Supplementary information

A novel aqueous K_2CO_3 electrolyte enables high-performance of FeS anodes in Ni-Fe batteries at both room and elevated temperatures

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Table S1 Comparison of characteristic XPS binding energies for FeS electrodes after 10 cycles in 5.8M K_2CO_3 electrolyte at temperatures of 25 and 80°C.

Railway		Binding Energy (eV)	
		25 °C 5.8M K_2CO_3	80 °C 5.8M K_2CO_3
O 1s	M-O	529.8	529.85
	O_v/S-O	531.27	531.27
	O-H	532.46	532.15
Fe 2p	Fe $2p_{3/2}$	709.62, 712.43, 715.66, 718.68	709.60, 711.83, 715.95, 718.96
	Fe $2p_{1/2}$	722.93, 725.54, 728.56, 731.87	723.08, 725.36, 729.02, 732.21
S 2p	S^{2-}	161.40, 162.50	161.43
	S^0	163.32, 164.62	162.93
	S-O	167.82, 168.92	168.15

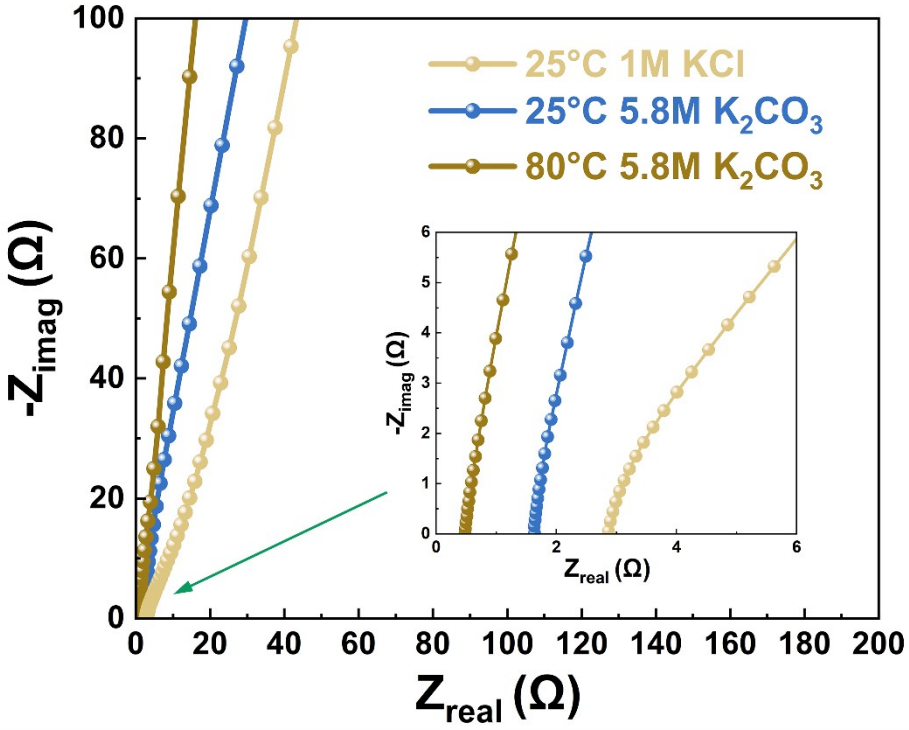

Fig. S1 Nyquist impedance spectra of KCl and K_2CO_3 solutions at various temperatures.

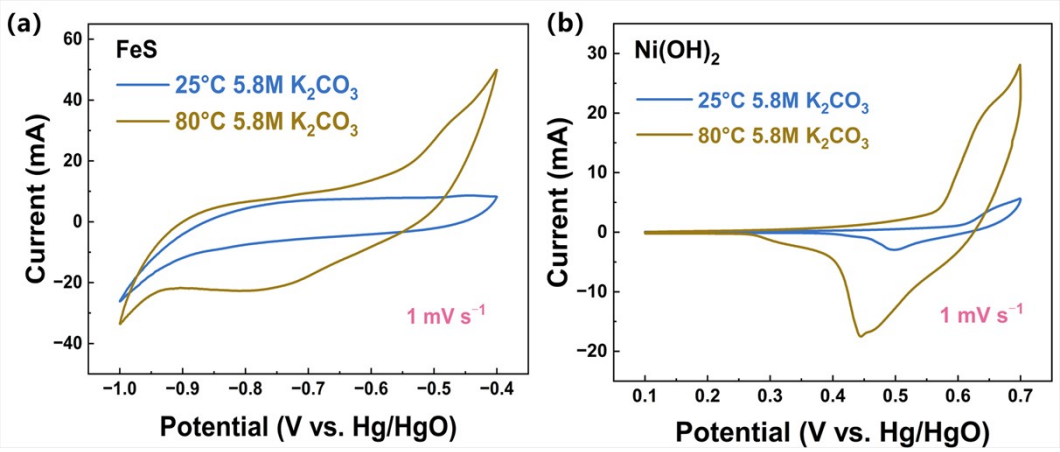

Fig. S2 CV curves of (a) the FeS anode and (b) the $Ni(OH)_2$ cathode in the 5.8M K_2CO_3 electrolyte at temperatures of 25 °C and 80 °C with a scan rate of 1 mV s^{-1}.

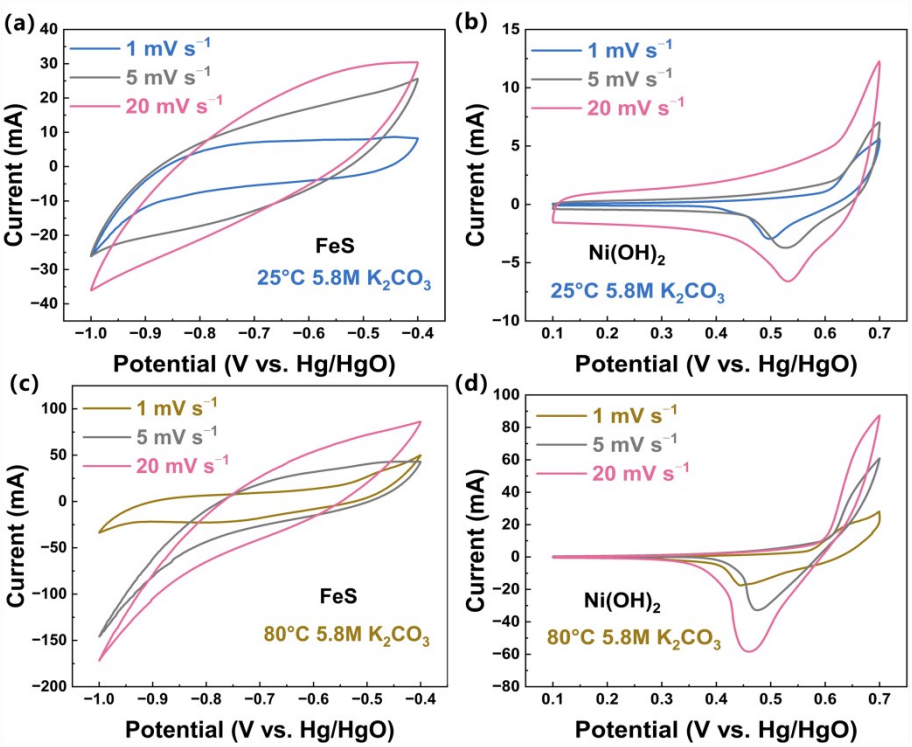

Fig. S3 CV curves of (a,c) the FeS anode and (b,d) the $Ni(OH)_2$ cathode in the 5.8M K_2CO_3 electrolyte at temperatures of 25 °C and 80 °C with different scan rates.

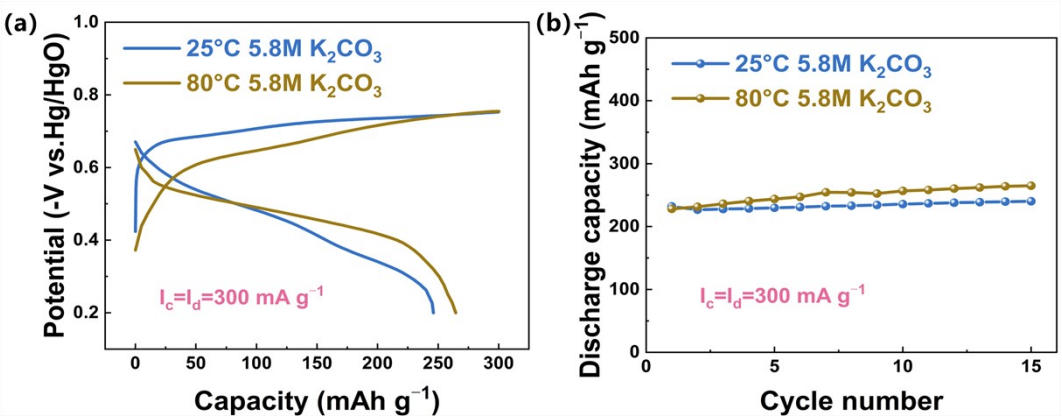

Fig. S4 (a) charge-discharge profiles and (b) cycling performance of the $Ni(OH)_2$ cathode in the 5.8M K_2CO_3 electrolyte at a current density of 300 mA g^{-1} at temperatures of 25 °C and 80 °C.

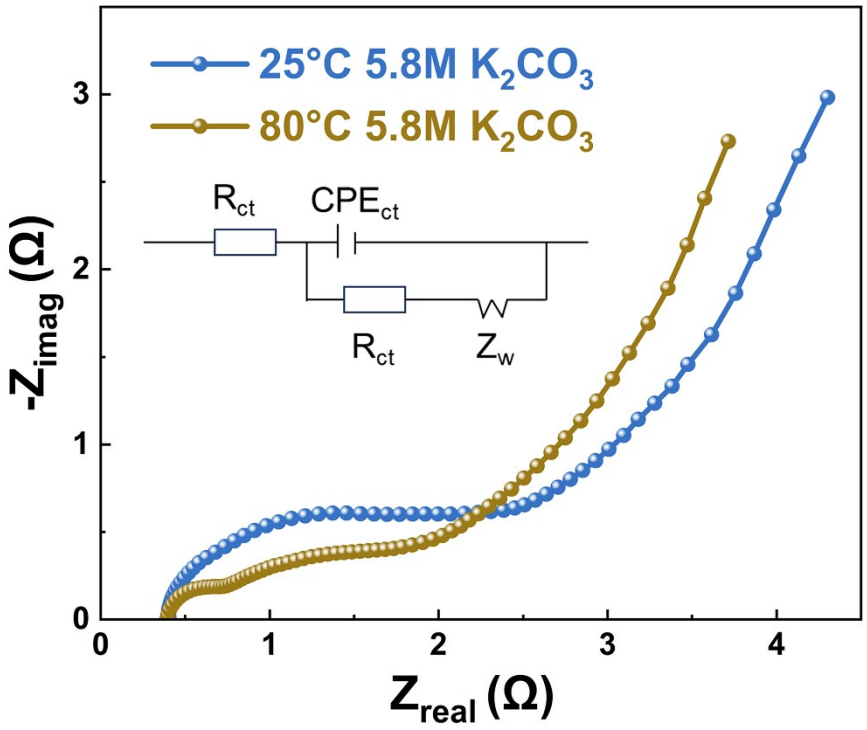

Fig. S5 Nyquist plots of the FeS electrode in the 5.8M K_2CO_3 electrolyte at temperatures of 25 °C and 80 °C.

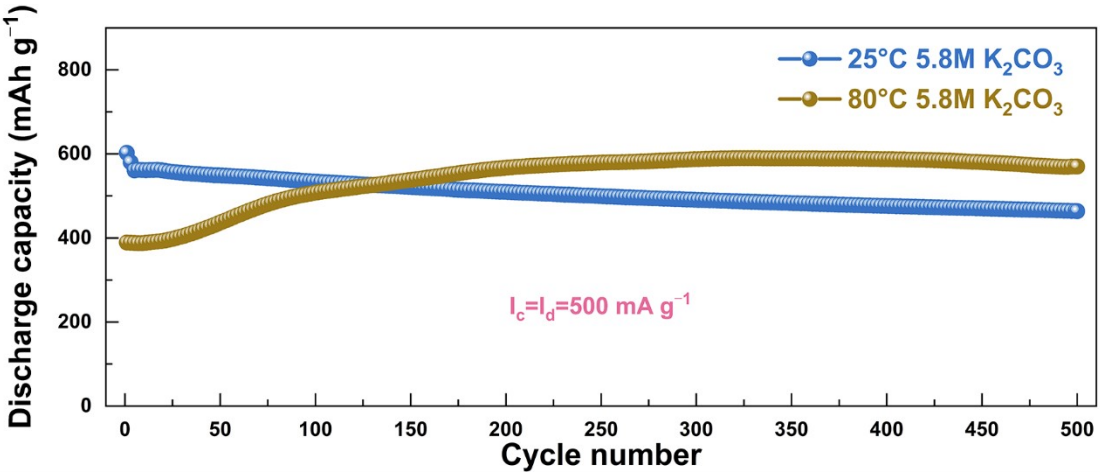

Fig. S6 Long-term cycling performance of the FeS electrode in the 5.8M K_2CO_3 electrolyte at temperatures of 25 °C and 80 °C.

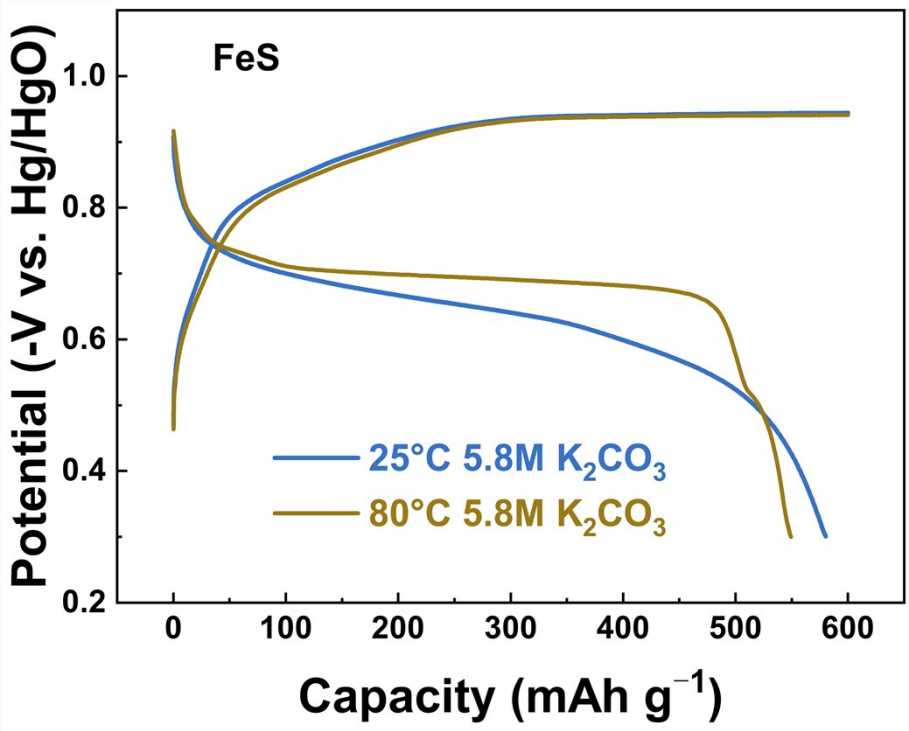

Fig. S7 Charge-discharge profiles of the FeS anode in 5.8M K_2CO_3 electrolyte during the 10th cycle at temperatures of 25 and 80 °C.