Supplementary Materials

A ferrocyanide-polysulfide redox flow battery with homogeneous catalysis for high-performance energy storage

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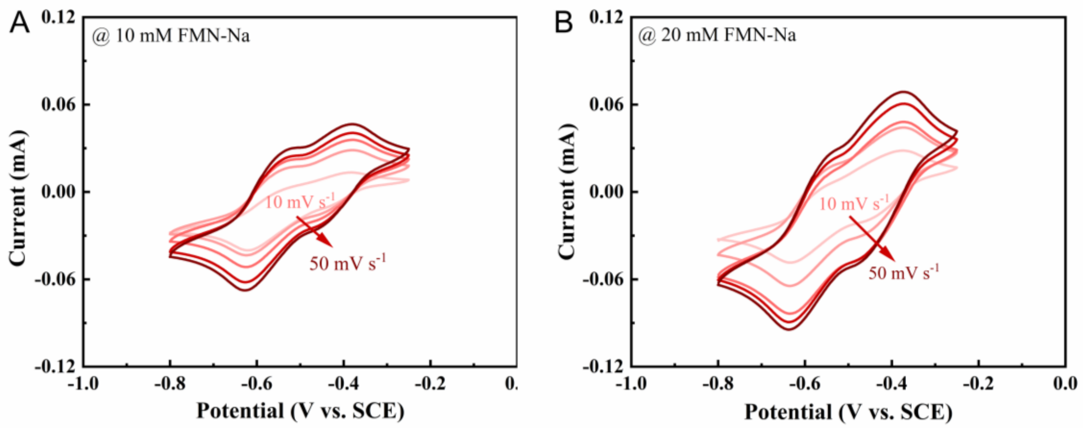
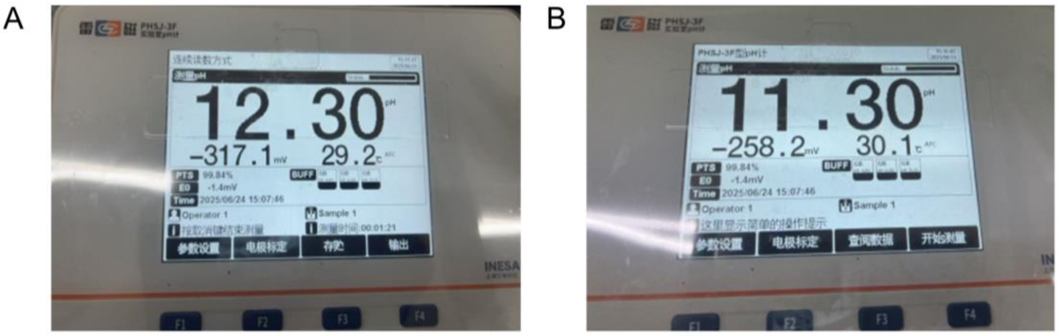
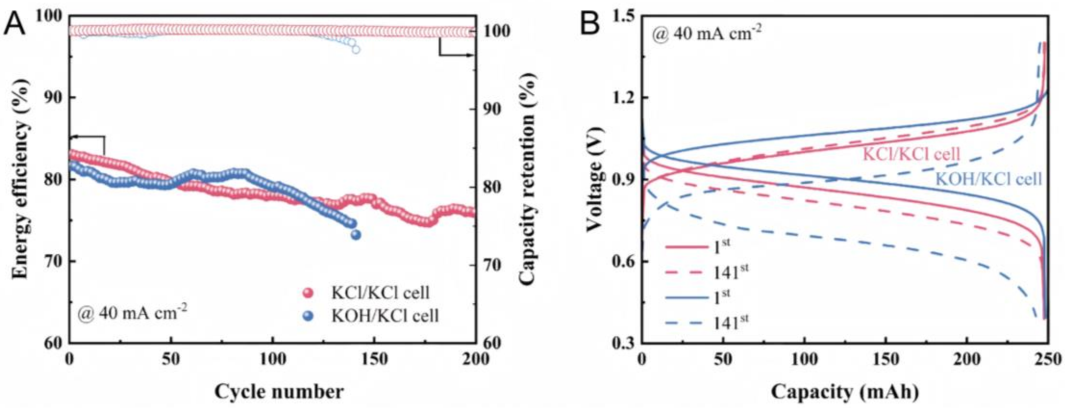


Supplementary Figure 1. (A) Cyclic voltammograms of 10.0 mM FMN-Na at different scan rates. (B) Cyclic voltammograms of 20.0 mM FMN-Na at different scan rates.



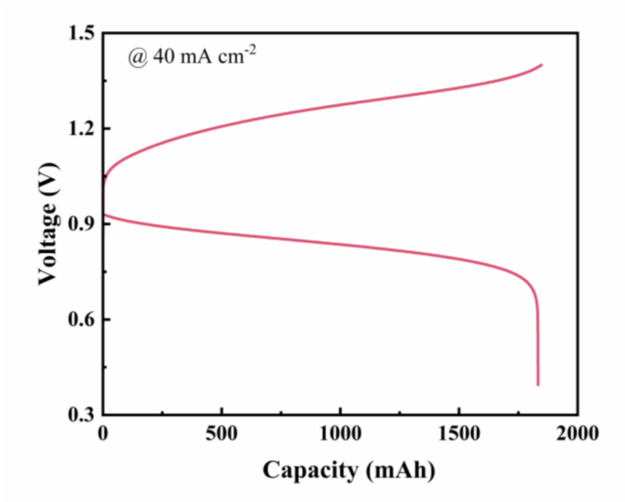
Supplementary Figure 2. (A) pH profile of 0.8 M K_2S in 1.0 M KCl solution. (B) pH profile of 2.0 M K_2S + 30.0 mM FMN-Na in 1.0 M KCl solution.

Supplementary Figure 3. Photographs of FMN-Na solutions with different concentrations in KCl and K_2S-KCl solutions.

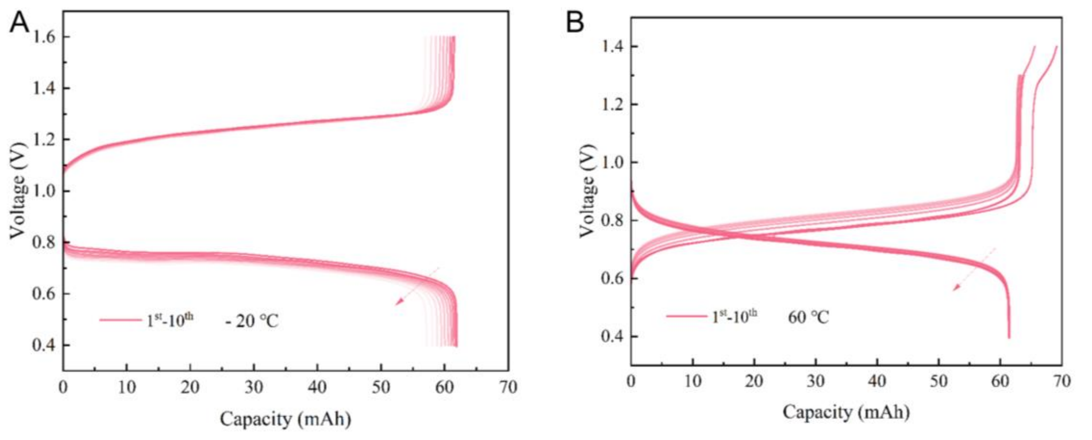


Supplementary Figure 4. (A) Energy efficiency and capacity retention of the KCl/KCl and KOH/KCl cells at 40 mA cm^{-2}. (B) Corresponding voltage-capacity profiles at the 1st and 141st cycles. The KCl/KCl cell composition was 40.0 mL of 2.0

M K_2S + 1.0 M KCl + 30.0 mM FMN-Na as the anolyte | PFSA membrane | 20.0 mL of 0.25 M $K_4[Fe(CN)_6]$ + 0.25 M $Na_4[Fe(CN)_6]$ + 1.0 M KCl as the catholyte. For the KOH/KCl control cell, only the 1.0 M KCl in the anolyte was replaced by 1.0 M KOH, while the catholyte composition and all other operating conditions remained unchanged.



Supplementary Figure 5. Voltage-capacity profile of the Fe-S RFB with high-concentration electrolytes, with PB in the catholyte and FMN-Na in the anolyte.



Supplementary Figure 6. Voltage-capacity profiles of the Fe-S RFB measured at (A) -20 °C and (B) 60 °C.

Supplementary Table 1. Cyclic voltammetry (CV) data of the K_2S electrolyte at various scan rates

Scan rate (mV s^{-1})	E (*vs.* SHE) (V)	peak potential separation (ΔE_p) (mV)	$i_{pa}/\lvert i_{pc}\rvert$
10	-0.398	846	0.93
20	-0.401	897	1.11
30	-0.402	933	1.14
40	-0.403	935	1.16
50	-0.404	954	1.19

Supplementary Table 2. CV data of 30.0 mM FMN-Na in neutral KCl supporting electrolyte

Scan rate (mV s^{-1})	E_1 (V *vs.* SHE)	peak potential separation (ΔE_{p1}) (mV)	$i_{pa1}/\lvert i_{pc1}\rvert$	E_2 (V *vs.* SHE)	Peak potential separation (ΔE_{p2}) (mV)	$i_{pa2}/\lvert i_{pc2}\rvert$
10	-0.349	90	0.07	-0.181	86	1.36
20	-0.349	92	0.29	-0.182	93	1.60
30	-0.352	93	0.38	-0.183	97	1.64
40	-0.352	94	0.40	-0.184	103	1.69
50	-0.353	96	0.44	-0.185	106	1.69

Supplementary Table 3. CV data of 30.0 mM FMN-Na in alkaline KCl + KOH supporting electrolyte (pH = 11.3)

Scan rate (mV s^{-1})	E (*vs.* SHE) (V)	Peak potential separation (ΔE_p) (mV)	$i_{pa}/\lvert i_{pc}\rvert$
10	-0.475	79	0.88
20	-0.474	84	0.94
30	-0.473	92	0.97
40	-0.475	95	0.98
50	-0.476	97	0.99

Supplementary Table 4. Comprehensive performance comparison between the present Fe-S RFB and previously reported systems

Reference	Catholyte concentration (M)	Current density (mA cm^{-2})	Cycle number	Energy efficiency

This work1	0.1	40	5000	82.14%
This work2	0.5	40	1000	83.07%
[30]	0.5	20	500	77.8%
[32]	0.1	20	1500	80.95%
[36]	0.1	40	2200	84%
[39]	0.5	40	2200	92.43%
[40]	0.5	40	2000	76%
[43]	0.1	50	1180	75.41%
[44]	0.1	20	2500	80.8%
[45]	1.3	20	900	70%
[46]	1.0	20	100	74%
[47]	0.3	50	160	77.7%
[48]	1.0	20	150	85.43%
[49]	2.0	20	50	87.9%