Supporting information

Bifunctional iron disulfide nanoellipsoid for high energy density supercapacitor and electrocatalytic oxygen evolution

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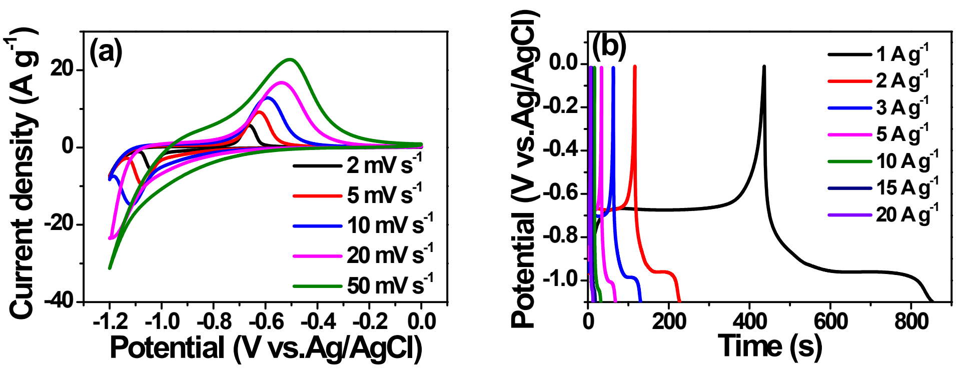

Fig.S1. (a) CV curves of Fe_2O_3 electrode at various scan rates. (b) Galvanostatic charge-discharge curves of Fe_2O_3 at different current densities.

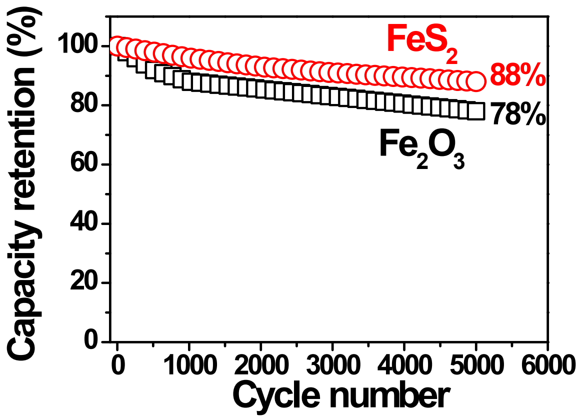

Fig.S2. Cycling performance of the Fe_2O_3 and FeS_2 electrodes at 15 A g^{-1}.

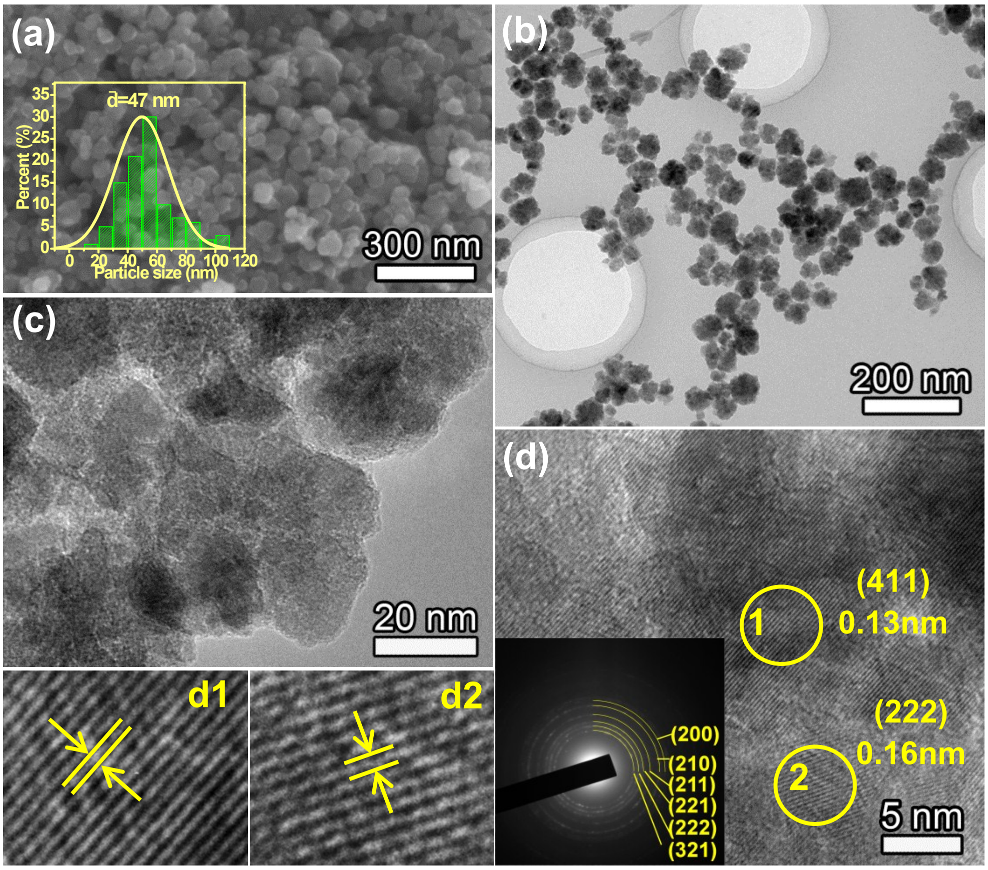

Fig.S3. (a) SEM image of CoS_2. (b) and (c) TEM images of CoS_2. (d) HRTEM and SAED pattern image of CoS_2.

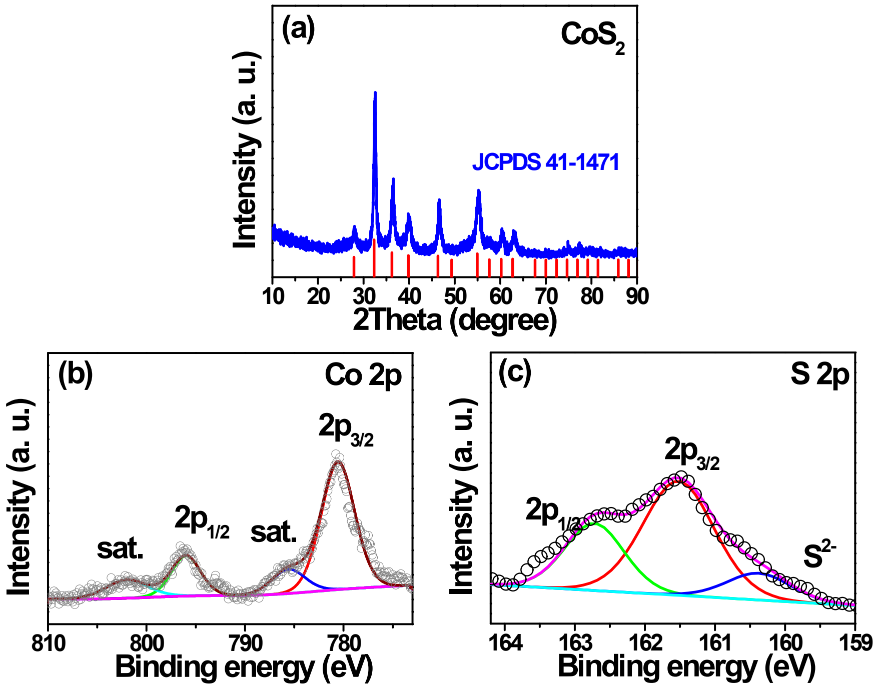

Fig.S4. (a) XRD pattern of CoS_2. XPS spectra of (b) Co 2p and (c) S 2p.

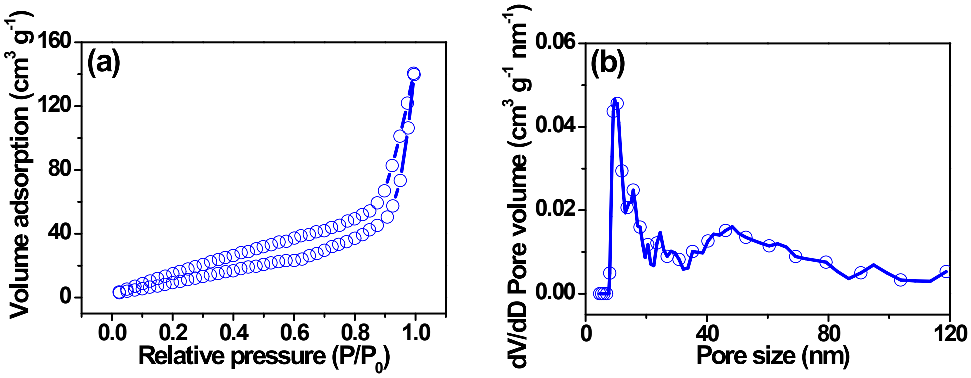

Fig.S5. (a) N_2 adsorption–desorption isotherms and (b) pore size distribution of CoS_2 sample.

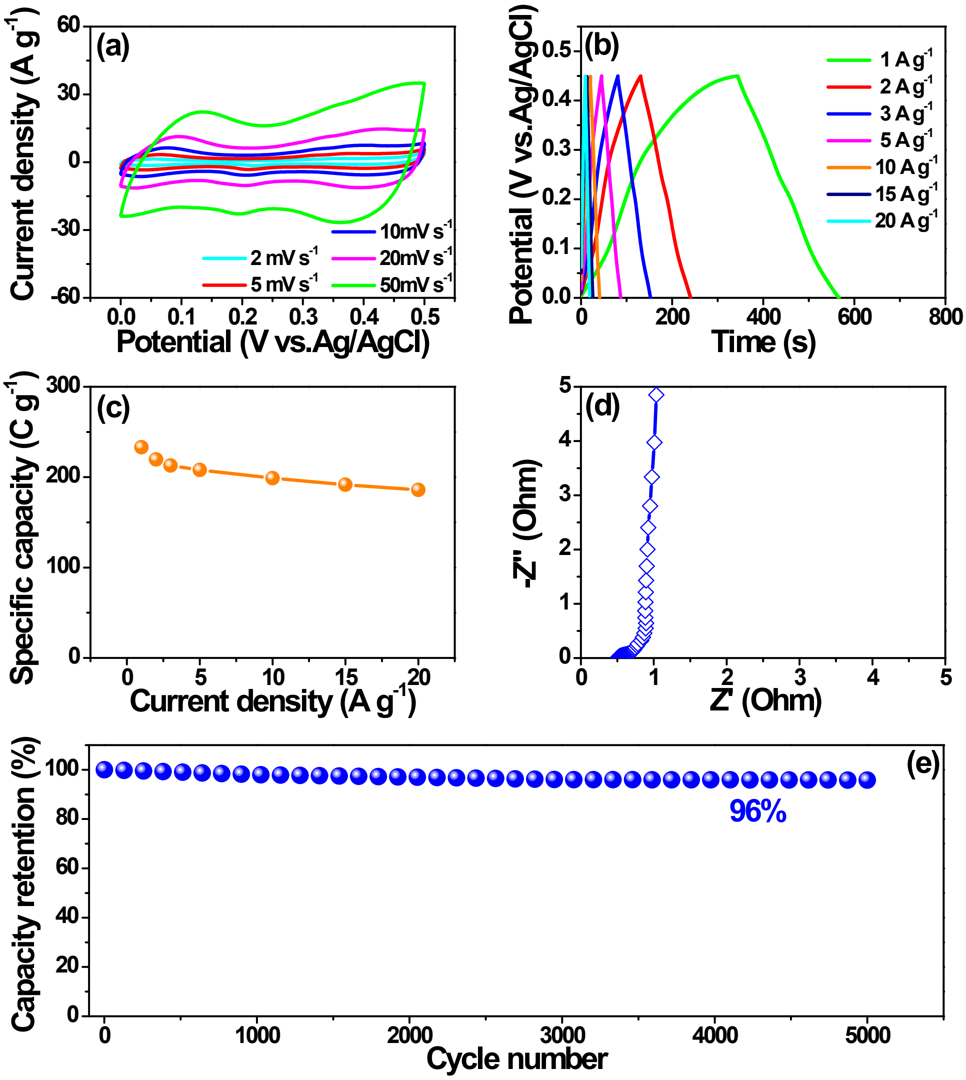

Fig.S6. (a) CV curves of CoS_2 sample at various scan rates. (b) Galvanostatic charge-discharge curves of CoS_2 at different current densities. (c) Specific capacity of CoS_2 at various scan rates. (d) Nyquist plot of CoS_2. (e) Cycling performance of CoS_2 electrode at the current density of 15 A g^{-1}.

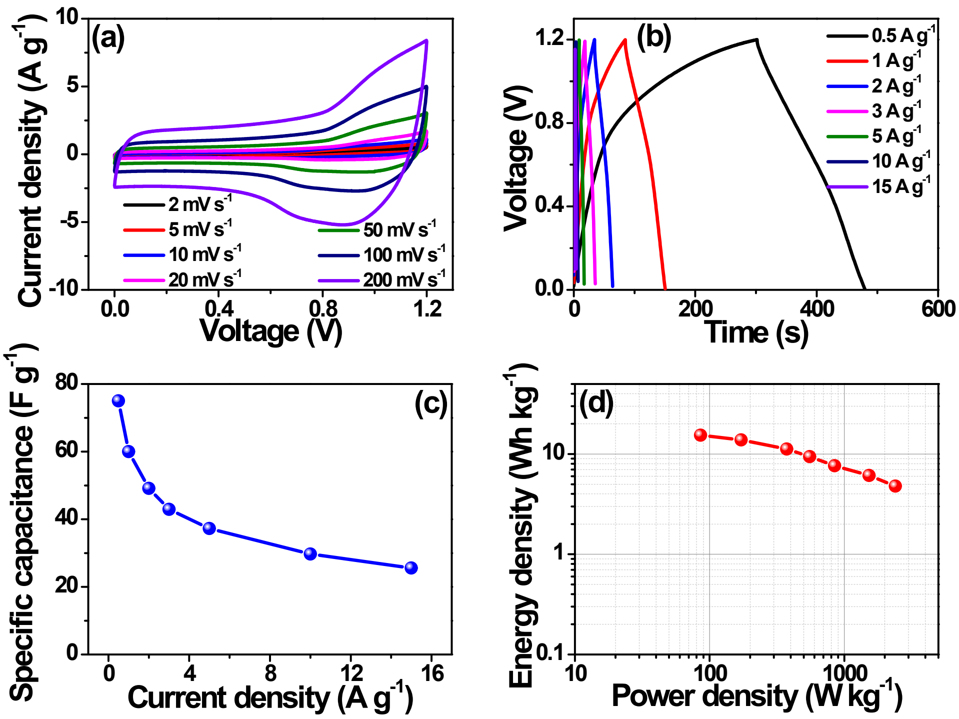

Fig.S7. (a) CV and (b) GCD curves of all-solid-state $FeS_2//FeS_2$ symmetry supercapacitor device. (c) Specific capacitance of device at different current densities. (d) Ragone plot of $FeS_2//FeS_2$ symmetry supercapacitor device.

Table S1. Integration of electrochemical performance of other sulfides, tellurides and oxides reported recently.

Materials	Electrolyte	Highest capacitance	Ref.
C@CoO	6 M KOH	473 F g^{-1} (2 mA cm^{-2})	38
Co_3O_4	3 M KOH	602.7 F g^{-1} (1.2 A g^{-1})	39
Bulk CoS_2	2 M KOH	177 F g^{-1} (5 A g^{-1})	40
CoS_2	8 M KOH	568 F g^{-1} (0.5 A g^{-1})	41
Co_9S_8	2 M KOH	308 F g^{-1} (1 A g^{-1})	28
Co_3S_4	6 M KOH	506 F g^{-1} (1 A g^{-1})	42
NiTe	3 M KOH	500 F g^{-1} (5 A g^{-1})	43
NiTe	3.5 M KOH	618 F g^{-1} (1 A g^{-1})	44
Se doped	3 M KOH	998 F g^{-1} (1 A g^{-1})	45
NiTe	3 MKOH	804 F g^{-1} (1 A g^{-1})	46
CoTe	3 M KOH	622.8 F g^{-1} (1 A g^{-1})	47
La_2Te_3	1 M KOH	469 F g^{-1} (2 mV s^{-1})	48
CdTe	2 M KOH	438 F g^{-1} (2 mA cm^{-2})	49
CoS_2	**2 M KOH**	**522 F g^{-1}(1 A g^{-1})**	**This work**

Table S2. Integration of electrochemical performance of various supercapacitor devices reported recently.

Supercapacitor device	Electrolyte	Voltage (V)	Energy density (Wh kg^{-1})	Power density (W kg^{-1})	Ref.
$Ni(OH)_2$// FeS/RGO/FeS@Fe	2 M KOH	1.9	24.07	2666	50
$SiC@Fe_2O_3$// $SiC@NiCo_2O_4@Ni(OH)_2$	2 M KOH	1.75	45	26.1	51
$NiNTAs@MnO_2$// $NiNTAs@Fe_2O_3$	Na_2SO_4/PVA	1.6	34.1	32.2	9
V_2O_5//Fe_2O_3	1 M Na_2SO_4	1.8	32.2	128.7	52
G-$NiMoO_4$//G-Fe_2O_3-QDs	2 M KOH	1.6	56	33.6	53
$NiCo_2O_4$//$FeSe_2$	2 M KOH	1.5	10.4	1200	54
CPY//C-G/AFC	6 M KOH	1.4	18.3	351	55
Fe_3O_4/Fe/C//NPC	6 M KOH	1.6	17.496	388.8	56
$CoNi_2S_4$/CNT//Fe_2O_3/CNT	2 M KOH	1.7	50	847	57
Zn-Co-NWS//Fe_2O_3@rGO	KOH/PVA	1.8	81.6	559.2	58
Co_3O_4//γ-Fe_2O_3	KOH/PVA	1.7	38.1	8500	59
NiO//α-Fe_2O_3	1 M KOH	1.25	12.4	951	60
MnO_2//Fe_2O_3/PPy	LiCl/PVA	1.6	0.22 mWh cm^{-3}	165.5 mW cm^{-3}	61
Ni/GF/H-$CoMoO_4$// Ni/GF/H- Fe_2O_3	KOH/PVA	1.5	1.13 mW cm^{-3}	150 kW cm^{-3}	62
AC/MXene	Et_4NBF_4/AN	2	17.5	207000	5
siloxene SSC	0.5 M $TEABF_4$	3	9.82 mJ cm^{-2}	272.5 mW cm^{-2}	63
PG-MSCs	$BMIMPF_6$	3	11.6 mWh cm^{-3}	2.47 mWh cm^{-3}	64
V_2O_5/MWCNTsFSS-SSC	$LiClO_4$/PVA	1.8	72	2300	65
FeS_2//CoS_2	**PAAS/KOH**	**1.7**	**64**	**271.3**	**This work**

Table S3 Comparisons of OER performance with other transition metal compound materials.

Materials	**Overpotential (mV *vs*.RHE)**	**Current density (mA cm^{-2})**	**Electrolyte**	**Ref.**
Fe_3O_4@Co_9S_8/rGo	340	10	0.1 M KOH	66
NiFe-NS	300	10	1 M KOH	67
NiCo-UMOFNs	250	10	1 M KOH	68
NiS_x	408	10	1 M KOH	69
$Li_{0.7}Co_{0.75}Fe_{0.25}PO_4$/rGo	470	10	0.1 M KOH	70
$Fe_1Co_1O_x$	350	10	1 M KOH	71
Co_9S_8/GNS	433	10	0.1 M KOH	72
CoS_x@MoS_2	347	10	1 M KOH	73
NiS	350	10	1 M KOH	74
$CoMoS_3$	320	10	1 M KOH	75
a-Ti-S/c-Fe-S	420	10	1 M KOH	76
FeCo-ONP	400	10	0.1 M KOH	77
FeS_2	**370**	**10**	**1 M KOH**	**This work**
CoS_2	**315**	**10**	**1 M KOH**	