Electronic Supplementary Information

Resistance components in organic electrolytes containing Fe^{2+}/Fe^{3+} for liquid thermoelectric conversion device

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solvent	R (Ω)	R_s (Ω)	R_{ct} (Ω)	R_{dif} (Ω)
PC	637	396	17	224
DMSO	389	265	11	113
AN	241	117	20	104
acetone	303	185	18	100
NMP	544	389	12	143
DMF	258	172	7	79

Table S1. Total resistance R solution resistance R_s, charge-transfer resistance R_{ct}, and diffusion resistance R_{dif} of LTE containing 0.1 M $Fe(ClO_4)_2$/$Fe(ClO_4)_3$. The electrodes were 220 mm graphite sheet (PREMA-FOIL, TOYO TANSO), whose distance and area are 1.0 cm and 0.42 cm^2, respectively. The temperature of the cold and hot electrodes were 298 K and 328 K, respectively. PC, DMSO, AN, NMP, and DMF represent propylene carbonate, dimethyl sulfoxide, acetonitrile, N-methylpyrrolidone, and N,N-dimethylformamide, respectively. R_s and R_{ct} were evaluated by EIS analysis. R_{dif} was evaluated by R - R_s - R_{ct}.
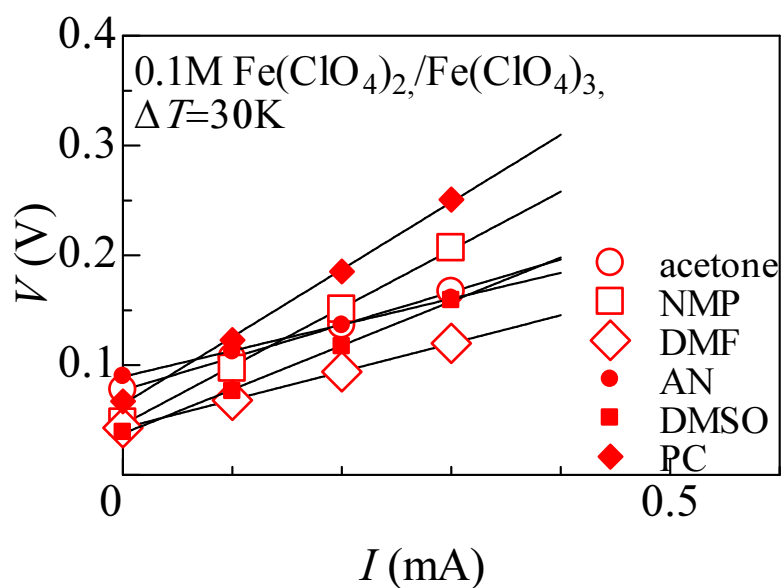
Fig. S1: Voltage V against current I of LTE with organic solutions containing 0.1 M $Fe(ClO_4)_2/Fe(ClO_4)_3$. The electrodes were 220 μm graphite sheet (PREMA-FOIL, TOYO TANSO), whose distance and area are 1.0 cm and 0.42 cm^2, respectively. The temperature of the cold and hot electrodes were 298 K and 328 K, respectively. Note that finite electromotive force is observed at $I = 0$ mA. The straight lines are the results of least-squares fits. The slope corresponds to the total resistance R.
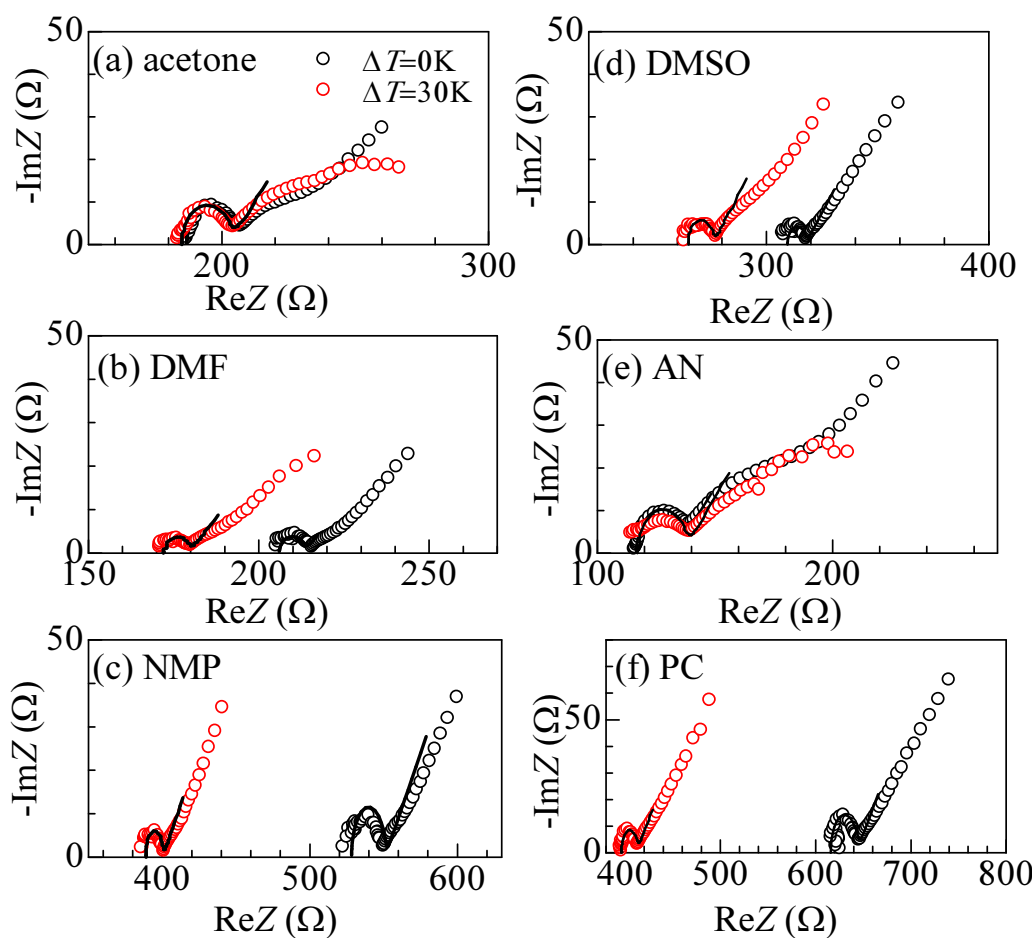
Fig. S2: Electrochemical impedance spectroscopy (EIS) data of LTE with organic solutions containing 0.1 M $Fe(ClO_4)_2/Fe(ClO_4)_3$: (a) acetone, (b) DMF, (c) NMP, (d) DMSO, (e) AN, and (f) PC. The electrodes were 220 μm graphite sheet (PREMA-FOIL, TOYO TANSO), whose distance and area are 1.0 cm and 0.42 cm², respectively. The temperature of the cold electrode was 298 K. Red and black circles represent data at $\Delta T = 0$ and 30 K, respectively. Solid curves are results of least-squares fits with a Randles equivalent circuit which consists of R_s, R_{ct}, C_d, and Z_ω.
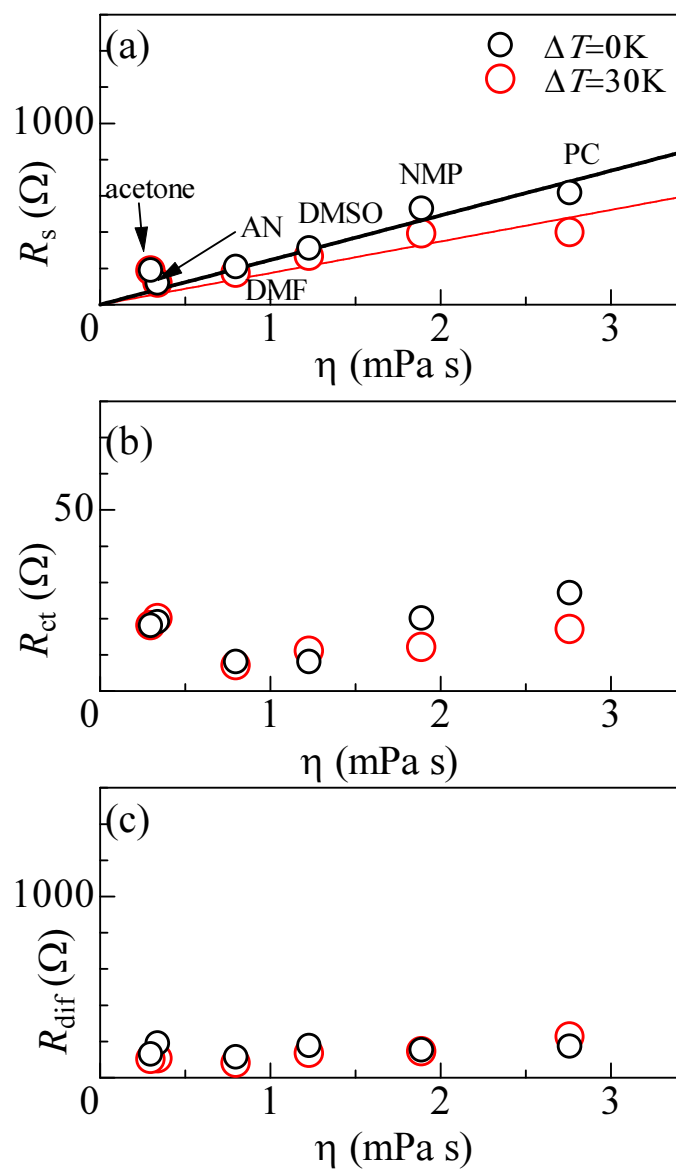
Fig. S3: Solvent dependence of (a) R_s, (b) R_{ct}, and (c) R_{dif} against viscosity η of LTE containing 0.1 M Fe(ClO$_4$)$_2$/Fe(ClO$_4$)$_3$. The electrodes were 220 mm graphite sheet (PREMA-FOIL, TOYO TANSO), whose distance and area are 1.0 cm and 0.42 cm^2, respectively. The temperature of the cold electrode was 298 K. Red and black circles represent data at $\Delta T = 0$ and 30 K, respectively. Straight lines in (a) are results of least-squares fits.