Electronic Supplementary Information

Solvent Effect on Seebeck Coefficient of Fe^{2+}/Fe^{3+} Hydrogel Thermogalvanic Cells

Yang Liu,[†a] Qi Zhang,[†a] George Omololu Odunmbaku,[†a] Yongjie He,[a] Yujie Zheng,[b] Shanshan Chen,[b] Yongli Zhou,[a] Jing Li,[a] Meng Li,[a] Kuan Sun*[a]

[a.] MOE Key Laboratory of Low-grade Energy Utilization Technologies and Systems, School of Energy & Power Engineering, Chongqing University, Chongqing 400044, China.

E-mail: kuan.sun@cqu.edu.cn

[b.] State Key Laboratory of Power Transmission Equipment & System Security & New Technology, School of Energy & Power Engineering, Chongqing University, Chongqing 400044, China.

[†] Y. Liu, Q. Zhang, and G.O. Odunmbaku contributed equally to this work.

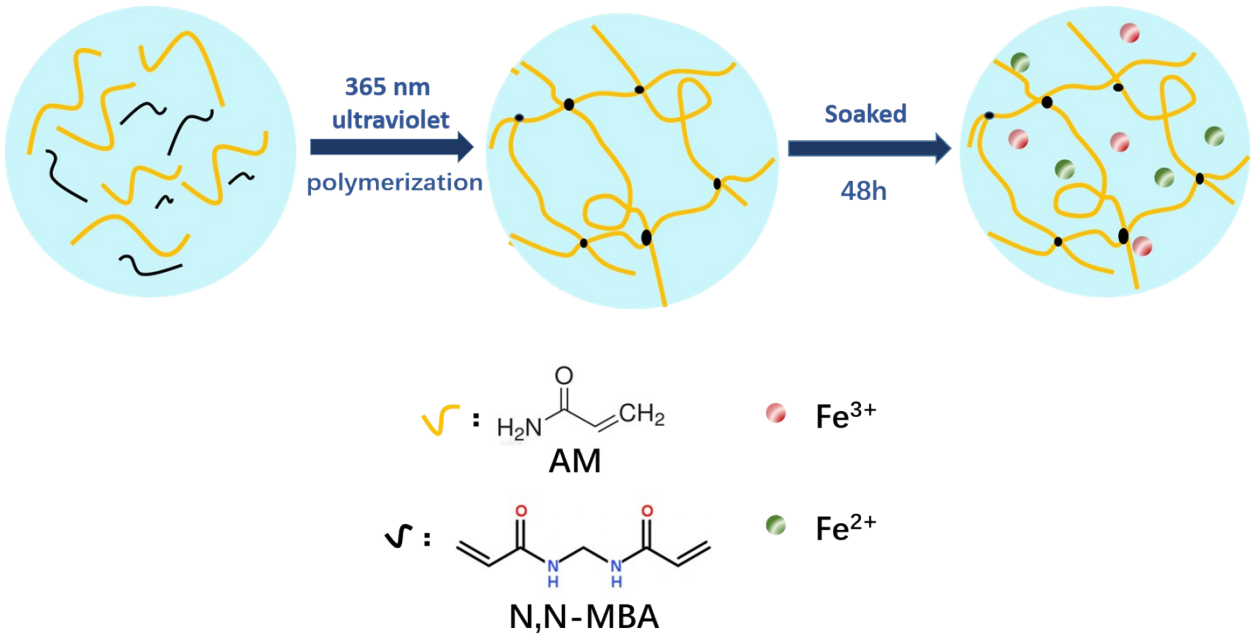

Fig. S1. Schematic illustrations showing the flow diagram of the preparation process of the thermogalvanic cell hydrogel.

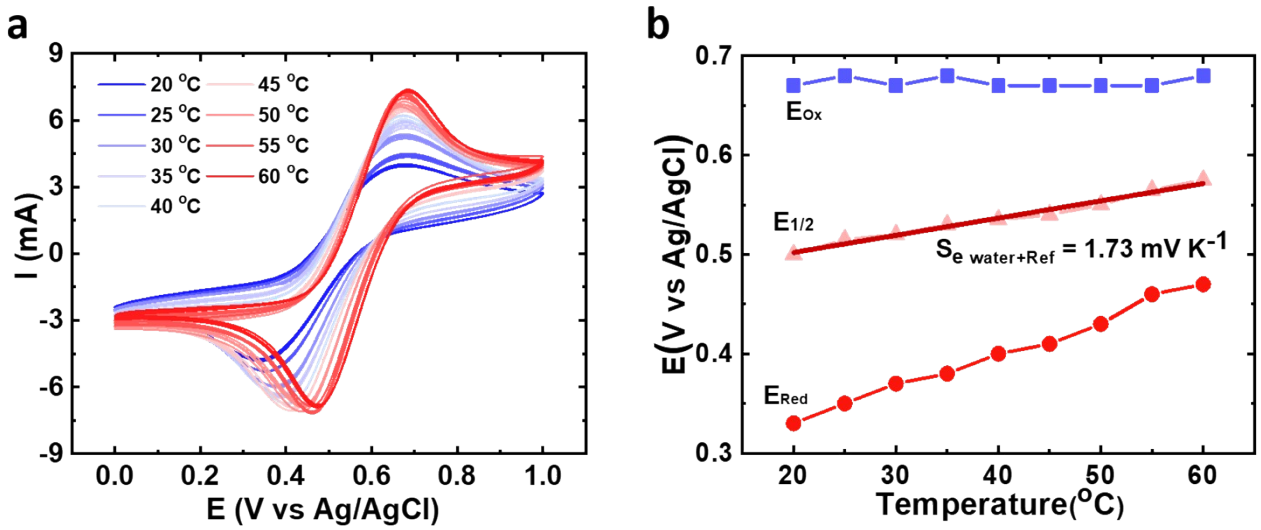

Fig. S2. (a) Variable-temperature cyclic voltammograms of 0.01 M Fe^{2+}/Fe^{3+} without supporting electrolyte. (b) A plot of the peak potentials of oxidation and reduction reactions and $E_{1/2}$ at various temperatures.

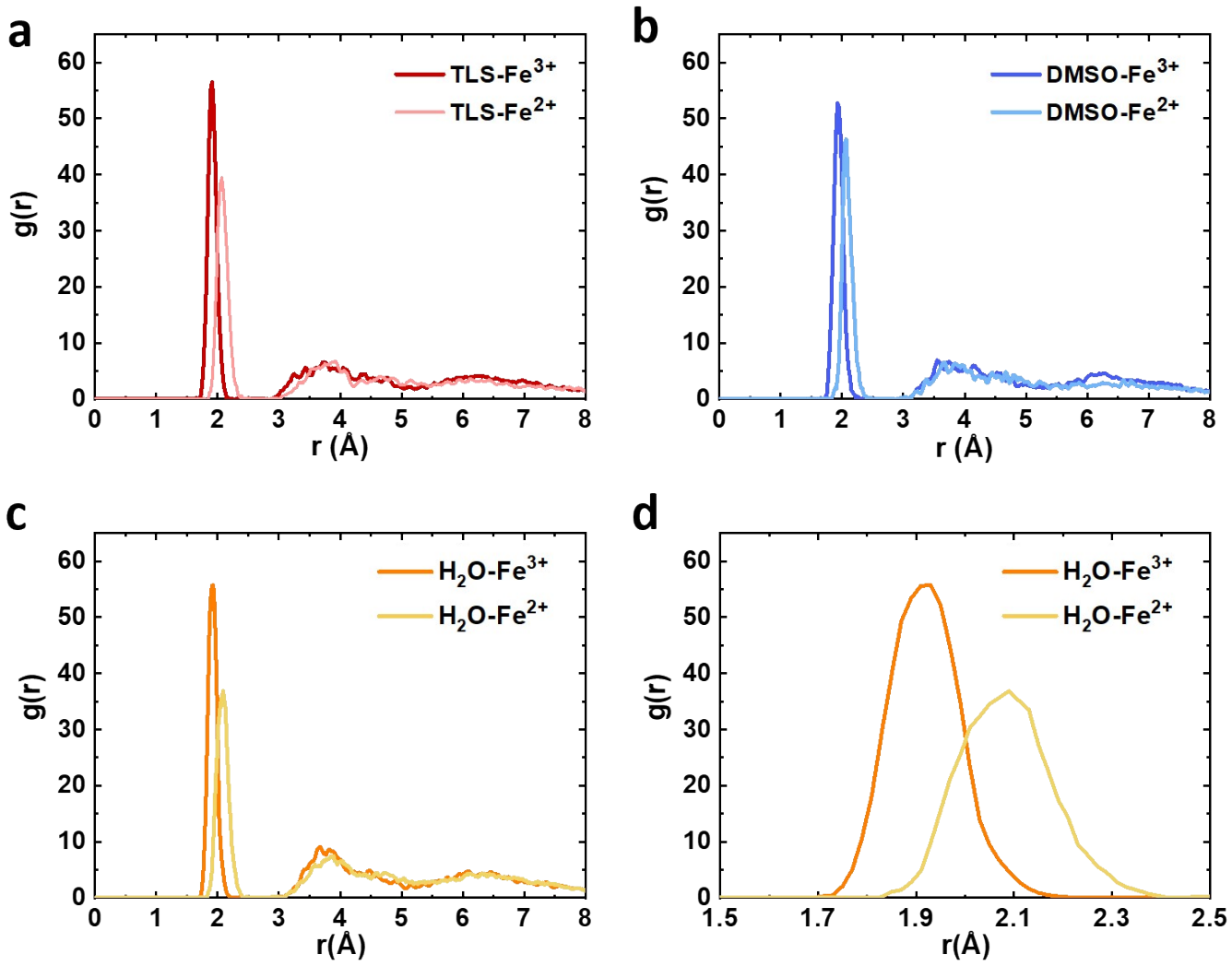

Fig. S3. (a) The RDF of the O atoms around Fe ions in the electrolyte with TLS: Fe^{3+}(deep red line) and Fe^{2+} (pink line). (b) The RDF of the O atoms around Fe ions in the electrolyte with DMSO: Fe^{3+}(deep blue line) and Fe^{2+} (sky blue line). (c) The RDF of the O atoms around Fe ions in water: Fe^{3+}(orange line) and Fe^{2+} (yellow line). (d) The first peak of RDF of the O atoms around Fe ions in the water.

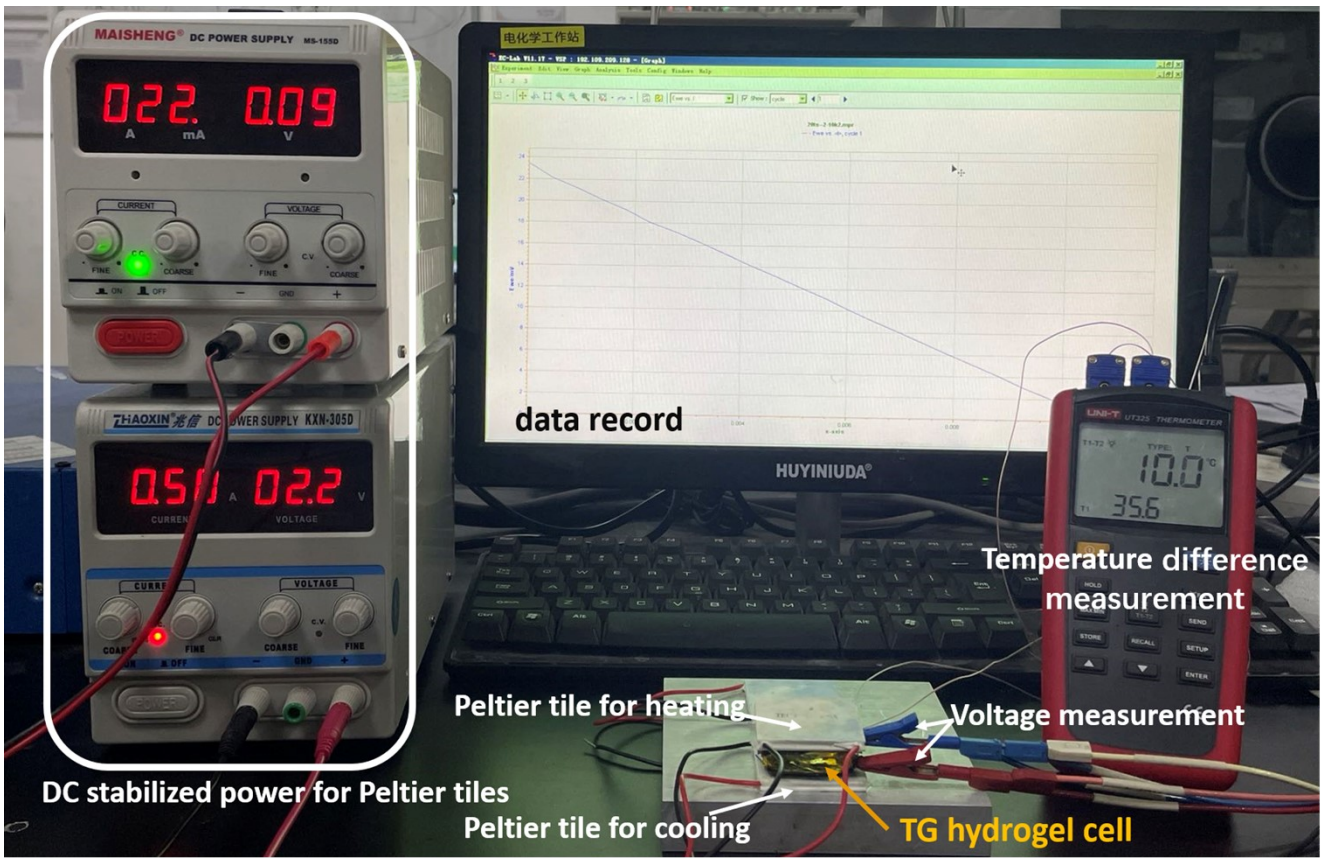

Fig. S4. Real shot of TG hydrogel cell and setup for power output measurement.

Table S1. Physical parameters of the organic solvents studied in this work.

Solvent*	Melting Point (℃)	Boiling Point (℃)	Viscosity (mPa·s)	Dielectric Constant	Polarizability ($10^{-24}cm^3$)	Donor Number
TLS	28.45	287.3	10.29	43.3	10.83	14.8
Acetone	-94.9	56.53	0.32	20.7	6.33	17
MeOH	-97.8	64.7	0.55	32.6	3.25	19
EG	-13	197.3	25.66	37	5.7	20
IPA	-87.9	82.45	2.431	18.3	6.91	21
DMF	-61	153	0.802	36.7	7.87	26.6
NMP	-24	202	1.65	32	10.64	27.3
DMSO	18.4	189	1.1	46.7	7.99	29.8
DEF	-78	178	1.366	29.0	11.54	30.9

* TLS - Tetramethylene sulfone; MeOH – Methanol; EG - Ethylene glycol; IPA - Isopropyl alcohol; DMF - N,N-Dimethylformamide; NMP - N-Methylpyrrolidone; DMSO - Dimethyl sulfoxide; DEF - N,N-Diethylformamide.

Table S2. Comparison of the S_e values of our work with those reported $Fe^{2+/3+}$ TG cell in the literatures on electrolyte and electrode.

Redox couple	Electrolyte	Electrode	S_e (mV K^{-1})	Ref
$[NH_4]Fe^{2+/3+}$ $(SO_4)_2/H_2SO_4$	Aqueous	Gold	0.84	[1]
$Fe^{2+/3+}SO_4$ /H_2SO_4	Aqueous	Gold	0.9	[1]
$Fe^{2+/3+}NO_3/HNO_3$	Aqueous	Gold	1.38	[1]
$Fe^{2+/3+}CF_3SO_3/CF_3SO_3H$	Aqueous	Gold	1.46	[1]
0.5M $Fe^{2+/3+}ClO_4$	Aqueous	Platinum	1.76	[2]
$Fe^{2+/3+}Cl$	Aqueous	Platinum	1.04	[3]
$Fe^{2+/3+}ClO_4$/HCl	Aqueous	Platinum	1.8	[3]
$Fe^{2+/3+}Cl$/PVA	Hydrogel	PEDOT:PSS	0.85	[4]
$Fe^{2+/3+}Cl$/HCl/PVA	Hydrogel	Au/Cr	1.02	[5]
$Fe^{2+/3+}Cl$/PVDF/PVA	Hydrogel	Graphite	0.79	[6]
$Fe^{2+/3+}Cl$/PAM-PEGDA	Hydrogel	Copper	2.02	[7]
$Fe^{2+/3+}ClO_4$/TLS/PAM	Hydrogel	Carbon Cloth	2.49	**This work**

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