Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supporting Information

FeS_2 Microspheres Wrapped by N-doped rGO from a Fe-Based Ionic Liquid Precursor for Rechargeable Lithium Ion Batteries

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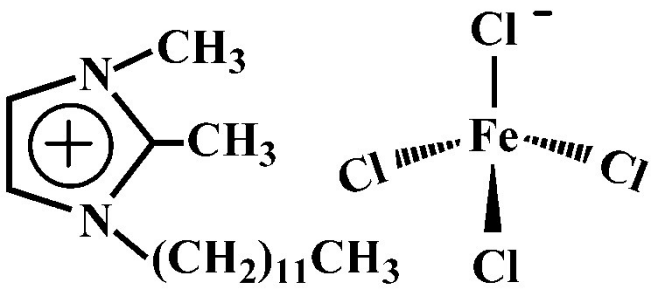

Fig. S1 Structural view of the Fe-based ionic liquid $[C_{12}MMim]FeCl_4$.

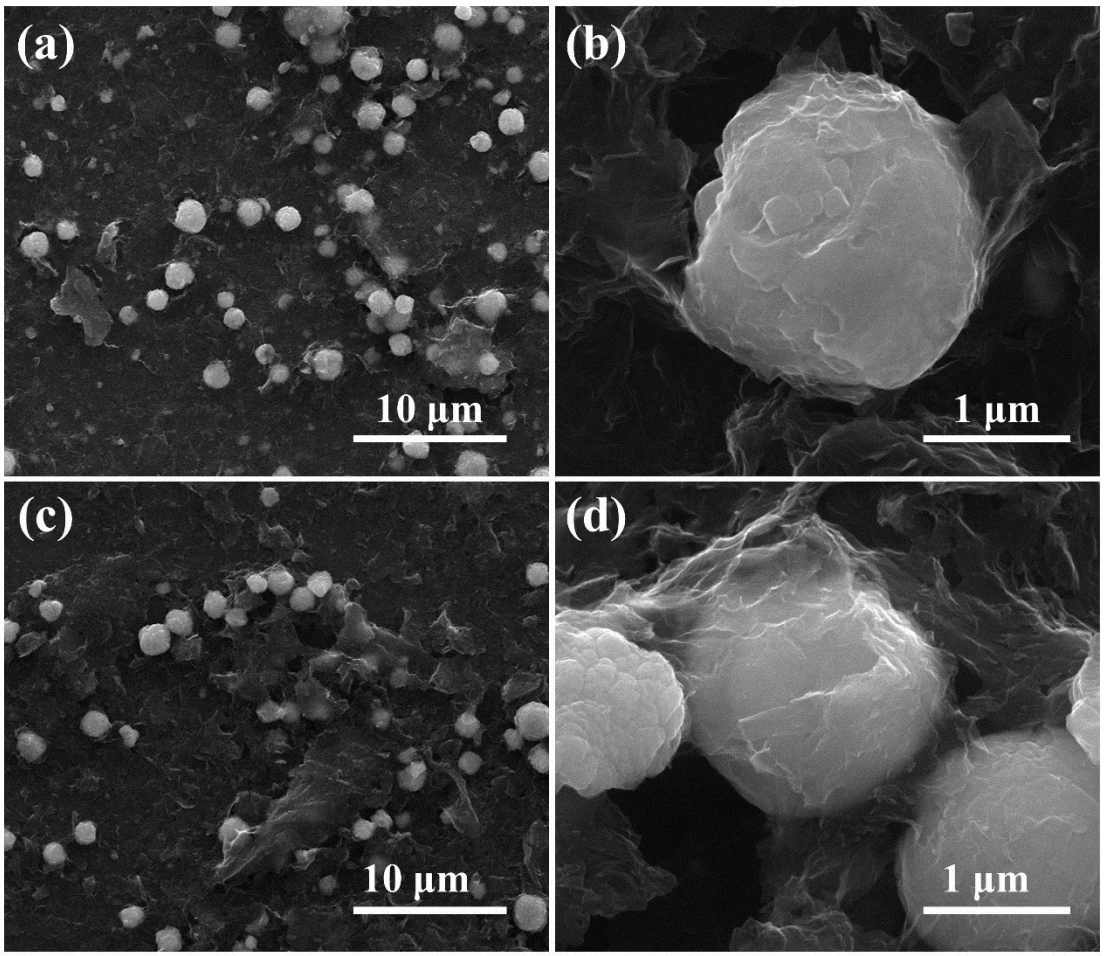

Fig. S2 SEM images of (a~b) FeS_2/N-rGO-0.5 and (c~d) FeS_2/N-rGO-2.

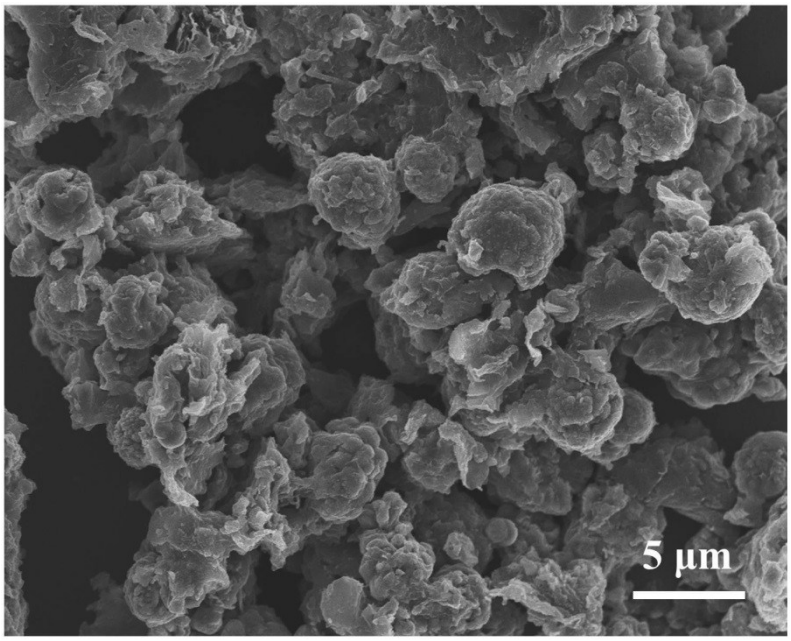

Fig. S3 SEM image of FeS_2/rGO.

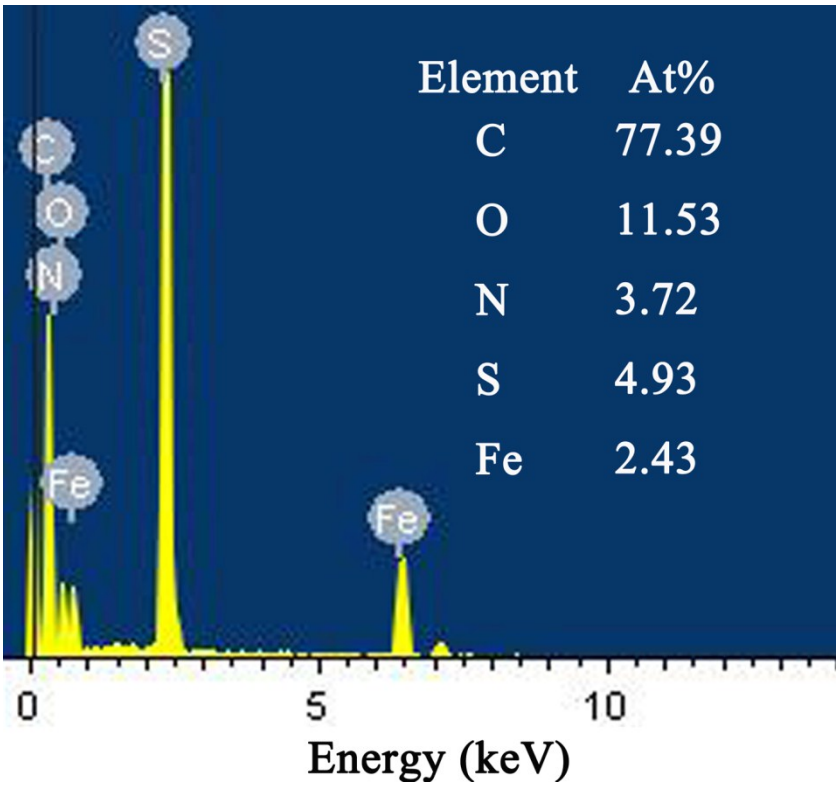

Fig. S4 EDS of FeS_2/N-rGO-1.

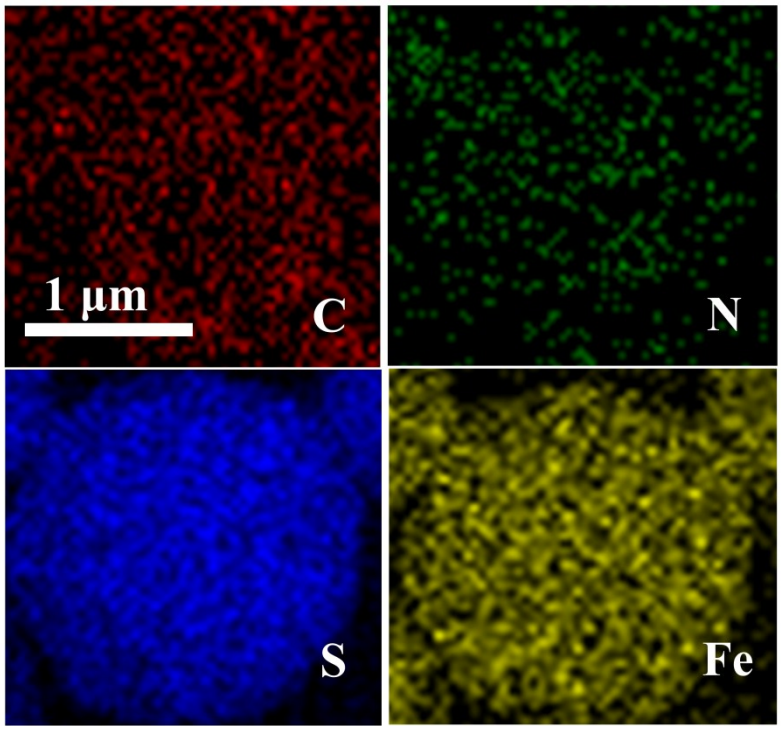

Fig. S5 SEM-EDS elemental mapping of C, N, S, and Fe elements for FeS_2/N-rGO-1.

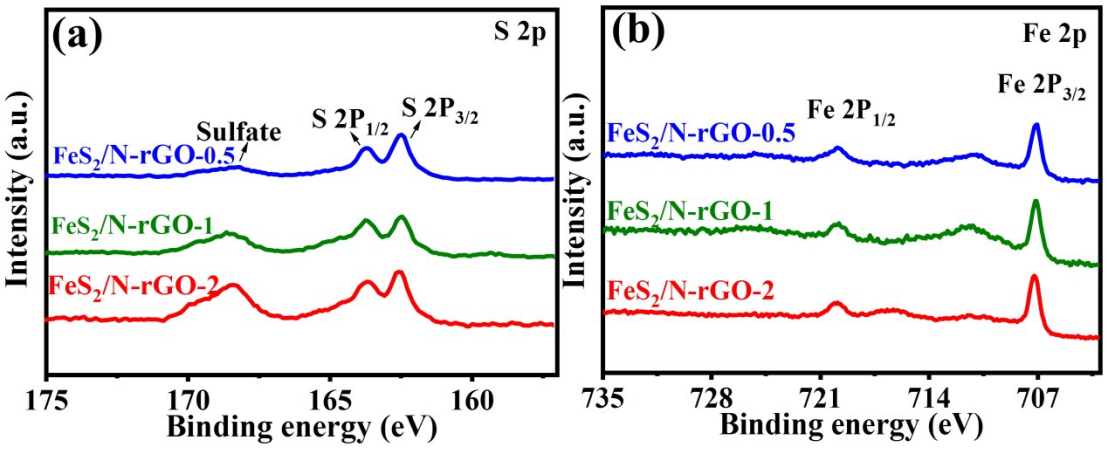

Fig. S6 High-resolution XPS spectra (a) S 2p (b) Fe 2p of FeS_2/N-rGO-0.5, FeS_2/N-rGO-1, and FeS_2/N-rGO-2.

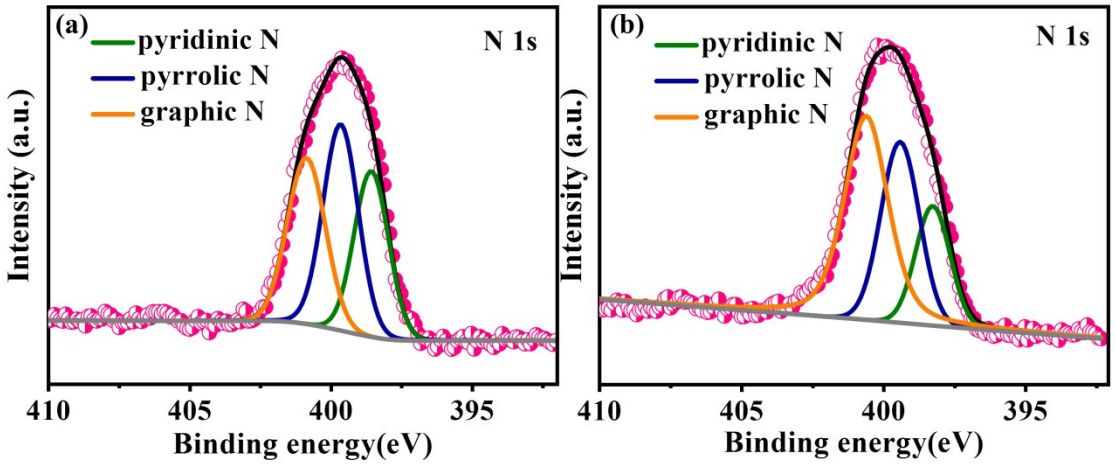

Fig. S7 High-resolution N 1s XPS spectra of (a) FeS_2/N-rGO-0.5 and (b) FeS_2/N-rGO-2.

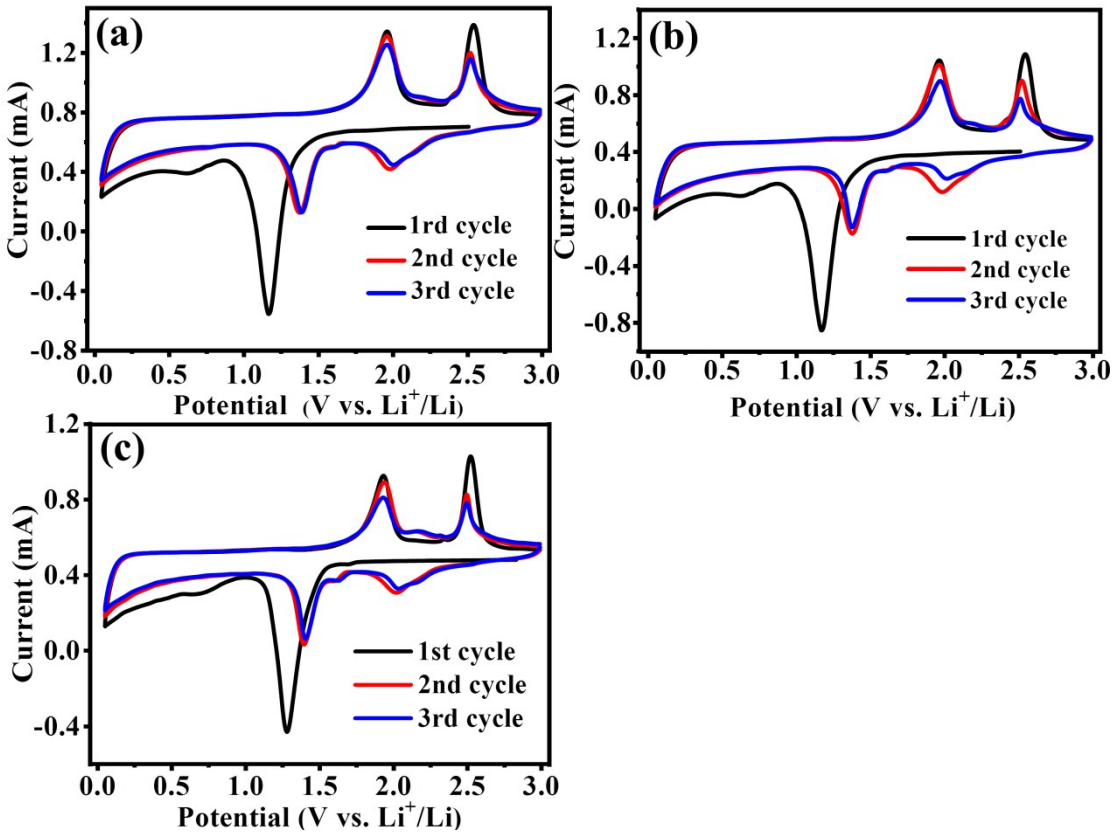

Fig. S8 CV curves of (a) FeS_2/rGO, (b) FeS_2/N-rGO-0.5, and (c) FeS_2/N-rGO-2 at a scan rate of 0.1 mV s^{-1} between 0.05 and 3.0 V.

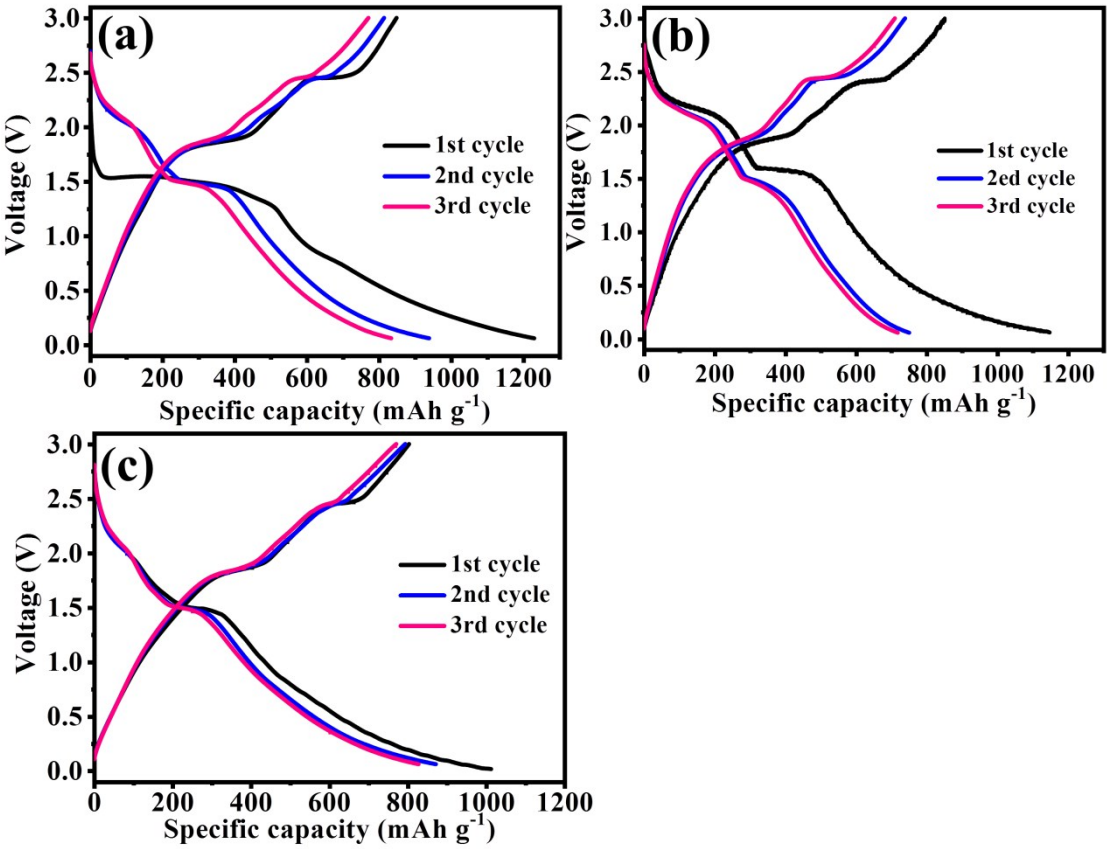

Fig. S9 Charge/discharge curves of (a) FeS_2/rGO, (b) FeS_2/N-rGO-0.5, and (c) FeS_2/N-rGO-2 at the current density of 150 mA g^{-1}, respectively.

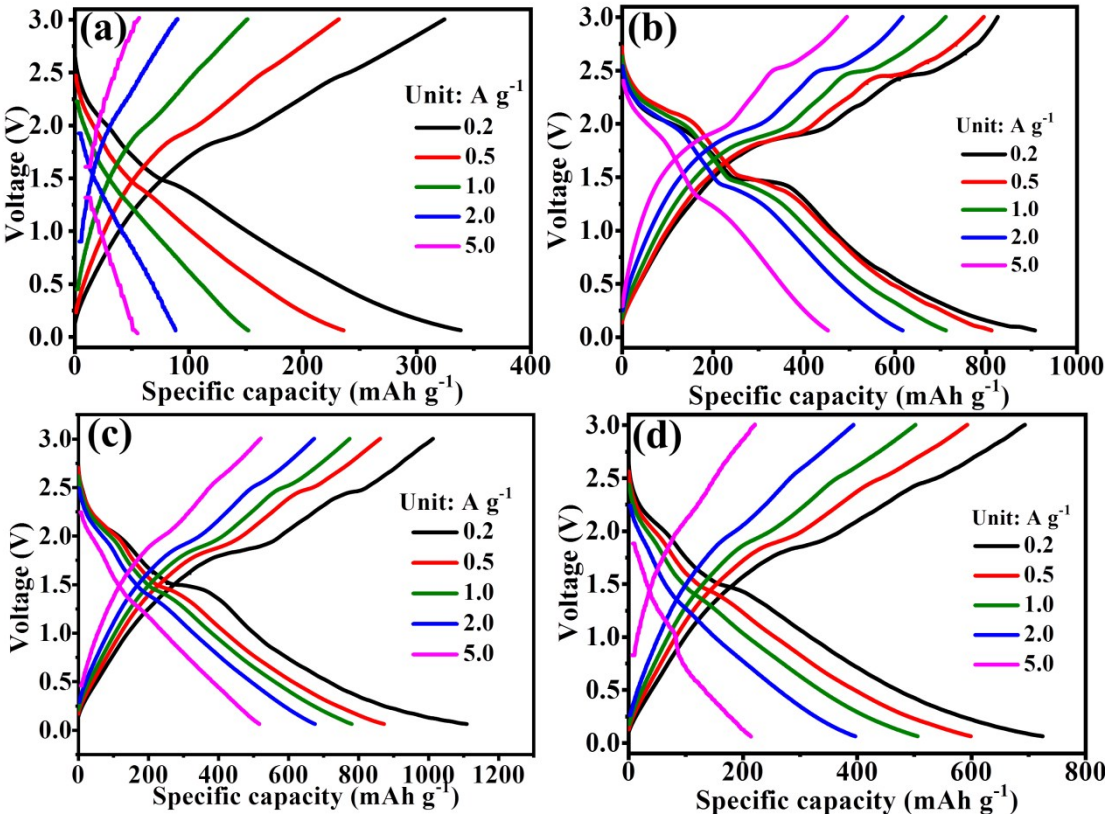

Fig. S10 The charge/discharge profiles of (a) FeS_2/rGO, (b) FeS_2/N-rGO-0.5, (c) FeS_2/N-rGO-1, and (d) FeS_2/N-rGO-2 at various current densities.

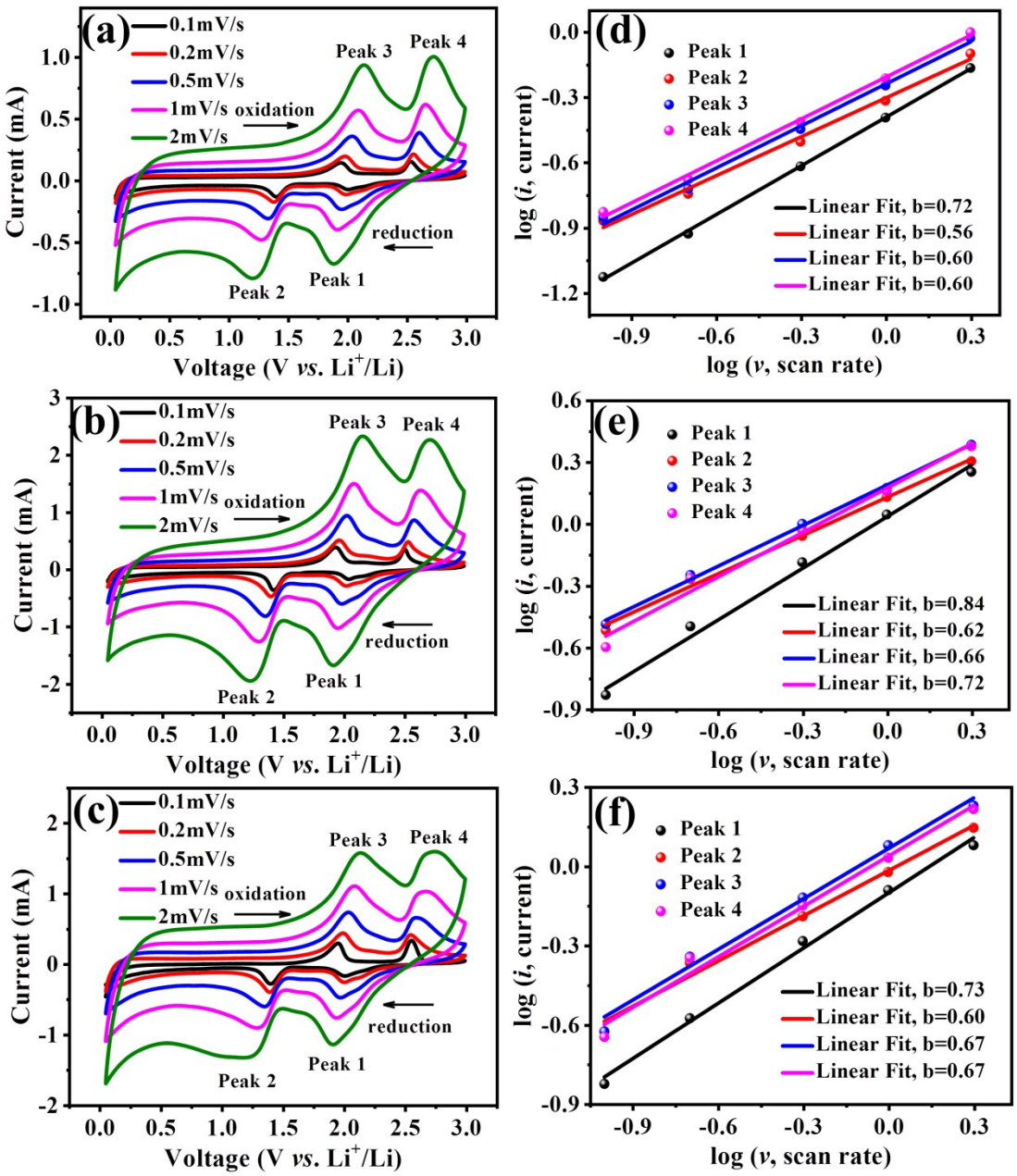

Fig. S11 Kinetic analysis of different cathodes: CV curves with scan rates from 0.1 to 2 mV s^{-1} for (a) FeS_2/rGO, (b) FeS_2/N-rGO-0.5, and (c) FeS_2/N-rGO-2. CV peak current (I_p) logarithmically potted as a function of the sweep rates (v) to give the slops (b) for (d) FeS_2/rGO, (e) FeS_2/N-rGO-0.5, and (f) FeS_2/N-rGO-2.

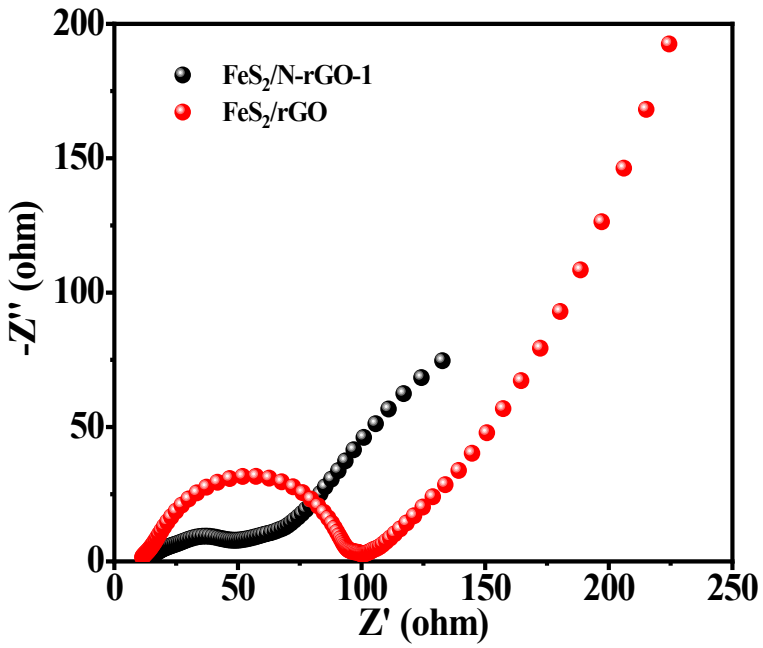

Fig. S12 Electrochemical impedance spectroscopy (EIS) spectra at the first cycle in the frequency ranging from 100 kHz to 0.01 Hz of FeS_2/rGO and FeS_2/N-rGO-1.

Table S1. Comparison of different FeS_2-based materials for LIBs.

Materials	Current density (mA g^{-1})	Reversible Capacity (mAh g^{-1})/cycle	Current density (A g^{-1})/ Rate Capability (mAh g^{-1})	References
FeS_2/N-rGO-1 (N-doped microsphere)	150	950 / 140	5.0 / 510	This work
FeS_2/rGO microparticle	100	1001.41 / 60	1.0 / 500	[1]
Resilient carbon encapsulated FeS_2	89.4	110 / 50	-	[2]
Al_2O_3-coated FeS_2@carbon fiber	200	530 / 100	0.2 / 275	[3]
FeS_2@N-graphene	500	401.7 / 400	5.0 / 285	[4]
FeS_2/C nanotubes arrays	223.5	689 / 100	1.34 / 482	[5]
FeS_2@3-D graphene foam	179	1080.3 / 100	5.0 / ~350	[6]
FeS_2@C nanospheres	300	614 / 100	5.0 / ~450	[7]
FeS_2/CNT hybrids	200	800 / 200	5.0 / 345	[8]
Biomass-carbon@FeS_2	445	850 / 80	4.47 / 725	[9]
FeS_2 micro/nano-structured	100	180.9 / 350	-	[10]

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