# Supporting information

Investigation on the Role of Different Conductive Polymer in Supercapacitors Based on Zinc Sulfide/Reduced Graphene Oxide/Conductive Polymers Ternary Composites Electrode

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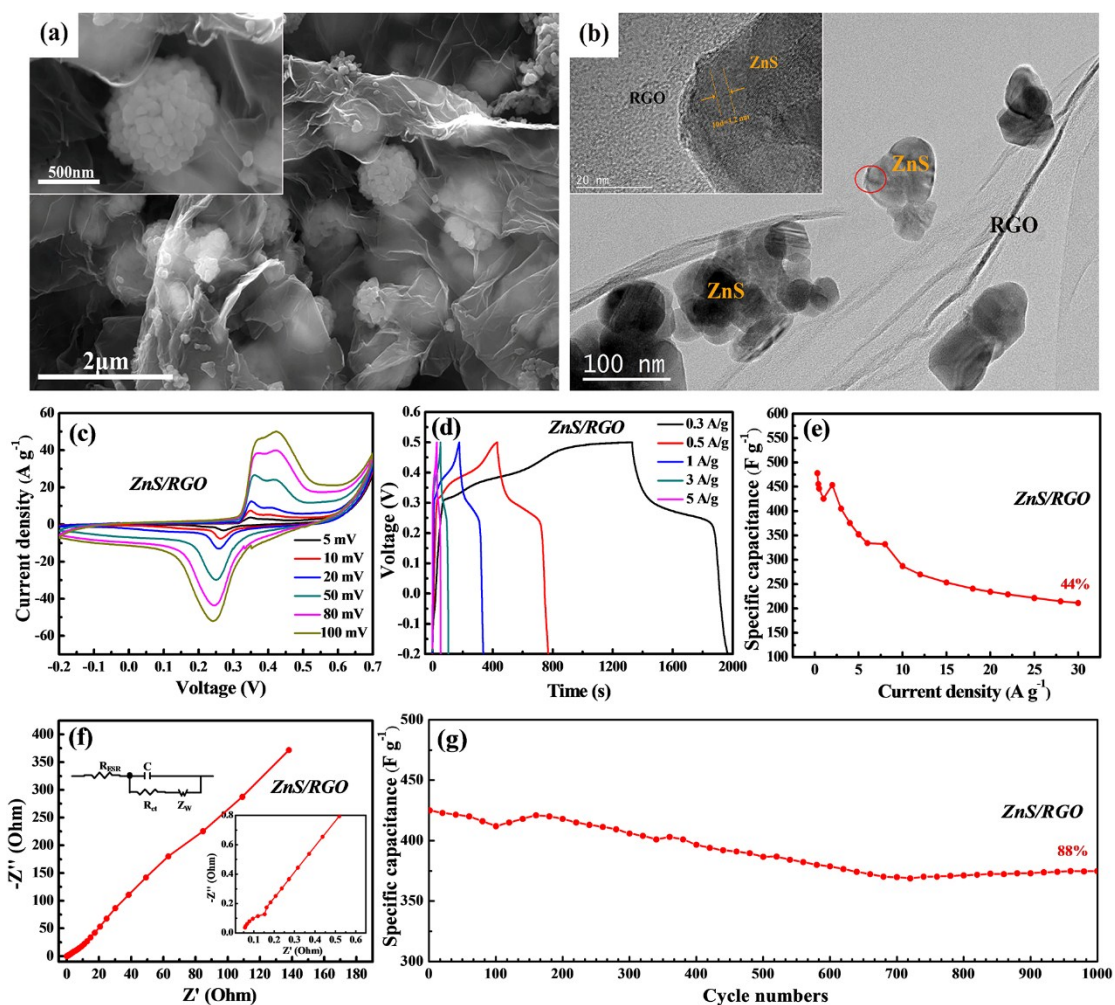
Fig. S1 Morphological structure of ZnS/RGO composite: (a) SEM image and (b) HRTEM image, and the electrochemical properties of ZnS/RGO electrode for three-electrode system: (c) CV curves at different scan rate, (d) GCD profiles at various current density, (e) specific capacitance at different current density, (f) Nyquist plot at frequency range from 100 kHz to 0.01 Hz and (g) cycle performance at 1 A g^{-1}.
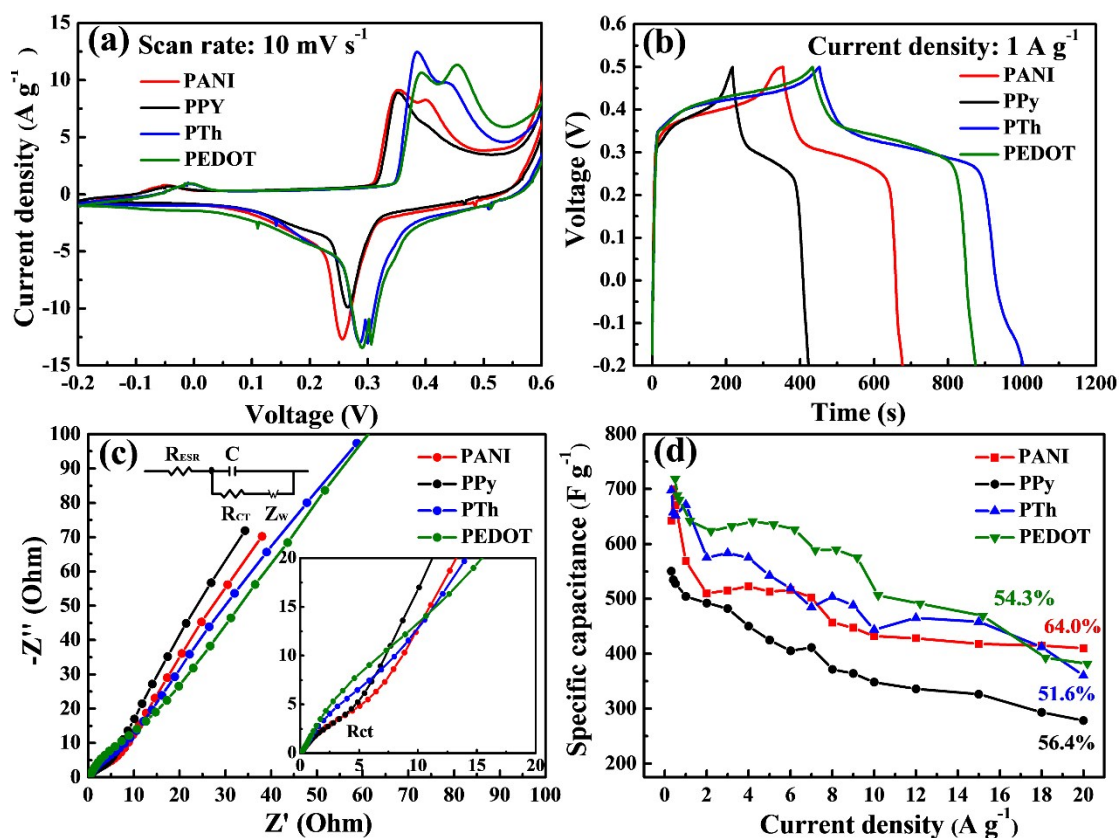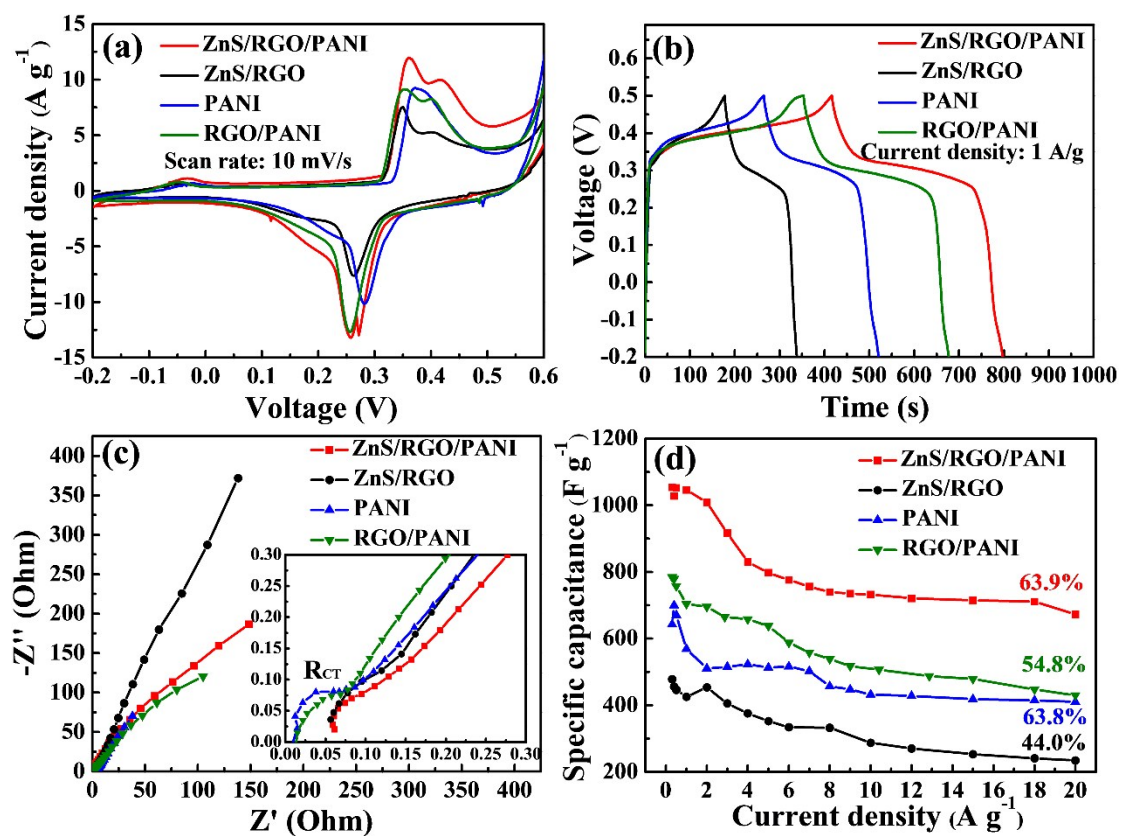
Fig. S2 The electrochemical performance of conductive polymers (CPs, such as Polyaniline (PANI), Polypyrrole (PPy), Polythiophene (PTh) and poly 3, 4-ethylenedioxythiophene (PEDOT)) in three-electrode system : (a) CV curves at scan rate of 10 mV s^{-1}, (b) GCD plots at current density of 1 A g^{-1}, (c) Nyquist plot at frequency range from 100 kHz to 0.01 Hz and (d) capacitance performance at the range of current density from 0.3 to 20 A g^{-1}.

Table S1 Ionic conductivity of different composites calculated by the fitting result of EIS dates.

Electrodes	Rs /Ω	Rct /Ω	σ_e/ (S m^{-1})	Z$_w$ /Ω	σ_i/ (×10^{-3} S m^{-1})	R$_{tol}$ /Ω	σ/ (×10^{-3} S m^{-1})
ZnS/RGO/PANI	0.035	0.21	4.08	564.3	1.77	564.55	1.77
ZnS/RGO/PPy	0.219	0.18	2.51	1236	0.81	1236.40	0.81
ZnS/RGO/PTh	0.041	0.17	4.74	684.2	1.46	684.41	1.46
ZnS/RGO/PEDOT	0.167	0.27	2.28	1354	0.74	1354.44	0.74
ZnS/RGO	0.053	0.40	2.20	1630	0.61	1630.45	0.61

* the thickness of electrode (L) is 100 μm and the surface area of electrode (S) is 1 cm^{-2}.

Fig. S3 The electrochemical performance of ZnS/RGO/PANI, ZnS/RGO, PANI and RGO/PANI in three-electrode system: (a) CV curves at scan rate of 10 mV s^{-1}, (b) GCD plots at current density of 1 A g^{-1}, (c) Nyquist plot at frequency range from 100 kHz to 0.01 Hz and (d) capacitance performance at the range of current density from 0.3 to 20 A g^{-1}.
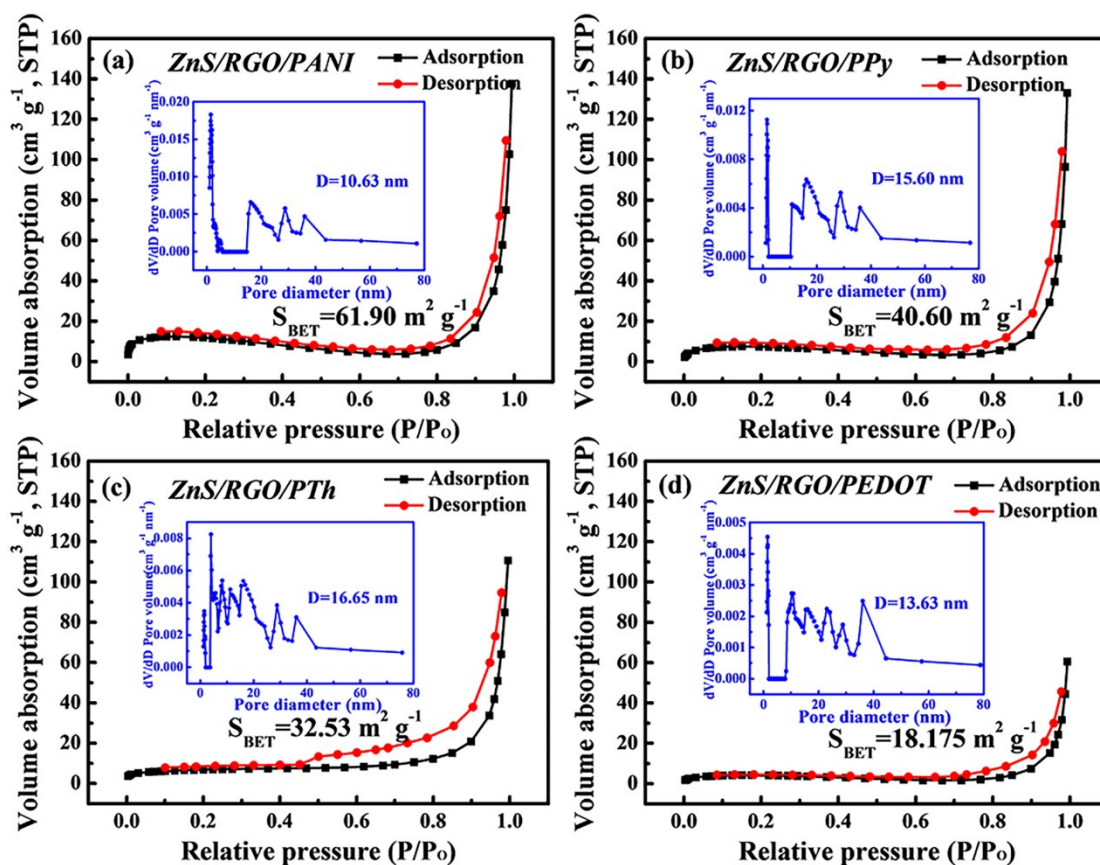
Fig. S4 Nitrogen adsorption–desorption isotherms and pore diameter distribution of (a) ZnS/RGO/PANI, (b) ZnS/RGO/PPy, (c) ZnS/RGO/PTh and (d) ZnS/RGO/PEDOT composites

Table S2 Atomic percentage of various polymer-coated ZnS/RGO composites according to the XPS spectrum.

Samples	C 1s /%	N 1s /%	O 1s /%	S 2p /%	Zn 2p /%
ZnS/RGO/PANI	70.51	15.68	10.08	2.32	1.41
ZnS/RGO/PPy	71.69	13.62	10.36	2.36	1.97
ZnS/RGO/PTh	73.24	-	13.38	10.61	2.77
ZnS/RGO/PEDOT	69.27	-	21.87	6.56	2.30