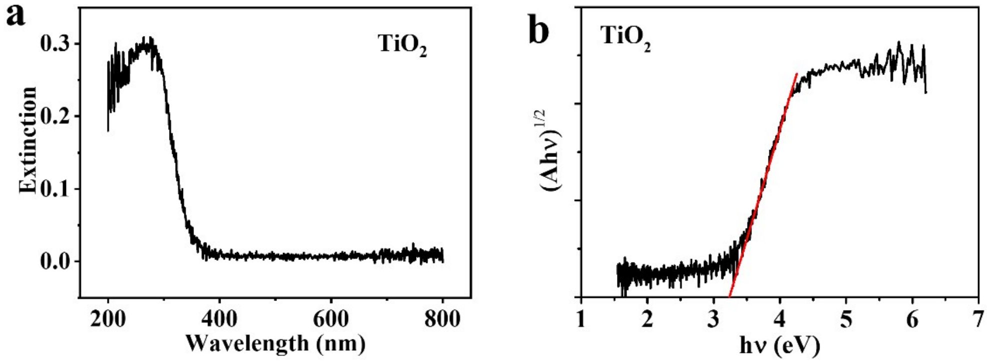

Fig. S15 (a) UV-Vis and (b) Kubelka-Munk plots of TiO_2.

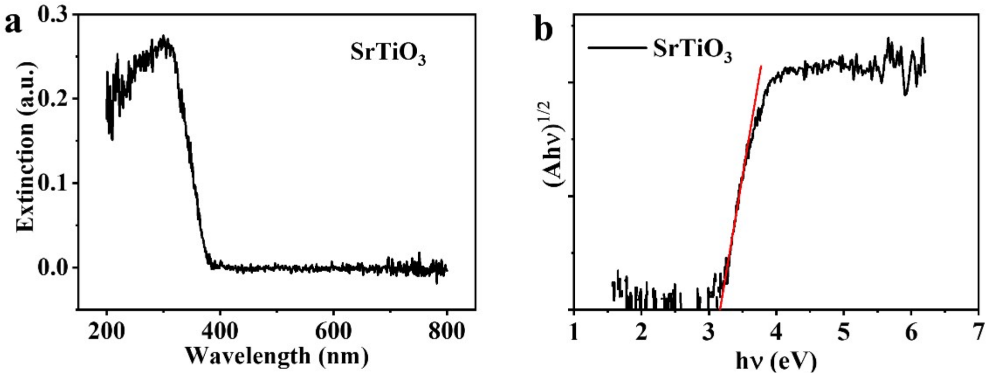

Fig. S16 (a) UV-Vis and (b) Kubelka-Munk plots of $SrTiO_3$.

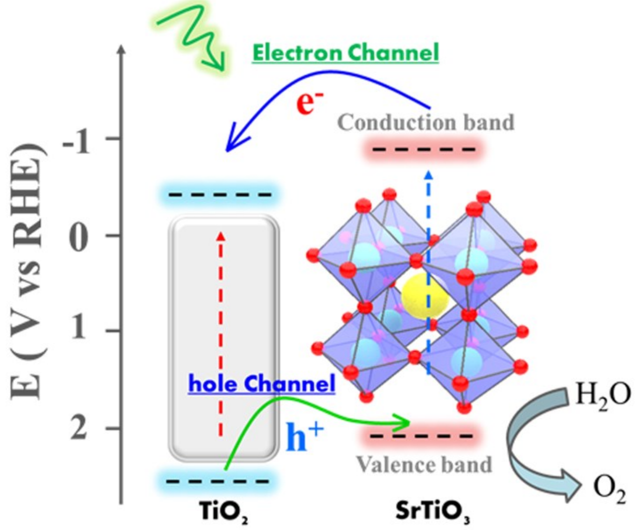

Fig. S17 Band structure diagram and charge transfer channels of TiO_2@$SrTiO_3$ hetero-nanostructures.

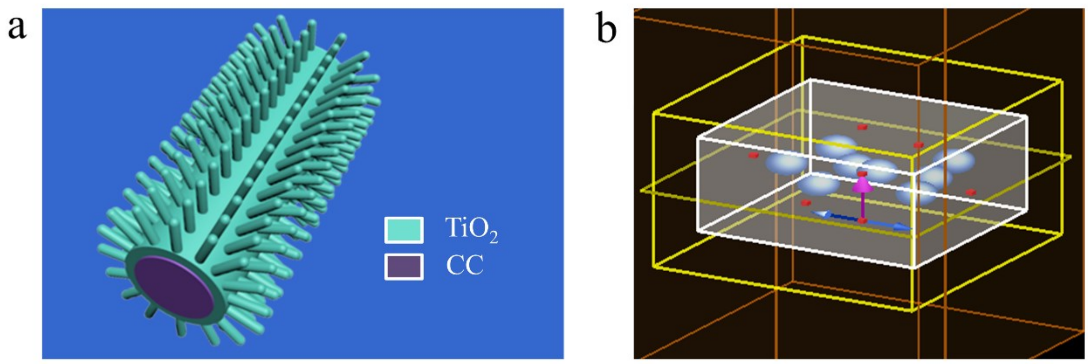

Fig. S18 Cross-section simulation model of (a) CC@TiO_2 and (b) disordered TiO_2 nanoparticles.

Table S1 Comparison of OER performance of PEC catalysts based on TiO_2 under light irradiation.

	Materials	Current Density （mA/cm²）	Electrolyte	Light intensity (mW/cm²)	Reference
1	Fe_2TiO_5–TiO_2 Nanocages	~0.35 (1.23 V vs RHE)	1.0 M NaOH	100	*Angew. Chem., Int. Ed.* 2020, 59, 1-6
2	Carbon Nitride/TiO_2	≈0.122 (1.23 V vs RHE)	0.5 M Na_2SO_4	100	*Chem. Eng. J.* 2020, 396, 125267
3	QDs/TiO_2-Au:CNTs	16.10 ± 0.10 (1.0 V vs RHE)	0.25 M Na_2S and 0.35 M Na_2SO_3	100	*Adv. Sci.* 2020, 2001864
4	$SrTiO_3$/TiO_2/Au	2.11 (1.23 V vs RHE)	1.0 M NaOH	100	*Nano Energy* 2019, 57 542–548
5	CQDs/A/R-TiO_2	2.76 (1.23 V vs RHE)	0.2 M Na_2SO_4	100	*Appl. Catal.* B 2020, 269 118776
6	C/N-TiO_2 NW Arrays	0.76 (1.80 V vs RHE)	1.0 M NaOH	100	*Adv. Energy Mater.* 2018, 1800165
7	CC@TiO_2@$SrTiO_3$-Au	23.56 (1.23 V vs RHE)	1.0 M KOH	100	This work

Table S2 Comparison of the maximum optical conversion efficiencies of commonly used PEC catalysts.

	Maximum Optical Conversion Efficiency	Reference
1	0.94% (0.61 V vs. RHE)	*Chem. Eng. J.* 2020, 385, 123878
2	0.07% (1.05 V vs RHE)	*Chem. Eng. J.* 2020, 379, 122256
3	0.40 % (0.97 V vs RHE)	*Appl. Catal. B* 2020, 277, 119197
4	14.1% (0.4 V vs Ag/AgCl)	*Adv. Energy Mater.* 2020, 2000772
5	0.56% (0.98 V vs RHE)	*ACS Appl. Mater. Interfaces* 2020, 12, 30304
6	7.73% (0.76 V vs RHE)	This work