Supporting Information

Enhanced thermal energy harvesting performance of a cobalt redox couple in ionic liquid-solvent mixtures

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Table S1. TEC performance of the 0.1 M cobalt redox couple in different electrolytes with different cold electrode temperatures, and T_{hot}=130 °C.

Electrolyte	P_{max} ($mW.m^{-2}$)		
	T_{cold} = 60 °C	T_{cold} = 70 °C	T_{cold} = 90 °C
Neat $[C_2mim][B(CN)_4]$	221	178	90
IL:MPN (3:1)	409	294	134
IL:MPN (1:1)	612	432	197
MPN:IL (3:1)	784	483	216
Neat MPN	452	292	105

Table S2. The solution resistance (R_{sol}) and charge transfer resistance (R_{CT}) at all volume ratios of the MPN-$[C_2mim][B(CN)_4]$ and DMSO-$[C_2mim][eFAP]$ system, containing 0.1M $[Co^{II/III}(bpy)_3](NTf_2)_{2/3}$, determined by EIS at 95 °C.

Electrolyte	R_{sol} (Ω)	R_{CT} (Ω)
Neat $[C_2mim][B(CN)_4]$	37	26
IL:MPN (3:1)	30	15
IL:MPN (1:1)	29	7
IL:MPN (1:3)	36	17
Neat MPN	88	6
Neat $[C_2mim][eFAP]$	87	98
IL:DMSO (3:1)	60	20
IL:DMSO (1:1)	51	10
IL:DMSO (1:3)	52	8
Neat DMSO	104	4

Table S3. Diffusion coefficients of the $Co^{II/III}(bpy)_3(NTf_2)_{2/3}$ redox couple in all electrolyte systems.

Electrolyte	Diffusion coefficient ($m^2\ s^{-1}$) $Co^{II}(bpy)_3$	Diffusion coefficient ($m^2\ s^{-1}$) $Co^{III}(bpy)_3$
Neat $[C_2mim][B(CN)_4]$	1.5E-09	1.1E-09
IL:MPN (3:1)	1.2E-09	9.6E-10
IL:MPN (1:1)	7.6E-10	7.4E-10
IL:MPN (1:3)	4.9E-10	5.2E-10
Neat MPN	2.4E-10	3.2E-10
Neat $[C_2mim][eFAP]$	1.0E-10	5.6E-10
IL:DMSO (3:1)	2.2E-10	4.6E-10
IL:DMSO (1:1)	4.7E-10	3.9E-10
IL:DMSO (1:3)	6.2E-10	2.0E-10
Neat MPN	9.1E-10	6.7E-11
0.2 M $TBABF_4$ in MPN	1.5E-09	1.5E-09
0.4 M $TBABF_4$ in MPN	1.3E-09	8.8E-10
0.5 M $TBAPF_6$ in MPN	8.9E-10	8.3E-10
1.1 M TBAPF6 in MPN	6.2E-10	6.7E-10

Table S4. TEC performance at various cobalt redox couple concentrations in 3:1 MPN: $[C_2mim][B(CN)_4]$; T_{hot}=130 °C.

Redox couple concentration / M	P_{max} (mW/m^2)		
	Tcold = 60 °C	Tcold = 70 °C	Tcold = 90 °C
0.025	519	269	112
0.050	586	368	170
0.075	697	448	191
0.1	780	483	216
0.125	613	420	162
0.2	497	303	127
0.3	505	289	133
0.4	471	253	120

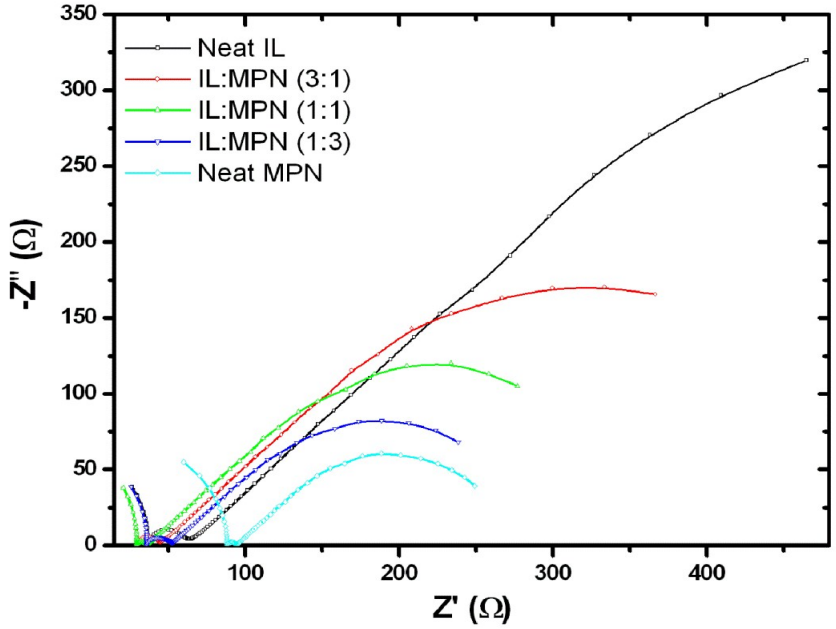

Fig. S1 Nyquist plot of 0.1M $[Co^{II/III}(bpy)_3](NTf_2)_{2/3}$ in neat IL, neat MPN and in their different volume mixtures (at 95 °C).