Supporting Information

Dual-duty $NiCo_2S_4$ Nanosheets Based Solar Rechargeable Batteries toward Multi-scene Solar Energy Conversion and Storage

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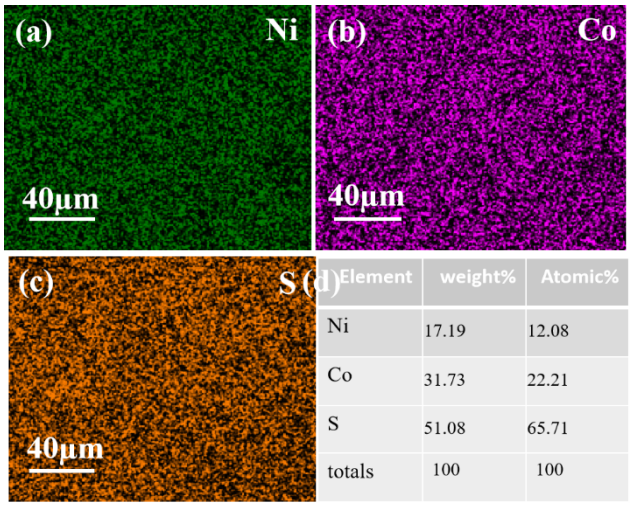

Element	weight%	Atomic%
Ni	17.19	12.08
Co	31.73	22.21
S	51.08	65.71
totals	100	100

Figure S1. (a-c) Elemental mappings of $NiCo_2S_4$ nanosheets showing the distribution of Ni, Co and S. (d) EDS of the $NiCo_2S_4$.

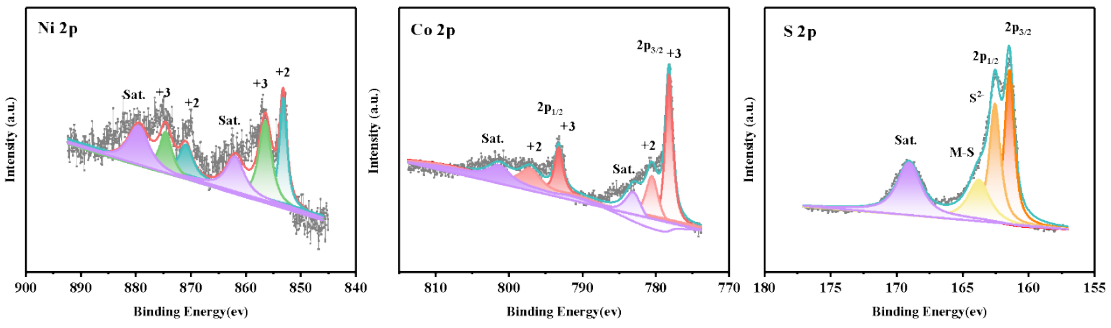

Figure S2. XPS spectra of the Ni 2p, Co 2p, and S 2p, respectively.

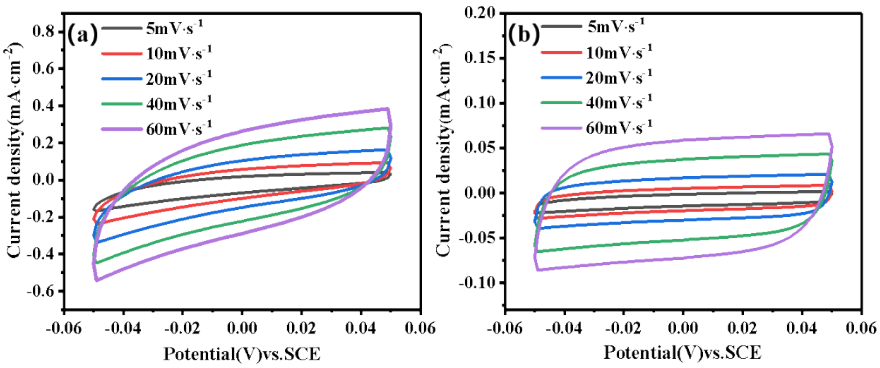

Figure S3. ECSA measurements (a, b) CV curves of $NiCo_2S_4$ nanosheets electrode and CP electrode in 1 M NaCl under different scan rates within non-Faradaic region.

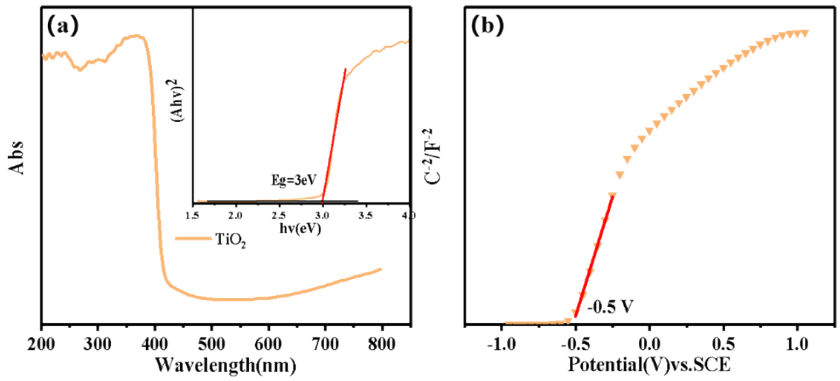

Figure S4. (a) UV-vis diffuse reflectance spectrum of TiO_2, (b) MS of TiO_2 in 0.5 M Na_2SO_4

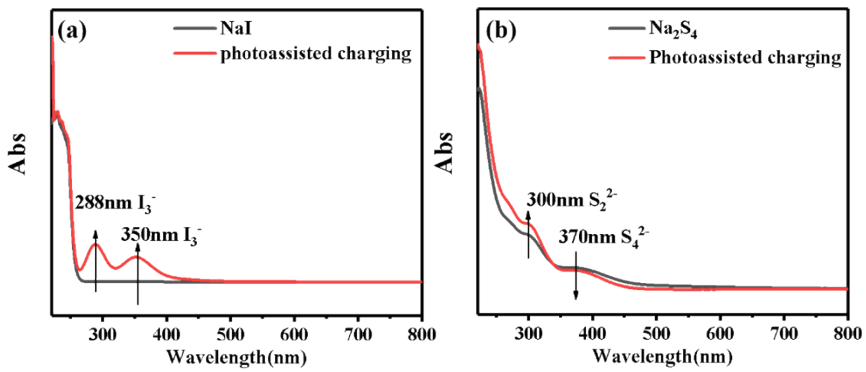

Figure S5. UV-vis diffuse reflectance spectrum after photo-assisted charging an hour at 0.01 mA cm^{-2}

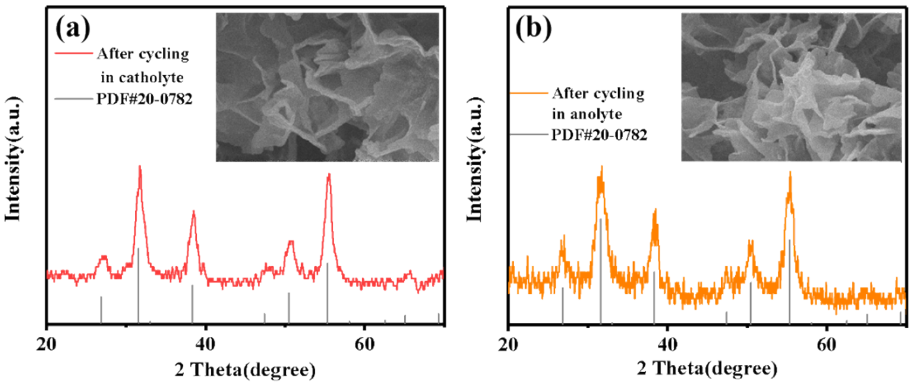

Figure S6. XRD and SEM of $NiCo_2S_4$ nanosheets electrodes after cycling test.

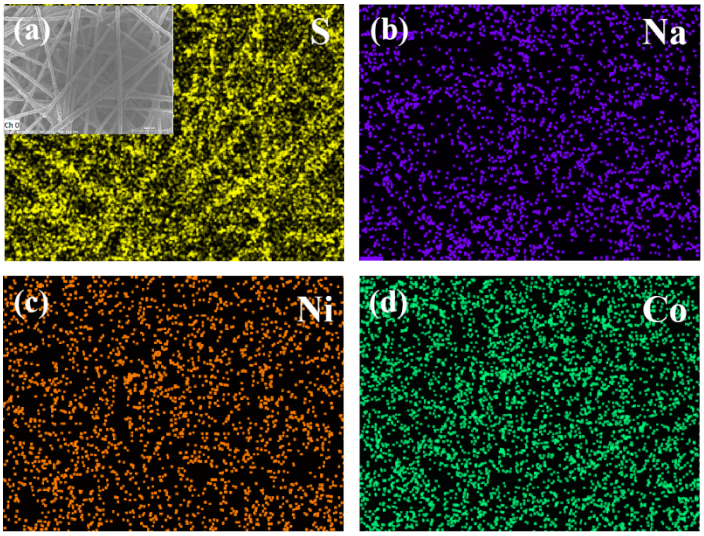

Figure S7. Elemental mappings of $NiCo_2S_4$ nanosheets after 1.5 h charging at 0.2 mA cm^{-2}.

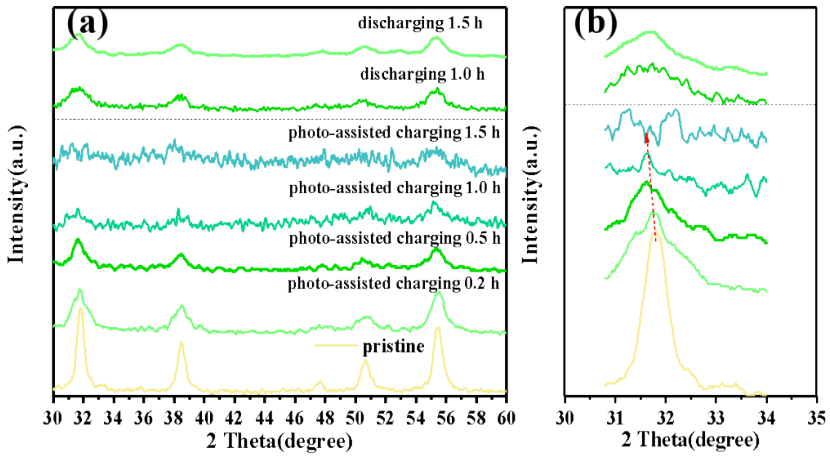

Figure S8. (a) Ex-situ XRD patterns at different photo-assisted charge and discharge states, (b) The $NiCo_2S_4$ structural evolution concentrating on the enlarged region of (a) of (311) crystal plane.

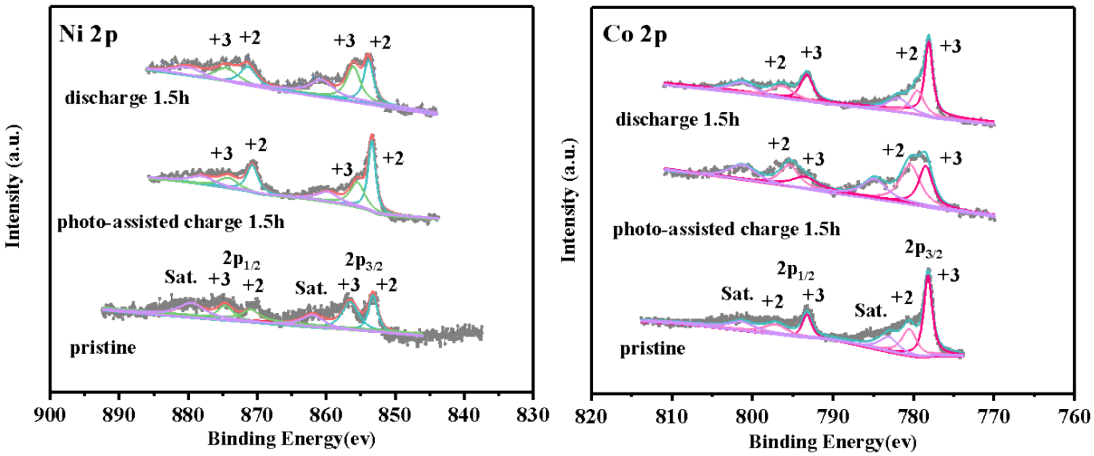

Figure S9. XPS spectra of Ni 2p, Co 2p at pristine, photo-assisted charge and discharge states of $NiCo_2S_4$ nanosheets electrode.

Table 1. Current density obtained from **Figure 2c** different electrolytes at −0.66 V.

Electrolyte	$NiCo_2S_4$	CP
1M NaCl	-0.00142	-6.682E-5
1M Na_2S_4	-0.01046	-2.586E-4

Table 2. EDS of the $NiCo_2S_4$ after the 1_{st} charge and 1_{st} discharge.

	Element	weight%	Atomic%
1st charge	S	47.72	58.99
	Ni	15.15	10.24
	Co	31.62	21.27
	Na	5.51	9.5
1st discharge	S	34.29	48.87
	Ni	20.96	16.32
	Co	44.67	34.65
	Na	0.08	0.16