

Supporting Information

Zinc Cobalt Sulfide Nanosheets Grown on 3D Nitrogen-Doped Graphene/Carbon Nanotube Film as high-performance Electrode for Supercapacitors

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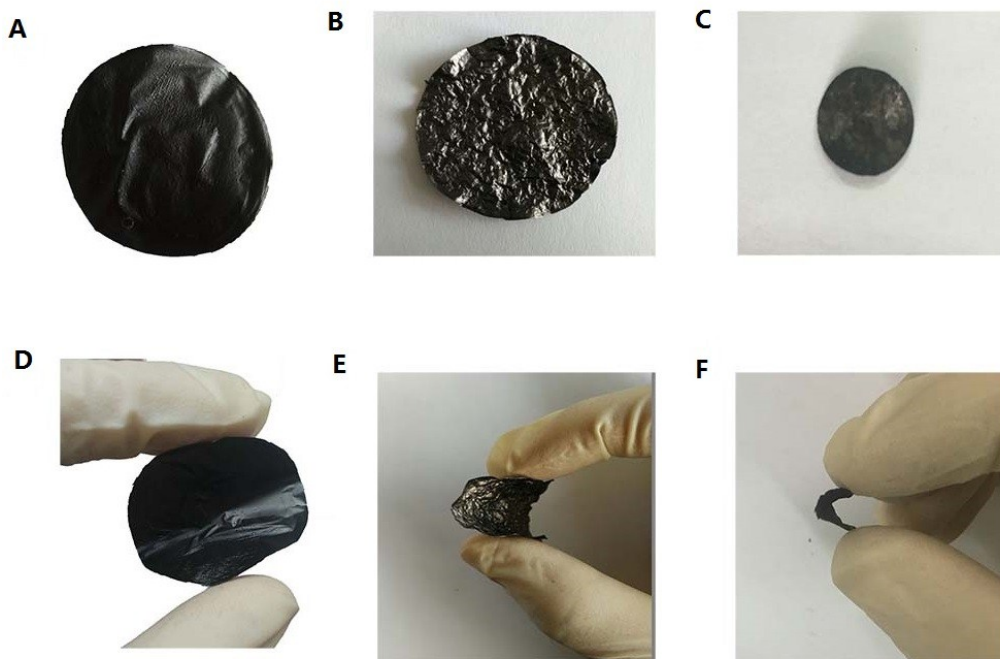


Figure S1. (A) GO/CNTs film. (B) NGN/CNTs film. (C) $\text{Zn}_{0.76}\text{Co}_{0.24}\text{S}/\text{NGN}/\text{CNTs}$ film. (D) the curving GO/CNTs film. (E) the curving NGN/CNTs film. (F) the curving $\text{Zn}_{0.76}\text{Co}_{0.24}\text{S} / \text{NGN}/\text{CNTs}$ film.

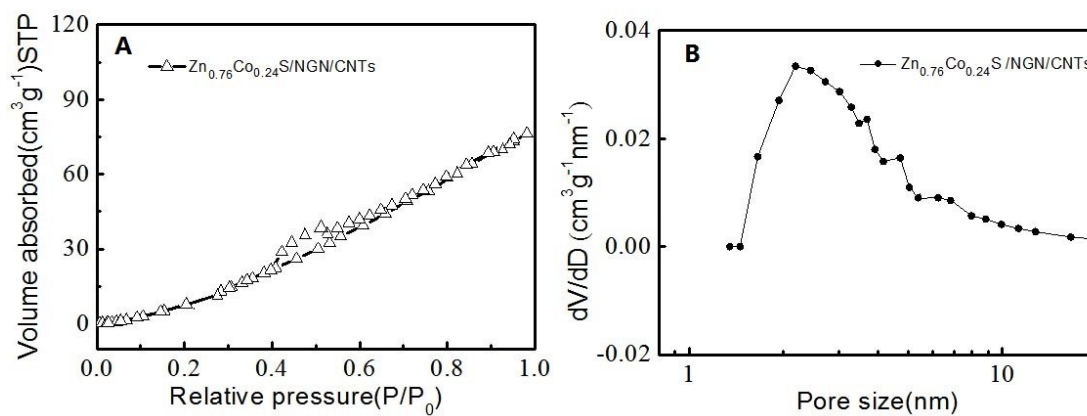


Figure S2. (A) Nitrogen adsorption-desorption isotherm and (B) Pore size distribution data through the BJH method of $\text{Zn}_{0.76}\text{Co}_{0.24}\text{S}/\text{NGN}/\text{CNTs}$.

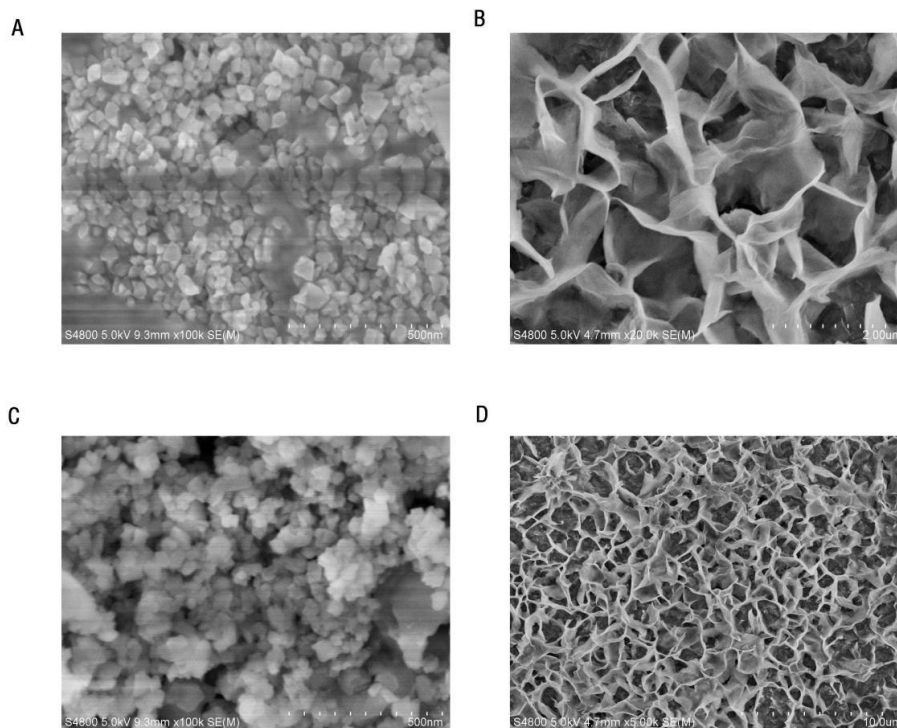


Figure S3. (A.C) SEM of $\text{Zn}_{0.76}\text{Co}_{0.24}\text{S}$ power. (B.D) SEM of $\text{Zn}_{0.76}\text{Co}_{0.24}\text{S}/\text{NGN}/\text{CNTs}$ film.

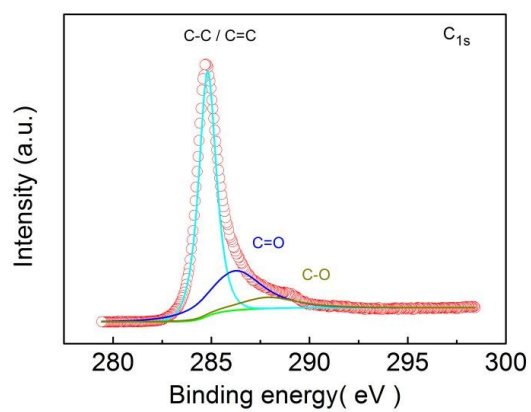


Fig. S4 Curve fit of C 1s spectra of $\text{Zn}_{0.76}\text{Co}_{0.24}\text{S}/\text{NGN}/\text{CNTs}$

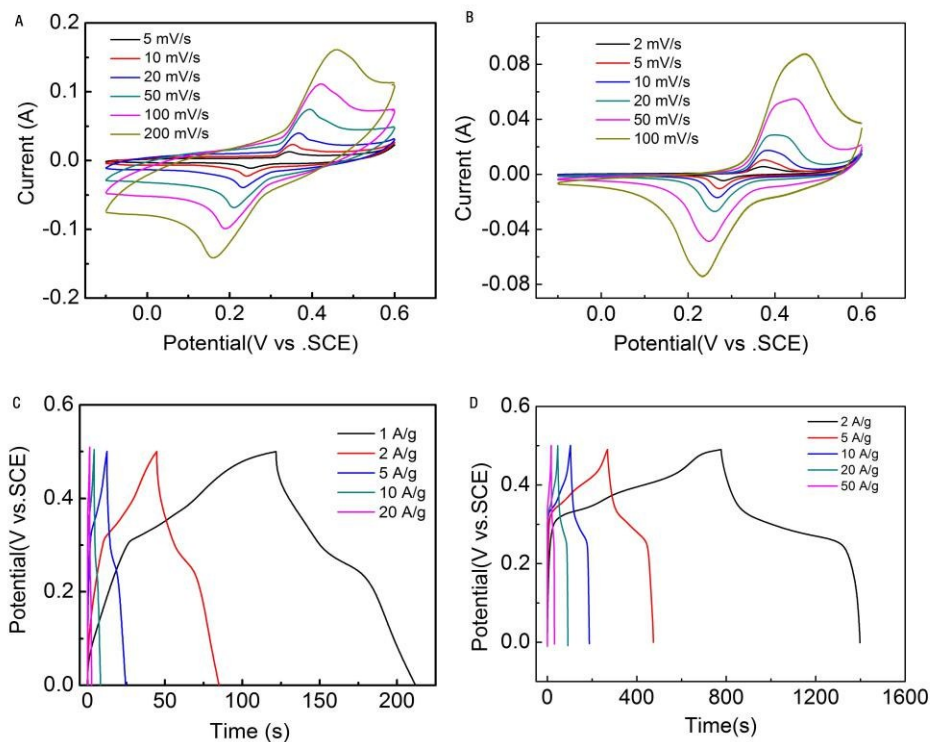


Figure S5. (A) CV curves of $\text{Zn}_{0.76}\text{Co}_{0.24}\text{S}$ power. (B) CV curves of $\text{Zn}_{0.76}\text{Co}_{0.24}\text{S}/\text{NGN}/\text{CNTs}$ film. (C) The galvanostatic charging/discharging curves of $\text{Zn}_{0.76}\text{Co}_{0.24}\text{S}$ power at different current density. (D) The galvanostatic charging/discharging curves of $\text{Zn}_{0.76}\text{Co}_{0.24}\text{S}/\text{NGN}/\text{CNTs}$ film.

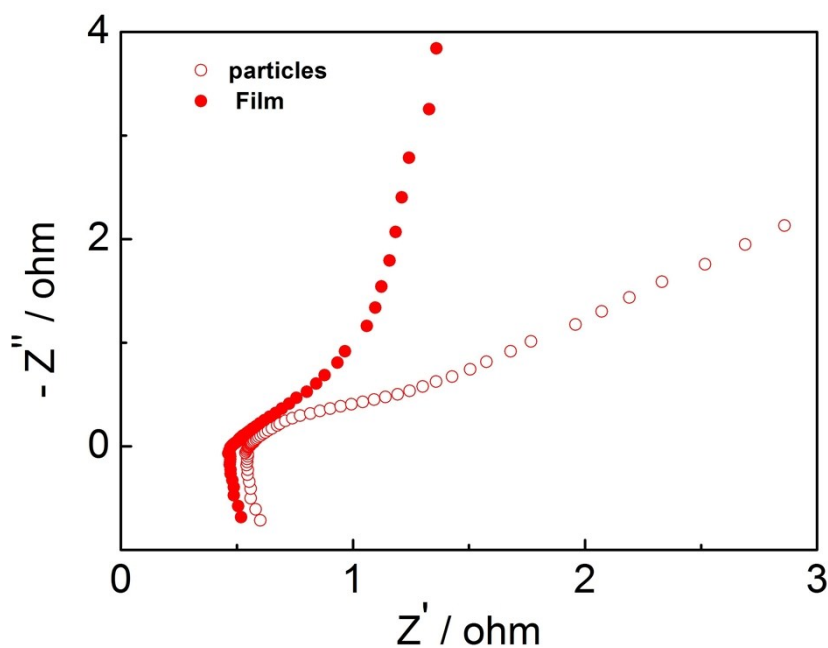


Figure S6. Nyquist plot of the $\text{Zn}_{0.76}\text{Co}_{0.24}\text{S}$ particles and $\text{Zn}_{0.76}\text{Co}_{0.24}\text{S}/\text{NGN}/\text{CNTs}$ film electrode

Table S1. Electronic conductivity of relevant film materials.

Material	Thickness (μm)	Electronic conductivity (S cm^{-1})
NGN/CNTs film	21	0.76
ZnCoO ₄ /NGN/CNTs film	28	1.26
Zn _{0.76} Co _{0.24} S/NGN/CNTs film	56	0.866

Table S2. Electrochemical performance of different Ni/Zn-Co sulfides based electrodes.

Reference	Type of materials	Specific capacitance	Capacitance retention	Max energy density
This work	Zn _{0.76} Co _{0.24} S nanosheets	1696 F g ⁻¹ at 20 A g ⁻¹	68.27 % from 2 to 20 A g ⁻¹	50.2 Wh kg ⁻¹ at 387.5 W kg ⁻¹
S1	Zn _{0.76} Co _{0.24} S nanoartichokes	377.8 F g ⁻¹ at 20 A g ⁻¹	78% from 2 to 20 A g ⁻¹	14 Wh kg ⁻¹ at 450 W kg ⁻¹
S2	ZnCo ₂ O ₄ nanoflowers	1200 F g ⁻¹ at 20 A g ⁻¹	63.74% from 1 to 25.5 A g ⁻¹	37.19 Wh kg ⁻¹ at 750 W kg ⁻¹
S3	ZnCo ₂ O ₄ nanorods	1015 F g ⁻¹ at 20 A g ⁻¹	72.5 % from 1 to 20 A/g	not reported
S4	ZnCo ₂ O ₄ @MnO ₂ core-shell nanotube	1812 F g ⁻¹ at 20 A g ⁻¹	81 % from 5 to 40 A g ⁻¹	37.8 Wh kg ⁻¹ at 648 W kg ⁻¹
S5	NiCo ₂ S ₄ nanoparticles	840 F g ⁻¹ at 20 A g ⁻¹	75.1% from 2 to 50 A g ⁻¹	28.3 Wh kg ⁻¹ at 245 W kg ⁻¹
S6	NiCo ₂ S ₄ nanosheets	877 F g ⁻¹ at 20 A g ⁻¹	71.24 % from 2 to 50 A g ⁻¹	45.5 Wh kg ⁻¹ at 512 W kg ⁻¹
S7	nickel cobalt sulfide ball-in-ball hollow spheres	705 F g ⁻¹ at 20 A g ⁻¹	68 % from 1 to 20 A g ⁻¹	42.3 Wh kg ⁻¹ at 476 W kg ⁻¹
S7	CoS _x Nanoparticles	651 F g ⁻¹ at 4 A g ⁻¹	71% from 0.4 to 4 A g ⁻¹	not reported

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