

Supplementary Information

A rechargeable high-temperature molten salt iron-oxygen battery

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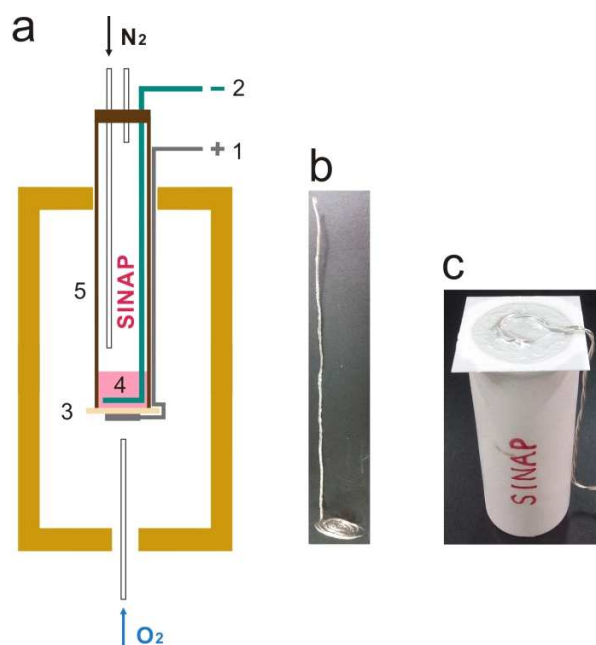


Figure S1. (a) Schematic illustration of the testing system for MIB, showing (1) the positive electrode (Ag wire), (2) negative electrode (Ni wire), (3) solid electrolyte membrane (YSZ), (4) molten salt ($\text{Fe}_2\text{O}_3+\text{Li}_2\text{O}+\text{K}_2\text{CO}_3$), and (5) alumina tube. (b) Photograph of the nickel wire. (c) Photograph of the laboratory MIB showing the end of the alumina tube that is sealed with the YSZ membrane which is glued to the Ag wire as the positive electrode.

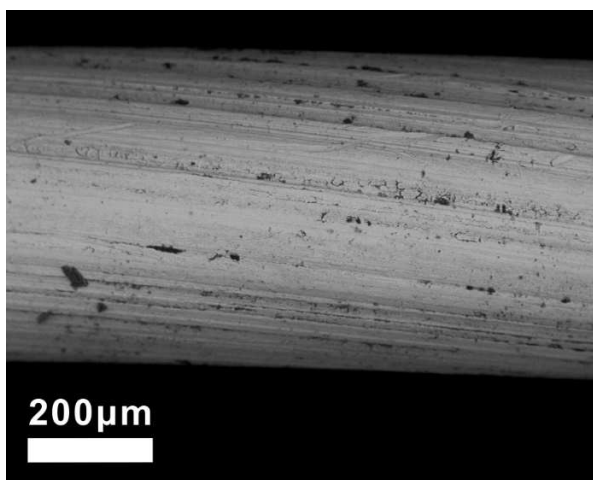


Figure S2. A SEM image of nickel wire before cycling charge/discharge tests.

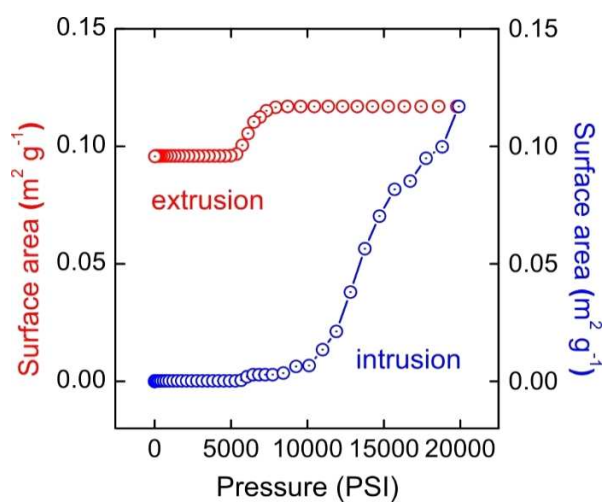


Figure S3. The surface area of nickel wires before cycling charge/discharge tests.

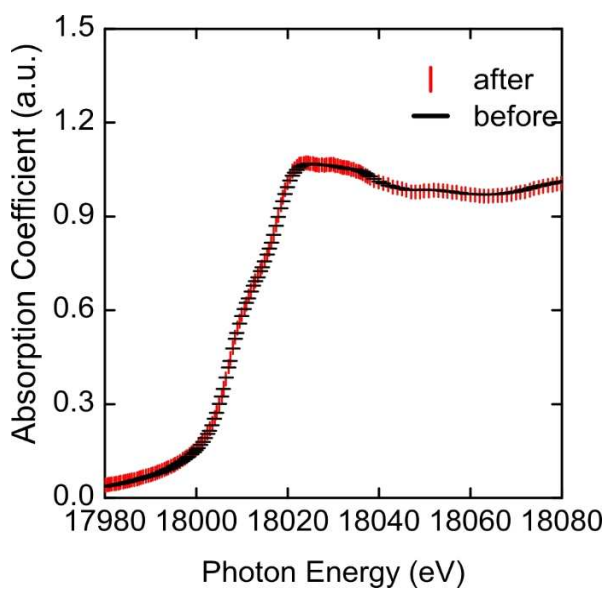


Figure S4. The K-edge XANES spectra of Zr atoms in YSZ pate before and after 200 times of cycling charge-discharge tests.

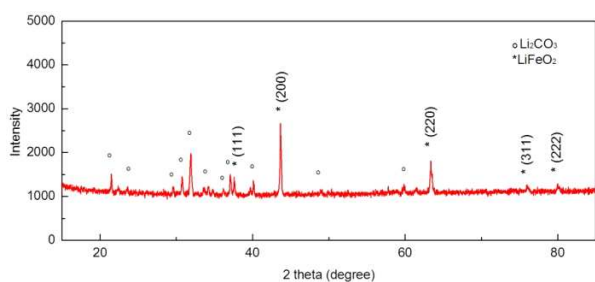


Figure S5. The XRD pattern of molten salt after cycling charge/discharge tests.

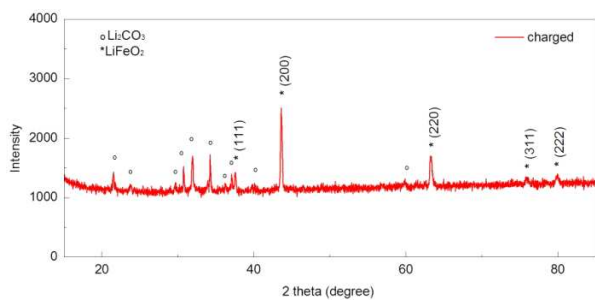


Figure S6. The XRD pattern of molten salt in a partially charged state.

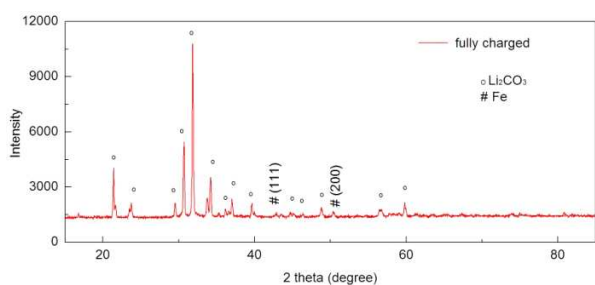


Figure S7. The XRD pattern of molten salt in a fully charged state.

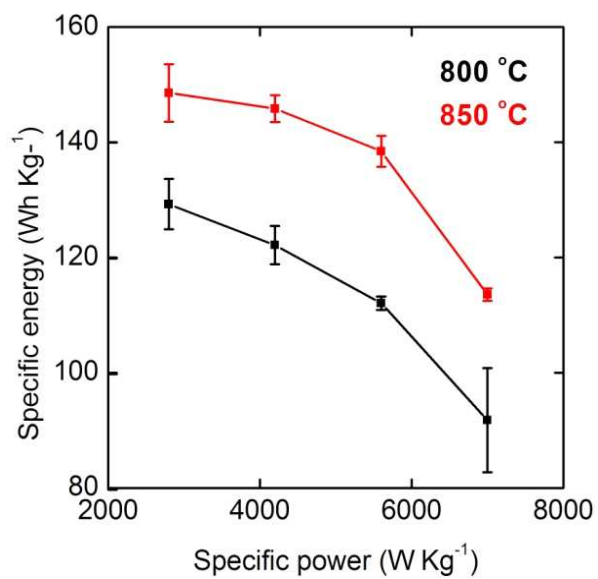


Figure S8. The Ragone plot of MIB on gravimetric basis.

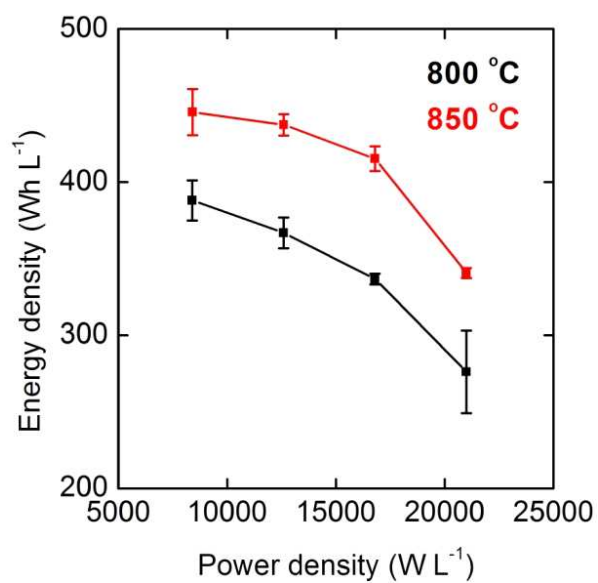


Figure S9. The Ragone plot of MIB on volumetric basis.

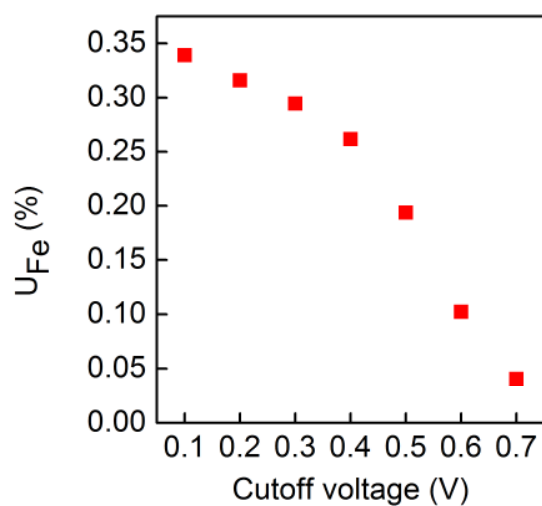


Figure S10. The iron utilization at different cutoff voltage.

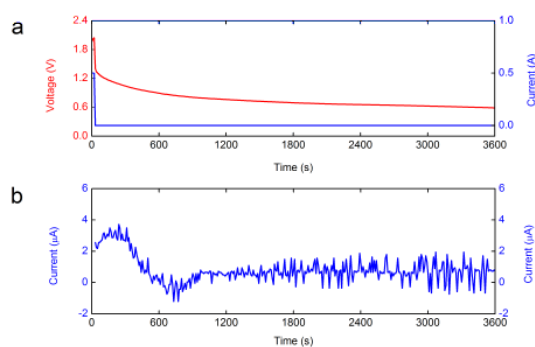


Figure S 11. The voltage-time profile (a) and the current-time profile (b) of the MIB recorded during charge at 0.5 A for 30 s and open circuit for 1 h at 800 °C in nitrogen.

Table S1. Mössbauer data of molten salt

molten salt	Fe(III)(A)				Fe(III)(B)				Fe(0) alpha-Fe				
	IS	QS	LW	Area	IS	QS	LW	Area	IS	QS	LW	Hf	Area
	(mm/s)			(%)	(mm/s)			(%)	(mm/s)			(T)	(%)
pristine	0.35	0.51	0.36	66.5	0.33	0.92	0.36	33.5	-	-	-	-	0
charged	0.38	0.44	0.42	53.2	0.37	0.84	0.50	41.6	0.00	0.03	0.31	33.1	5.2
discharged	0.36	0.48	0.37	62.6	0.35	0.90	0.35	37.4	-	-	-	-	0