Electronic Supplementary Material (ESI) for New Journal of Chemistry.

SUPPORTING INFORMATION

Reverse Voltage Pulse Deposition of Porous Polyaniline/Mn-Co Sulfide Composite Cathode Material for Modified Zn-ion Hybrid Supercapacitor

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Supplementary Figures

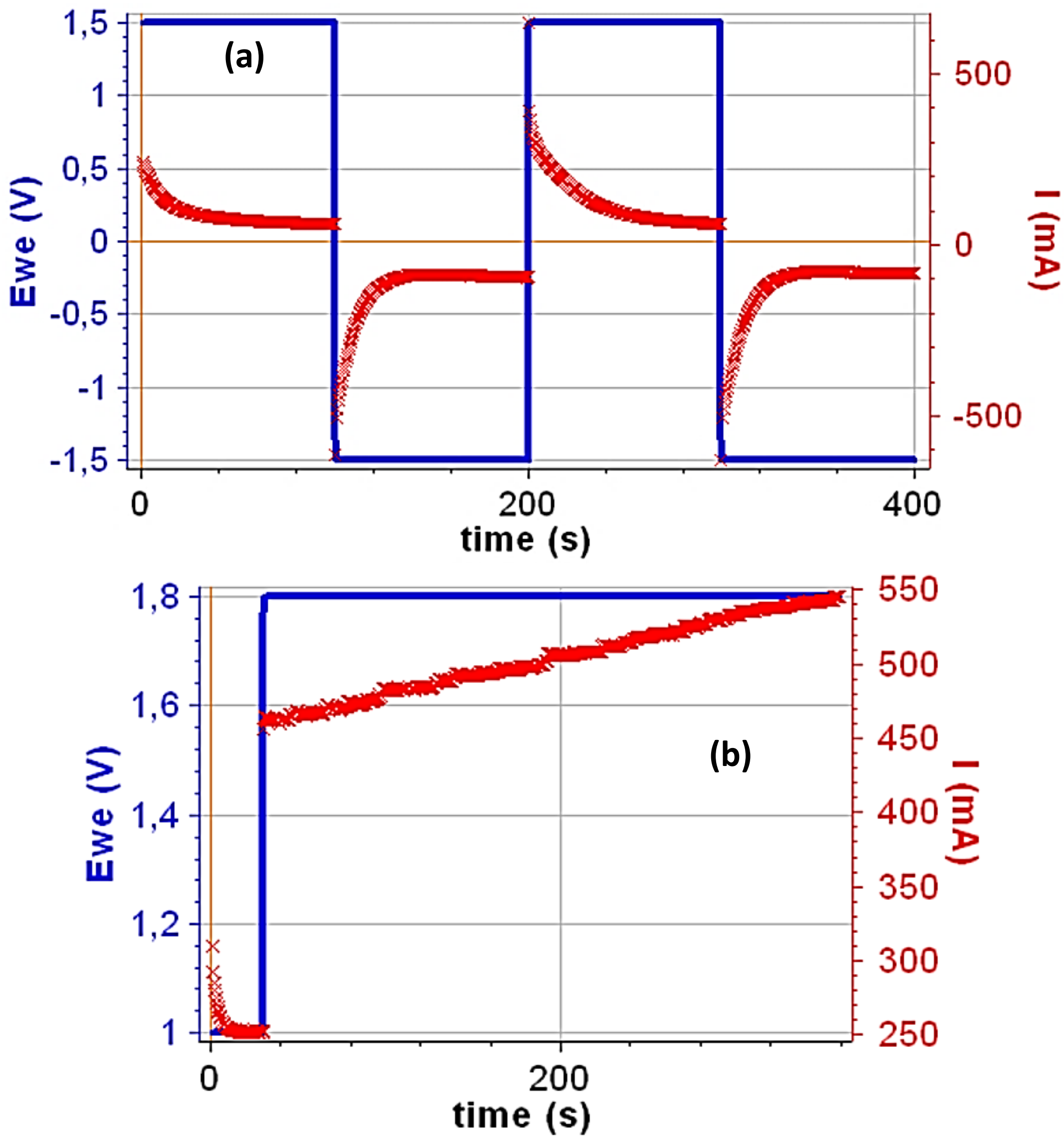

Fig. S1. Potential and current graphs of electrodeposition method (a) and electroplating method (b).

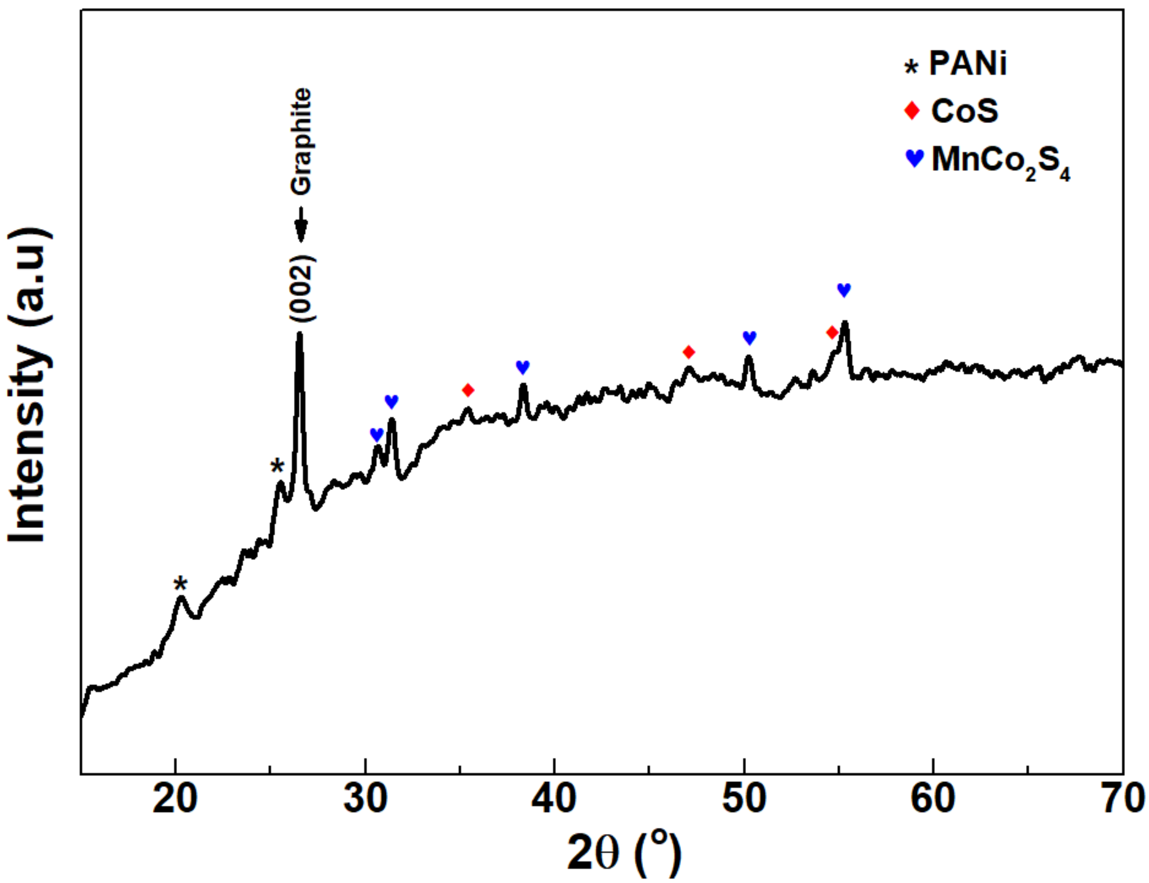

Fig. S2. XRD pattern of MCS/PANi electrode.

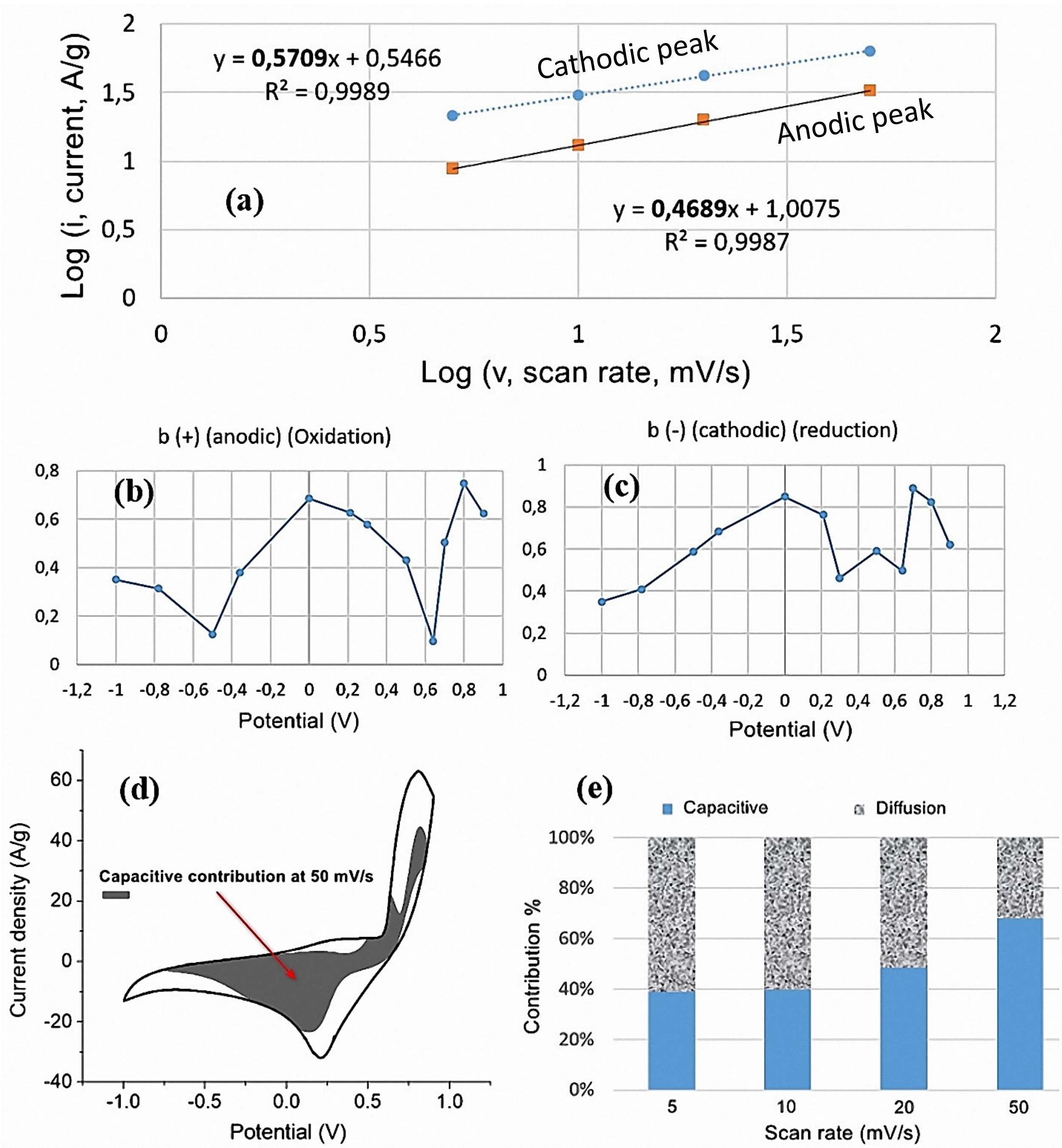

Fig. S3. Log I (A/g) vs log v (mV/s) (a), b factor vs some potential value (b,c), CV curve with capacitive contribution at scan rate of 50 mV/s (d) and the percentages of capacitive and diffusion contributions at different scan rates (e).

Supplementary Tables

Table S1. Electrochemical performance and synthesis methods of different transition metal sulfides-based electrodes

Materials	Method	Electrolyte	Working Potential (V)	Specific capacitance	Reference
MCS-PANi	*Electrodeposition (Reverse Voltage Pulse)*	*$ZnSO_4$ 1M and $MnSO_4$ 0.1M*	*-1 to 0.9*	*1048.8 F/g (at CV scan rate of 5 mV/s)*	*This work*
MnCoS	CVD	6M KOH	-0.2 to 0.6	1938 F/g (at 5 A/g)	[S1]
MnCoS	Hydrothermal	3M NaOH	0 to 0.4	992 F/g (at 1 A/g)	[S2]
Ni-Co-Zn-S	Hydrothermal	3.5M KOH	0 to 0.5	825 F/g (at 1 A/g)	[S3]
Zn-Ni-Co-S-rGO	Electrodeposition (CV)	2M KOH	0 to 0.6	1302 F/g (at 0.5 A/g)	[S4]
FeCoS-rGO-PPy	Electrodeposition (Const V)	3M KOH	-0.1 to 0.55	3178 F/g (at 2 A/g)	[S5]
$NiCo_2S_4$ – C quantum dot	Hydrothermal	2M KOH	0 to 0.5	124.4 mAh/g (at 2 A/g)	[S6]
Zn-Co-S	Hydrothermal	6M KOH	-0.5 to 0.4	578.6 F/g (at 1 A/g)	[S7]
FeS_x	Hydrothermal	1M Na_2SO_4	-0.95 to 0	730.52 mF/cm^2 (at 1 mA/cm^2)	[S8]
$MnCo_2S_4$	Hydrothermal	1M KOH	0 to 1 V	1980 F/g (at 1 A/g)	[S9]
$MnCo_2S_4$	Solvothermal	3 M KOH	0 to 0.4	780.8 mF/cm^2 (at 1 mA/cm^2)	[S10]

Table S2. Electrochemical performance of various electrodes for ZHSCs

Cathode	Anode	Electrolyte	Working Potential (V)	Capacitance	Energy density	Durability, stability	Ref
MCS-PANi/graphite paper	*hierarchical micro-flower-like Zn*	*$ZnSO_4$ 1M and $MnSO_4$ 0.1M*	*0 to 2*	*1048.8 F/g (at CV scan rate of 5 mV/s)*	*216 Wh/kg at a power density of 4610 W/kg*	*98,3 % after 11232 cycles (50 A/g)*	*This work*
Flower-like carbon	Zn foam	$ZnSO_4$ (aq)	0.1–1.8	132 mAh/g (1 A/g)	117.5 Wh/kg	90% after 10,000 cycles (5 A/g)	[S11]
Carbon nano sponge	Zn foil	$Zn(CF_3SO_3)_2$ + AN	0–1.8	226 F/g (0.1 A/g)	91.5 Wh/kg	Nearly 100% after 60,000 cycles (10 A/g)	[S12]
S-doped 3D PC	Zn foil	$ZnSO_4$ (aq)	0.2–1.8	123.8 mAh/cm^3 (0.2 A/g)	162.6 Wh/kg	96.8% after 18,000 cycles (10 A/g)	[S13]
P-doped PC	Zn foil	$ZnSO_4$ (aq)	0.1–1.8	143.7 mAh/g (1 A/g)	129.3 Wh/kg	92% after 10,000 cycles (5 A/g)	[S14]
Graphene Hydrogel (GH)	Zn foil	$ZnSO_4$ (aq)	0.2–1.8	99.3 mAh/g (0.2 A/g)	76.2 Wh/kg	90% after 10,000 cycles (15 A/g)	[S15]
3D Mxene-rGO aerogel	Zn foil	$ZnSO_4$ (aq)	0.2–1.6	128.6 F/g (0.4 A/g)	34.9 Wh/kg	95% after 75,000 cycles (5 A/g)	[S16]
2D/2D LDH/V2CTx MXene	Zn plate	$ZnSO_4$ + $MnSO_4$ (aq)	0.9–1.85	372.9 mAh/g (0.2 A/g)	368.7 Wh/kg	95.7% after 600 cycles (1 A/g)	[S17]

3D graphene@PANI	Zn foil	$ZnSO_4$ (aq)	0.4–1.6	154 mAh/g (0.1 A/g)	205 Wh/kg	80.5% after 6000 cycles (0.1 A/g)	[S18]
Few-layer phosphorene	Zn plate	$Zn(CF_3SO_3)_2$ + LiTFSI-PAM	0.8–2.2	304 F/g (0.2 A/g)	315.6 Wh/kg	Nearly 100% after 5000 cycles (0.5 A/g)	[S19]
Few-layer siloxene	Zinc plate	$Zn(CF_3SO_3)_2$ + LiTFSI	0–1.8	6.86 mF/cm^2 (0.05 mA/cm^2)	10.66 mJ/cm^2	94.3% after 16,000 cycles (0.05 mA/cm^2)	[S20]

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