Supporting Information

Controllable construction of core-shell $CuCo_2S_4$@polypyrrole nanocomposites as advanced anode for high-performance sodium ion half/full batteries

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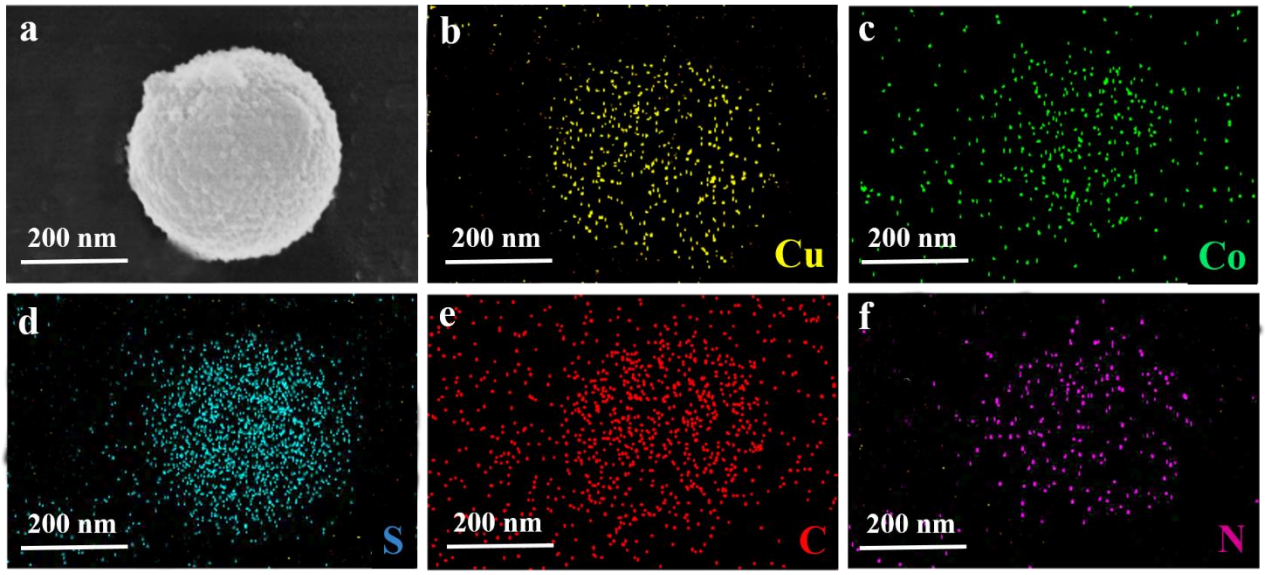

Fig. S1 EDS mappings of an individual CS-$CuCo_2S_4$@PPy. (a) SEM image of CS-$CuCo_2S_4$@PPy, (b) Cu, (c) Co, (d) S, (e) C and (f) N.

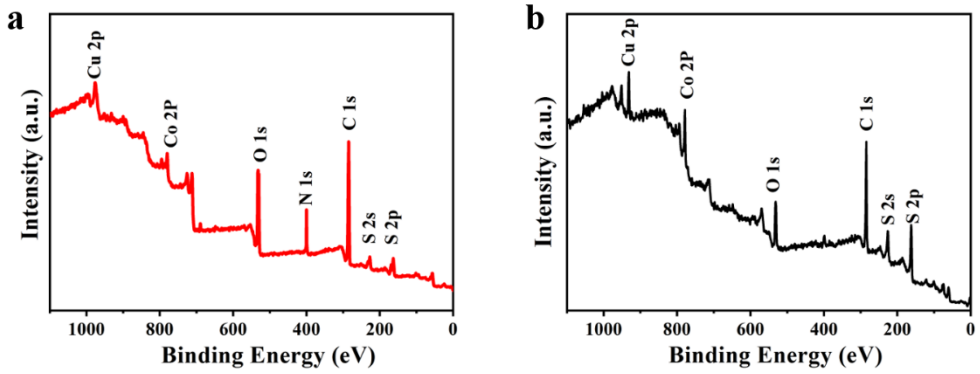

Fig. S2 XPS survey spectrum of as-prepared samples, (a) CS-$CuCo_2S_4$@PPy, (b) pure $CuCo_2S_4$.

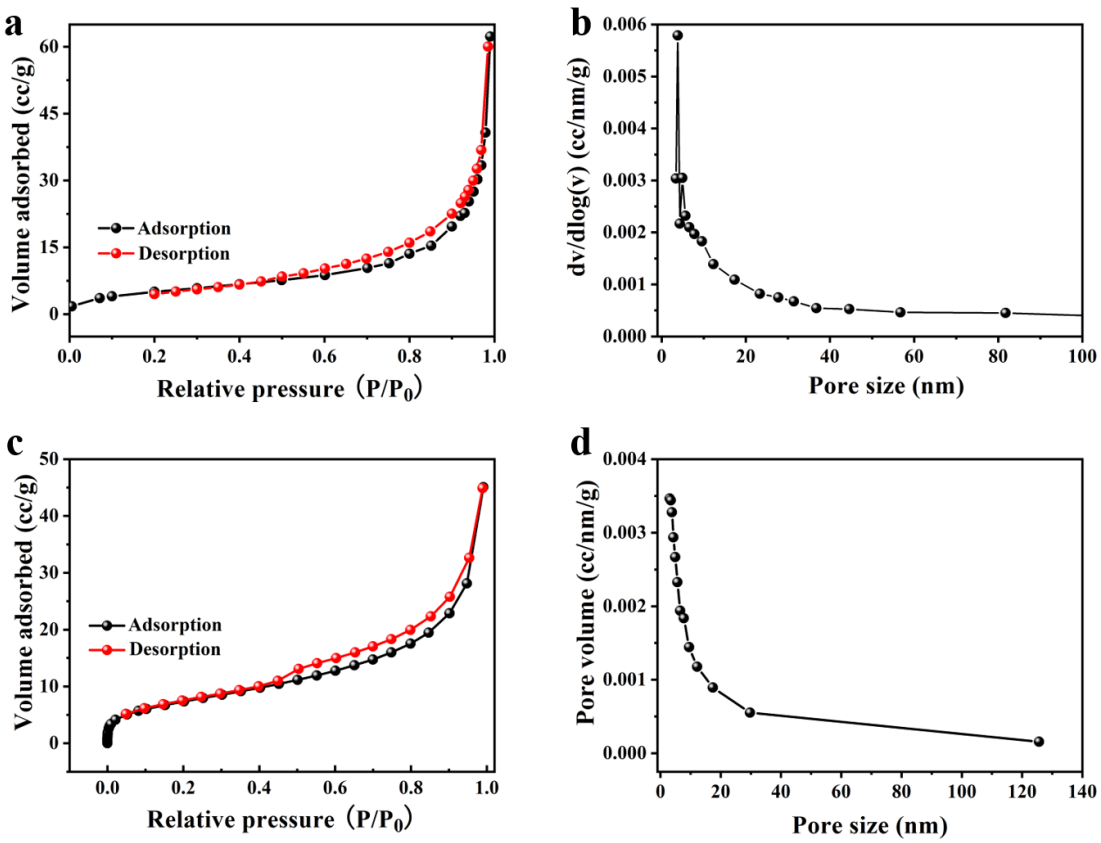

Fig. S3 Nitrogen adsorption-desorption isotherms and pore size distribution curves of CS-$CuCo_2S_4$@PPy (a-b) and pure $CuCo_2S_4$ (c-d)

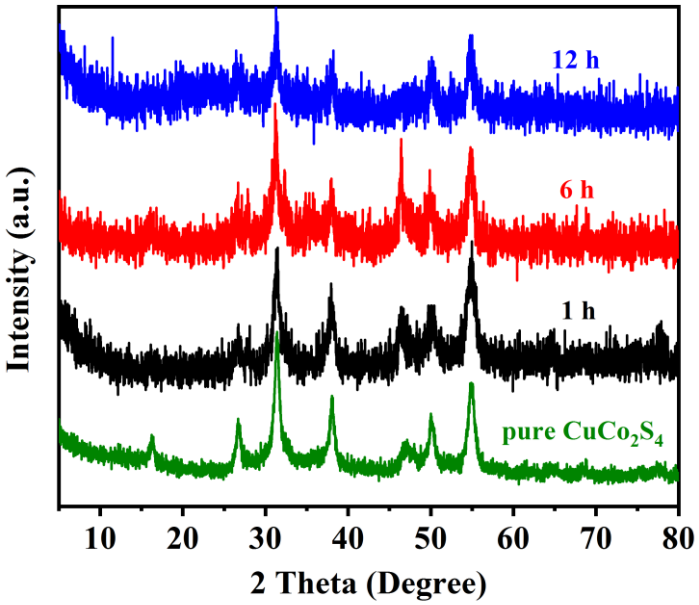

Fig. S4 XRD pattern of as-prepared samples with different polymerization time ranging from 1 h to 12 h.

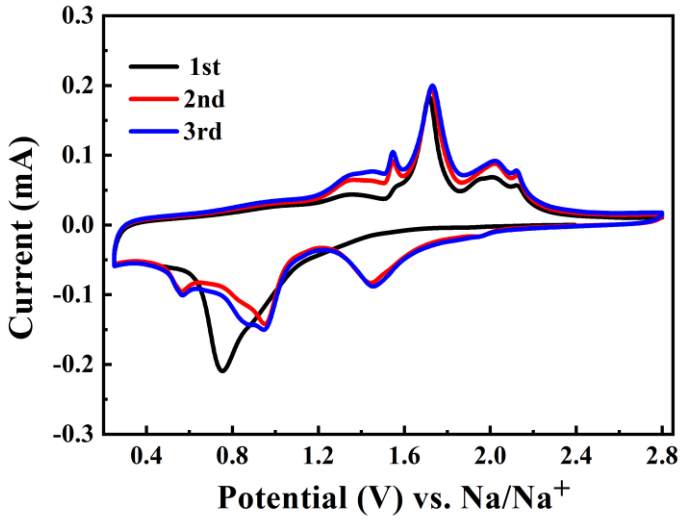

Fig. S5 CV curves of pure $CuCo_2S_4$ at a sweep rate of 0.1 mV/s.

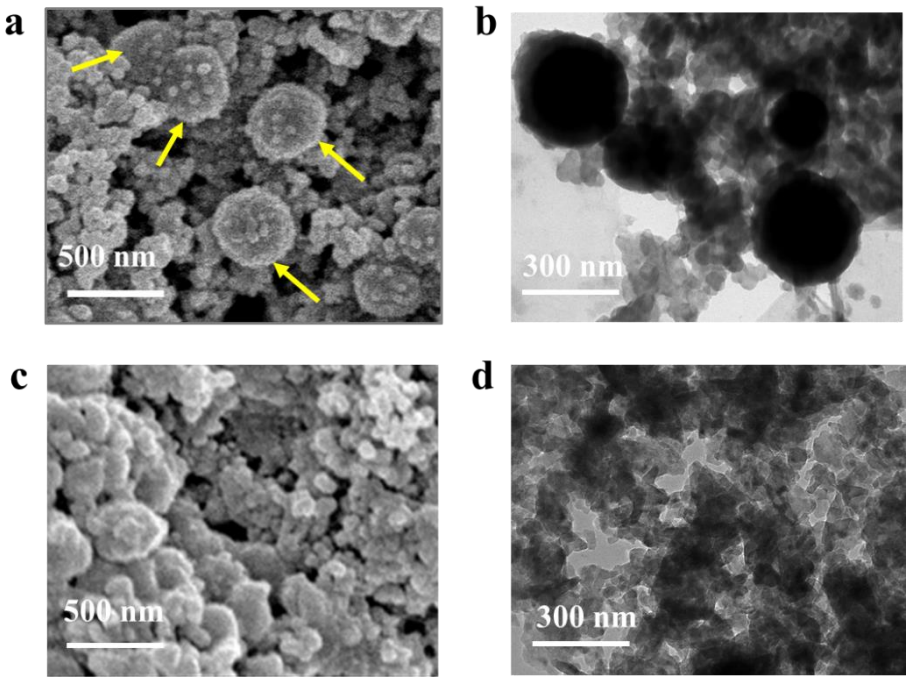

Fig. S6 SEM and TEM images of CS-$CuCo_2S_4$@PPy after 2000 cycles at 2 A g^{-1} (a-b) and pure $CuCo_2S_4$ after 500 cycles at 2 A g^{-1} (c-d).

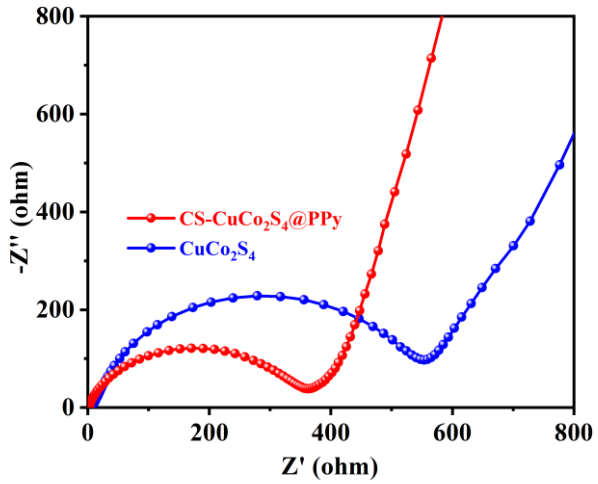

Fig. S7 The initial EIS curves of half cell for CS-$CuCo_2S_4$@PPy and pure $CuCo_2S_4$.

As shown in Fig. S7, the charge-transfer resistance and the sodium ion diffusion resistance of CS-$CuCo_2S_4$@PPy in the initial curve are smaller than that of pure $CuCo_2S_4$, illustrating the CS-$CuCo_2S_4$@PPy possesses faster electrochemical reaction kinetics.

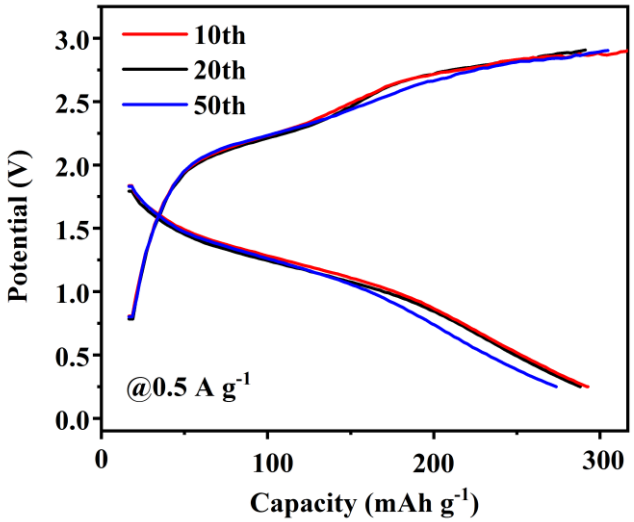

Fig. S8 The charge/discharge curves of full cell at 0.5 A g^{-1} with a potential window of 0.25-3.0 V.