

Supporting Information

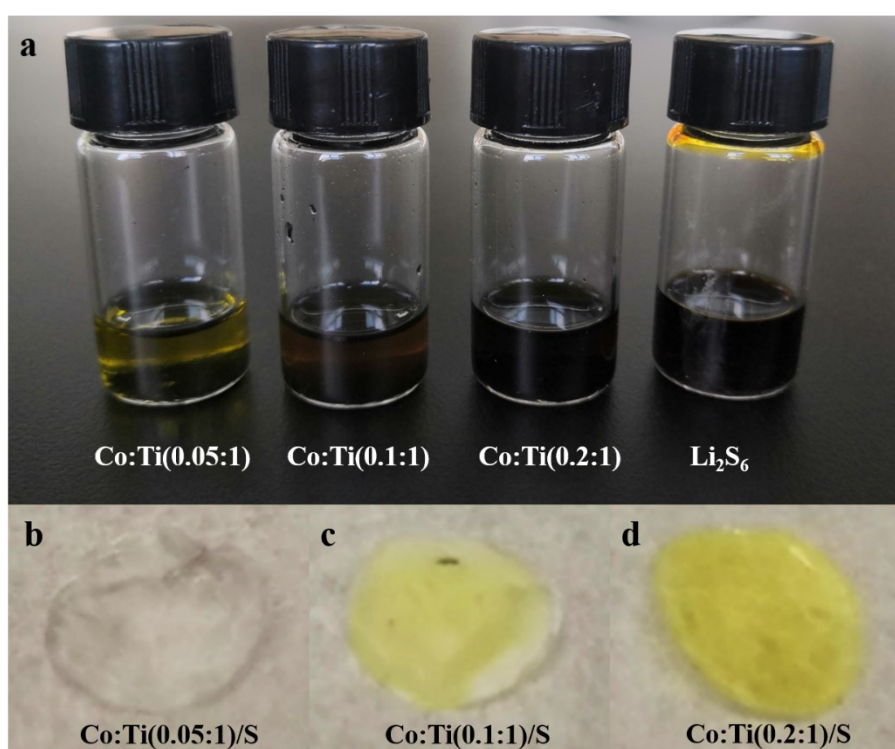


Figure S1 (a) Polysulfide-adsorption performance test of three composite materials and Li₂S₆ after 24 h, (b-d) digital images of separators from three composite electrodes after discharging to 2.0 V at 1.7 A·g⁻¹

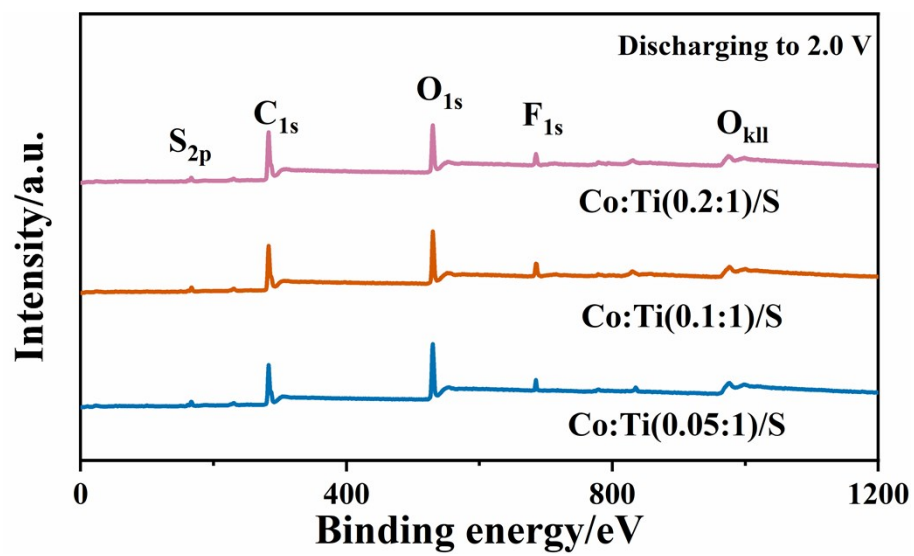


Figure S2 XPS spectra of three composite electrodes after discharging to 2.0 V at $1.7 \text{ A} \cdot \text{g}^{-1}$

Table S1 Cycling stabilities of titanium oxide/biomass carbon/sulfur composite electrodes with different load thicknesses and sulfur electrode (Units of capacities: mAh·g⁻¹)

Electrode	Initial discharge capacity	Initial charge capacity	Initial Coulombic efficiency/%	Discharge capacity after 500 cycles
Co:Ti(0.05:1)/S	877.1	918.3	105	375.0
Co:Ti(0.1:1)/S	942.0	936.7	99	279.8
Co:Ti(0.2:1)/S	824.6	837.1	102	280.7
S	464.5	449.1	97	163.1

Table S2 Rate performance of titanium oxide/biomass carbon/sulfur composite electrodes with different load thicknesses and sulfur electrode after 10 cycles
(Units of current densities: $\text{A} \cdot \text{g}^{-1}$, Units of capacities: $\text{mAh} \cdot \text{g}^{-1}$)

Electrode	0.8	1.7	3.4	8.4	17	34	0.8
Co:Ti(0.05:1)/S	807.7	700.1	631.1	595.7	565.3	500.9	641.1
Co:Ti(0.1:1)/S	710	598.7	545.6	502.8	414.2	123.3	539.7
Co:Ti(0.2:1)/S	583.8	466.8	421	338.3	219.8	193.1	386.3
S	445.1	337.6	231.1	124	82.1	38.8	342.4

Table S3 Peak voltage comparisons of three electrodes (Units: V)

V	Co:Ti(0.05:1)/S	Co:Ti(0.1:1)/S	Co:Ti(0.2:1)/S
Cathodic peak 1	2.4	2.4	2.41
Cathodic peak 2	2.31	2.32	2.31
Cathodic peak a	2.44	2.47	
Cathodic peak b	2.5		2.5
Anodic peak 1	2.32	2.31	2.3
Anodic peak 2	2.03	2.02	2

Table S4 EIS analysis results of titanium oxide/biomass carbon/sulfur composite electrodes with different load thicknesses at $1.7 \text{ A} \cdot \text{g}^{-1}$ without cycling, after 100 cycles and 500 cycles, respectively

	Electrode	$R_e (\Omega)$	$R_{sl} (\Omega)$	$R_{ct} (\Omega)$
Without cycling	Co:Ti(0.05:1)/S	1.34	73.28	0.01
	Co:Ti(0.1:1)/S	1.59	23.49	20.25
	Co:Ti(0.2:1)/S	1.15	8.27	37.37
After 100 cycles	Co:Ti(0.05:1)/S	1.98	14.63	11.26
	Co:Ti(0.1:1)/S	1.65	5.11	2.89
	Co:Ti(0.2:1)/S	3.1	6.84	4.41
After 500 cycles	Co:Ti(0.05:1)/S	1.02	10.93	15.35
	Co:Ti(0.1:1)/S	2.41	12.9	51.19
	Co:Ti(0.2:1)/S	1.54	15.02	24.3

Table S5 XPS analysis results of titanium oxide/biomass carbon/sulfur composite electrodes with different load thicknesses after discharging to 2.0 V (%)

	C	O	S	Co	F
Co:Ti(0.05:1)/S	64.20	30.07	5.09	0.14	0.5
Co:Ti(0.1:1)/S	67.81	23.55	4.24	0.19	4.21
Co:Ti(0.2:1)/S	71.17	21.49	3.79	0.15	3.39

Table S6 C 1s peak fitting results of titanium oxide/biomass carbon/sulfur composite electrodes
with different load thicknesses after discharging to 2.0 V (%)

	Co:Ti(0.05:1)/S	Co:Ti(0.1:1)/S	Co:Ti(0.2:1)/S
C-C/C=C (284.6 eV)	80	71	63
Carbides (283.5 eV)	8	16	25
C-S (286.2 eV)	12	12	12

Table S7 S 2p peak fitting results of titanium oxide/biomass carbon/sulfur composite electrodes
with different load thicknesses after discharging to 2.0 V (%)

	Co:Ti(0.05:1)/S	Co:Ti(0.1:1)/S	Co:Ti(0.2:1)/S
S-S (163.5 eV)			12
S ⁻ (161.6 eV)	24	20	13
SO ₄ ²⁻ (166.6 eV)	76	80	75

Table S8 Comparison of our work and composite electrodes in literatures

	Rate performance/mAh g ⁻¹
Our work	807.7 (0.8 A·g ⁻¹), 700.1 (1.7 A·g ⁻¹), 631.1 (3.4 A·g ⁻¹), 595.7 (8.4 A·g ⁻¹), 565.3 (17 A·g ⁻¹), 500.9 (34 A·g ⁻¹)
S@Co-TiO ₂ /C [31]	500 (8.4 A·g ⁻¹)
N-TiO ₂ NW@CC [32]	580 (3.4 A·g ⁻¹)
MTC [33]	200 (17 A·g ⁻¹)
rod-TiO ₂ @C/S [34]	500 (17 A·g ⁻¹)
hybrid MC-Meso C-doped TiO ₂ /S composite [35]	200 (3.4 A·g ⁻¹)
TiO ₂ @AB/S [14]	600 (1.7 A·g ⁻¹)
KB@TiO ₂ @S [36]	600 (3.4 A·g ⁻¹)
PCNS-TiO ₂ [37]	620 (3.4 A·g ⁻¹)
RGO/TiO ₂ (B) [38]	500 (3.4 A·g ⁻¹)
TiO ₂ /PC modified separator [39]	480 (3.4 A·g ⁻¹)