Electronic supplementary information

Hydrothermally synthesized Chalcopyrite platelets as electrode material for symmetric supercapacitors

Surjit Sahoo[a], Parthiban Pazhamalai[a], Vimal Kumar Mariappan[a], Ganesh Kumar Veerasubramani[c], Nam-Jin Kim[d] and Sang -Jae Kim[a,b*]

[a] Nanomaterials and System Lab, Department of Mechatronics Engineering, Jeju National University, Jeju 63243, South Korea.

[b] Department of Advanced Convergence Science and Technology, Jeju National University, Jeju 63243, South Korea.

[c]Department of Chemical Engineering, Hanyang University, Seoul, 04763, Republic of Korea

[d]Department of Nuclear & Energy Engineering, Jeju National University, Jeju 63243, South Korea.

*Corresponding author. Email: kimsangj@jejunu.ac.kr

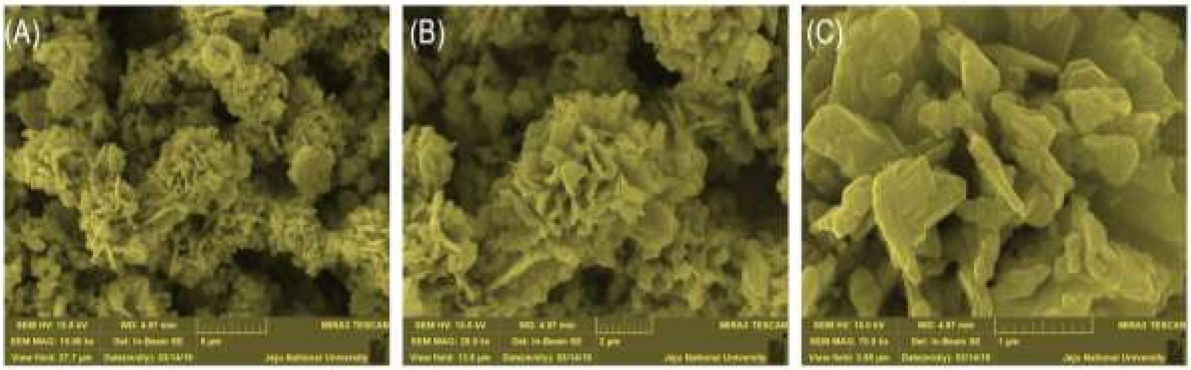

Figure S1. Field emission-scanning electron (FE-SEM) micrographs of as prepared $CuFeS_2$ (A-C) at different magnification (10.0 kx, 20.0 kx, and 70.0 kx).

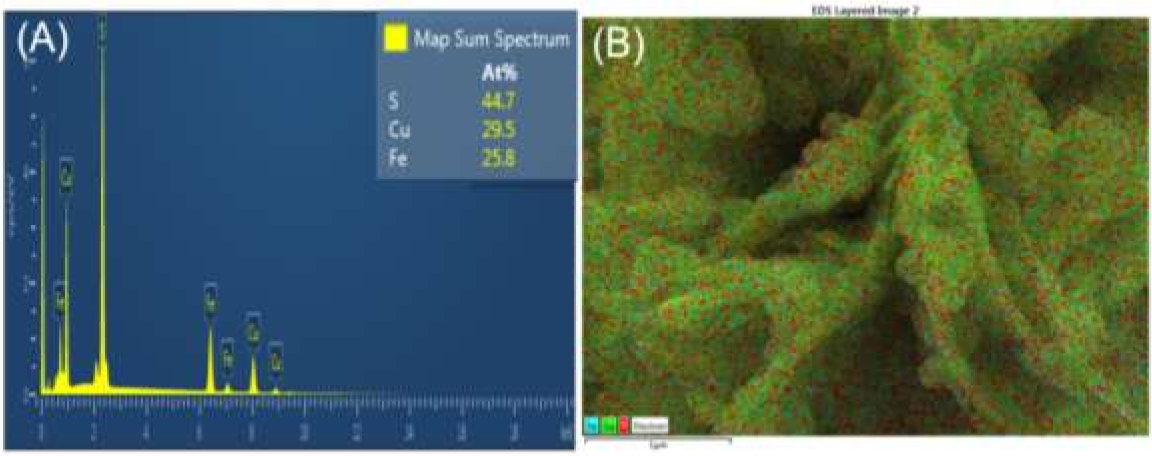

Figure S2. (A) EDX spectrum of as prepared $CuFeS_2$, and (B) FE-SEM micrographs for elemental mapping of $CuFeS_2$.

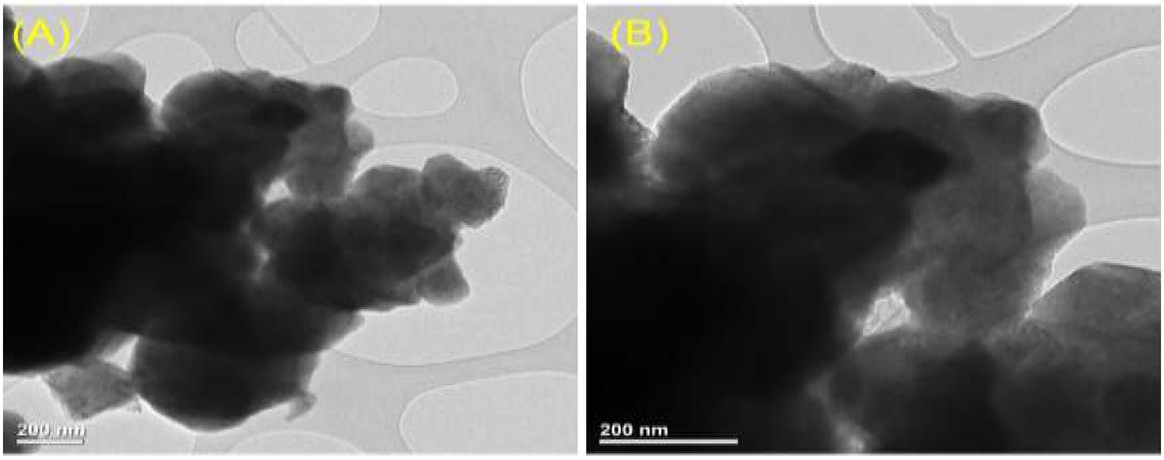

Figure S3. The highly magnified HR-TEM image to confirming the presence numerous hierarchically porous and interconnected $CuFeS_2$ platelet network.

To understand the porosity of $CuFeS_2$, the highly magnified micrograph (Figure S3 (A and B)) of $CuFeS_2$ is provided. The micrograph shows the presence numerous porous in the interconnected network. It is clearly visible that, the mesopores with a size ranged from 30-40 nm were comfortably distributed throughout the surface of interconnected $CuFeS_2$ platelate. These mesoporous structure in interconnected $CuFeS_2$ platelate are important to facilitate the mass transport of electrolyte ions within the electrodes for fast redox reactions[1]. Similar mesopores stracture are well matched with the previous reports [2–5].

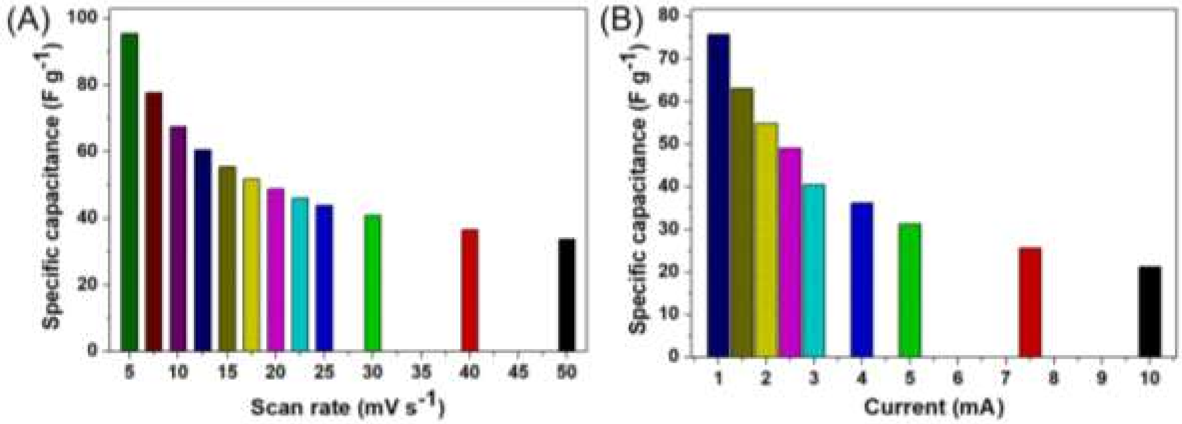

Figure S4. (A) Effect of specific capacitance of $CuFeS_2$ electrode with respect to scan rate, and (B) Effect of specific capacitance of $CuFeS_2$ electrode with respect to current.

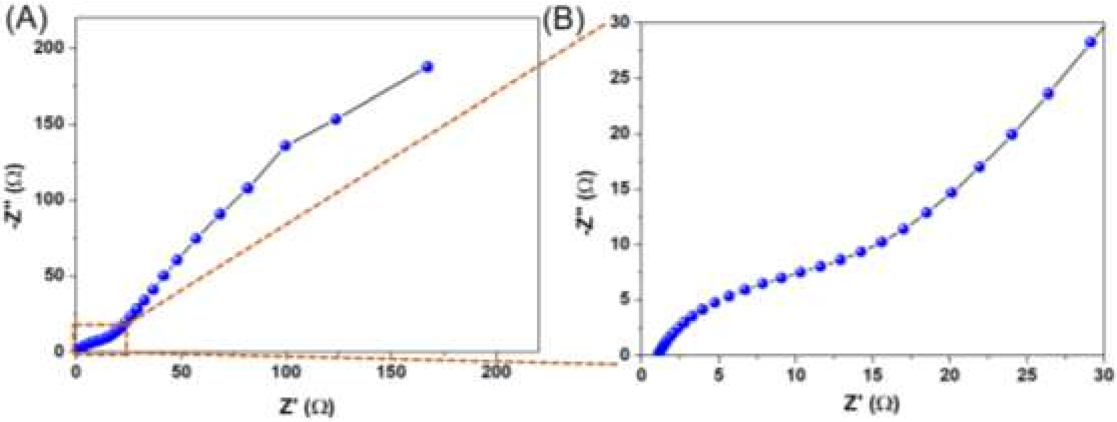

Figure S5. (A) Nyquist plot of $CuFeS_2$ electrode, and (B) enlarged view of the Nyquist plot of $CuFeS_2$ electrode.

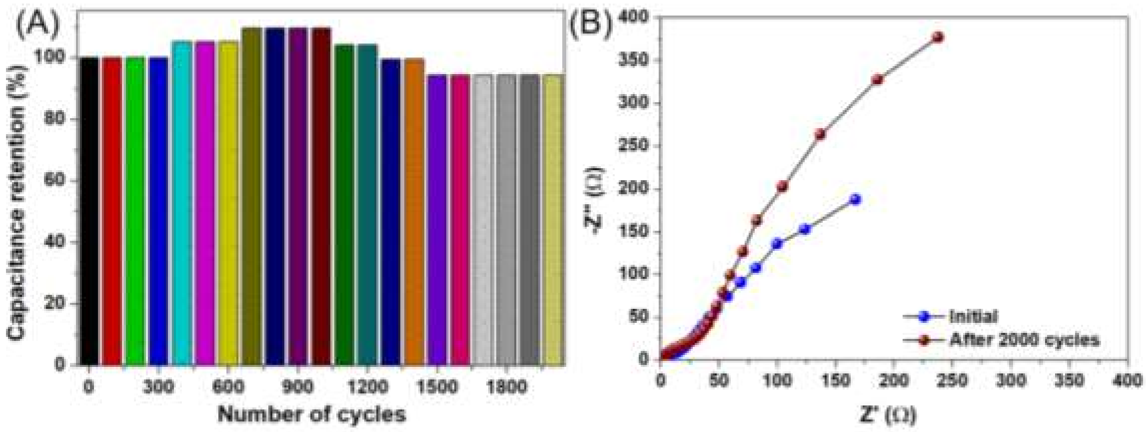

Figure S6. (A) Cyclic stability performance of $CuFeS_2$ electrode over 2000 cycles, and (B) Nyquist plot of $CuFeS_2$ electrode measured during initial and after the 2000 cycle.

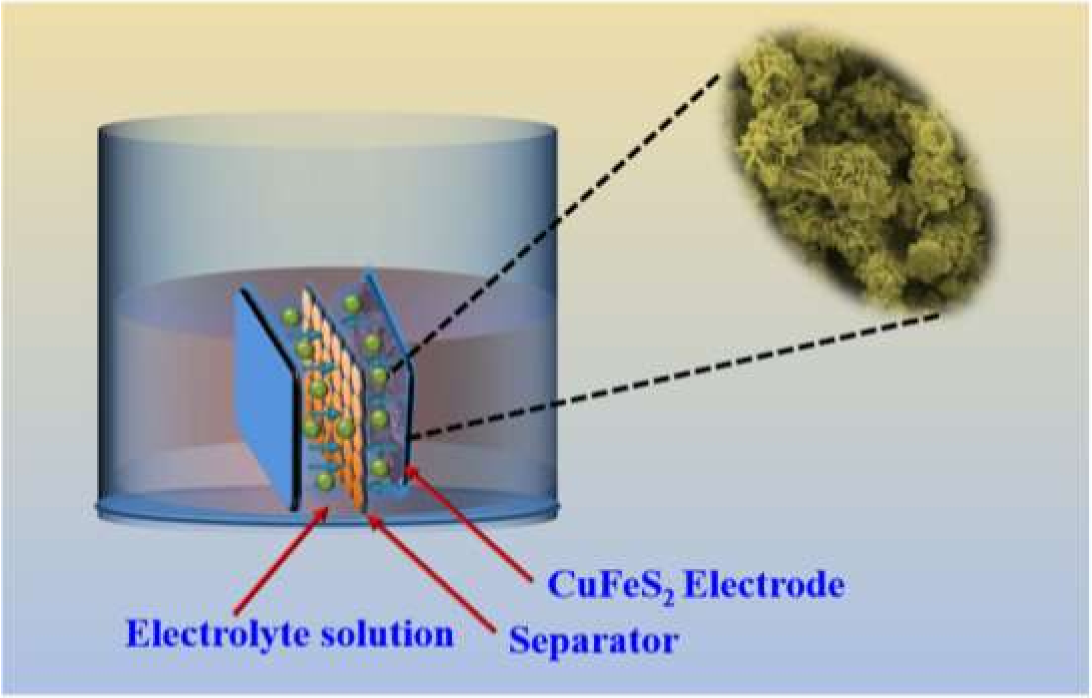

Figure S7. Schematic illustration of the fabrication of $CuFeS_2||CuFeS_2$ SSD.

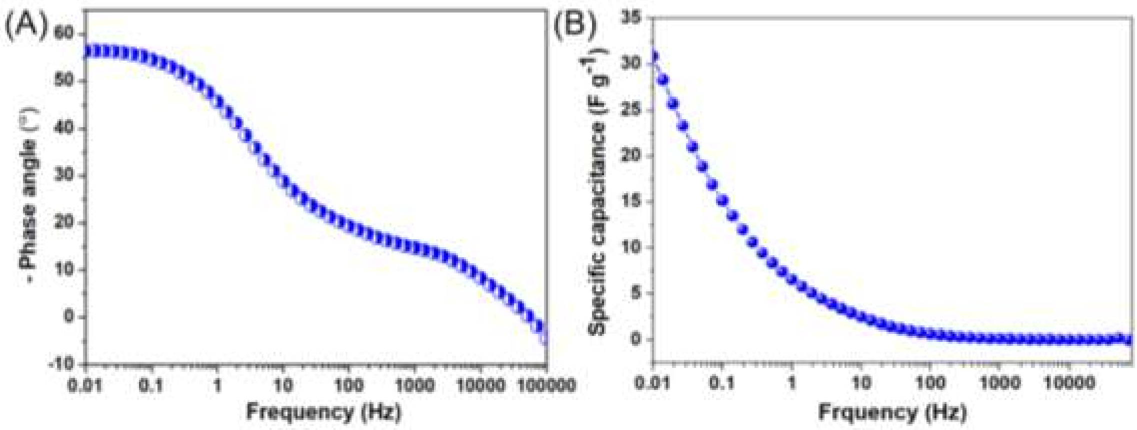

Figure S8. EIS analysis of $CuFeS_2||CuFeS_2$ SSD (A) Bode phase angle plot, and (B) Plot of variation of specific capacitance of $CuFeS_2||CuFeS_2$ SSD with respect to frequency.

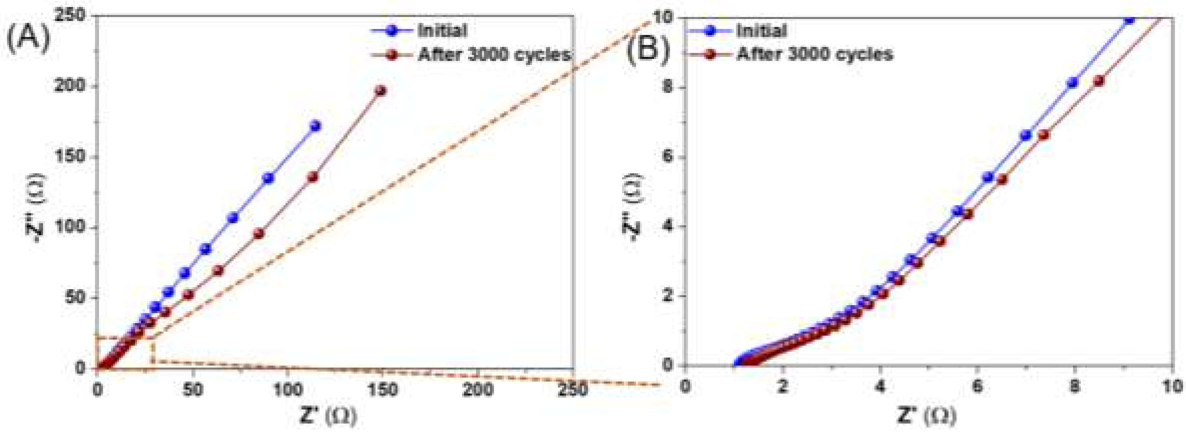

Figure S9. (A) Nyquist plot of $CuFeS_2$||$CuFeS_2$ SSD measured during initial and after 3000 cycles, and (B) enlarged view of Nyquist plot of $CuFeS_2$||$CuFeS_2$ SSD.

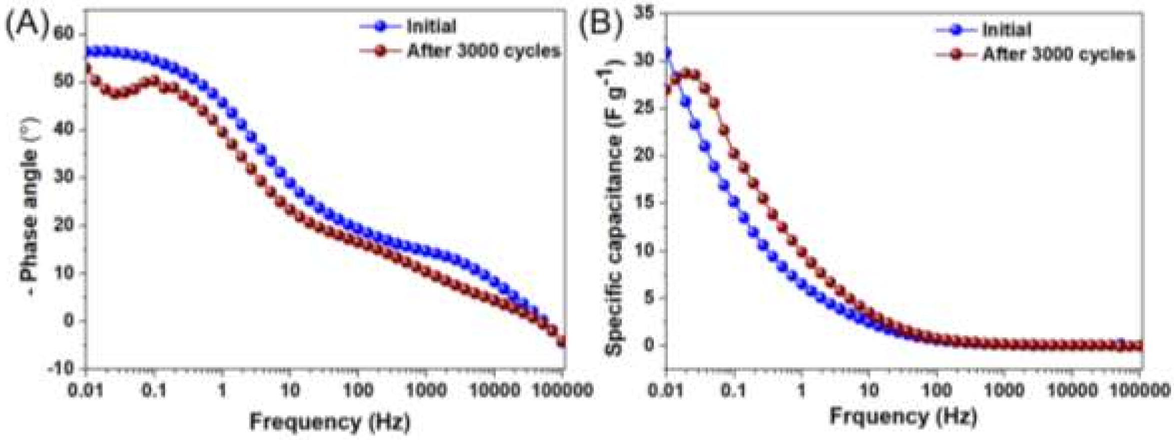

Figure S10. (A) Bode phase angle plot initial and after 3000 cycles of $CuFeS_2||CuFeS_2$ SSD, and (B) Plot of variation of specific capacitance of $CuFeS_2||CuFeS_2$ SSD with respect to frequency at initial and after 3000 cycles.

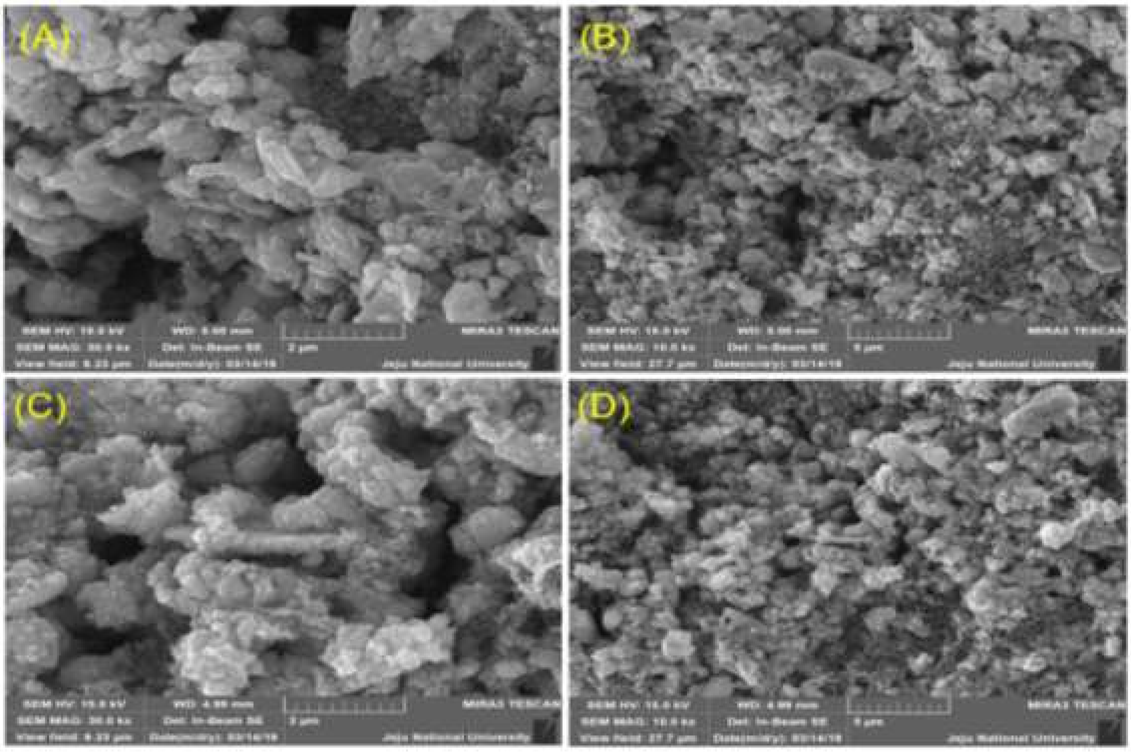

Figure S11. FE-SEM micrograph of as fabricated $CuFeS_2$ electrode (A and B) before electrochemical test, and (C and D) after cyclic stability test.

Figure S11 represents that the FE-SEM micrographs of $CuFeS_2$ electrode before and after the cyclic stability tests, which demonstrated that there are no structural changes occurred at the $CuFeS_2$ electrode even after 3000 cycles of continuous charge-discharge measurement. The FE-SEM micrographs suggesting the robust surface/interface of $CuFeS_2$ electrode [6–9].

Table S1. Summary of electrochemical performances of $CuFeS_2$ electrode and recently reported electrode materials using three-electrode configurations.

S. No	Material	Preparation method	Specific capacitance ($F\ g^{-1}$)	Reference
1	RuO_2	Chemical synthesis	50	[10]
2	CuO	Wet chemical	88.5	[11]
3	α-MoO_3	Hydrothermal	32	[12]
4	CuS	Sonochemically	62.77	[13]
5	ZnS	Solvothermal	32.8	[14]
6	WS_2	Chemical exfoliation	40	[15]
7	MoS_2	Hydrothermal	19.1	[16]
8	CuSbSSe	Colloidal	15	[17]
9	$CuSbS_2$	Colloidal	34	[17]
10	$CuSbSe_2$	Colloidal	48	[17]
11	Cu_3SbS_4	Hydrothermal	60	[18]
12	**$CuFeS_2$**	**Hydrothermal**	**95.28**	**This work**

Table S2. Summary of electrochemical performances of $CuFeS_2$ electrode and reported Cu and Fe based electrode materials using three-electrode configurations.

S. No	Material	Preparation method	Specific capacitance ($F\ g^{-1}$)	Reference
1	α-Fe_2O_3	Solvothermal	79	[19]
2	Fe_2O_3	Ball milling	88	[20]
3	α-Fe_2O_3	Spray coating	75	[21]
4	α-FeOOH	Hydrothermal	70	[22]
5	CuO	Hydrothermal	85	[23]
6	Cu_2O	Hydrothermal	79	[24]
7	CuO	Wet chemical	88.5	[11]
8	CuS	Sonochemically	62.77	[13]
9	**$CuFeS_2$**	**Hydrothermal**	**95.28**	**This work**

Table S3. Summary of electrochemical performances of $CuFeS_2||CuFeS_2$ SSD and recently reported SSD.

S. No	Material	Specific capacitance (F g^{-1})	Energy density (Wh kg^{-1})	Power density (W kg^{-1})	Reference
1	Porous carbon	-	2.2	15	25
2	Ni_2P	1.7	0.24	40	26
3	FeS	4.62	2.56	726	27
4	MXene	4.9	0.089	700	28
5	RuS_2	17	1.51	40	29
6	α-MnSe	23.44	2.08	25	30
7	$Cu_{12}Sb_4S_{13}$	26	0.85	20	31
8	Cu_3SbS_3	19	0.7	30	31
9	Cu_3SbS_4	17.8	0.62	30	31
10	Cu_2MoS_4	28.25	3.92	100	32
11	**$CuFeS_2$**	**34.18**	**4.74**	**166**	**This work**

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