

Supplementary Materials

Table S1. Performance of the thermosetting and thermoplastic electrolytes in DSSCs. Please refer to corresponding references for electrolyte components abbreviation full description.

Composition of the electrolytes	Electrolyte deposition + curing method	σ (mS/cm)	η (%)	Stability	Ref
Thermosetting electrolytes					
PU membrane soaked in 0.6 M DMPII + 0.1M LiI + 0.05M I ₂ + 0.5M TBP in MPN	Casting + hot pressing at 100 °C	12.3	7.7	1000 h at-rest stability	[101]
HII PIL + DMII wt./wt, 1/0.7 (E2)	Drop-casting + heating at 40 °C	1.26	6.5	At-rest, room temp	[102]
BEMA/PEGMA (1/1 ratio) in 0.22 M Co(II)(bpy) ₃ (PF ₆) ₂ + 50 mM Co(III)(bpy) ₃ (PF ₆) ₃ + 0.2 M TBP	Vacuum back-filling + UV curing	-	6.4	1500 h at 60°C in the dark 1800 h at 40°C and 1 Sun	[106]
0.05 M I ₂ , 0.25 M PMI, 0.25 M DMPII, 0.5 M TBP, 25mM LITFSI	Vacuum filling + UV curing	2	6.15	1 sun light soaking at 50 °C.	[105]
PIL+ C14MImI	Pressing + 60 °C for 12h	2	5.8	1000 h at 85% RH and 30 °C	[103]
10M C14MImI + 2M I ₂ + 2M TBP + 1M LiClO ₄ in dichloromethane	Pressing + 60 °C for 12h	0.4	3.5	2000 h at 85% RH and 30°C	[104]
PEGMA:PEGDA membrane soaked in 0.5M NaI/0.05M I ₂ in ACN	Pressing + UV curing	-	3.2	-	[107]
Thermoplastic electrolytes					
16 wt% SGT-643 + 1 wt% SiO ₂ in 0.1 M LiI + 0.5 M I ₂ + 0.7 M DMPII + 0.9 M TBP in ACN.	Vacuum filling	2.96	10.2	500 h under 1 SUN and 50 °C	[120]
Acetamide 5 wt. % in 0.1M of LiI/I ₂	Pressing	0.6	9	-	[72]
9 wt. % of (PEO/PVDF) + 4 wt. % TiO ₂ + 0.1 M LiI + 50 mM I ₂ + 0.8 M DMIMI + 0.5 M TBP + 0.1 M GuSCN in MPN	Doctor-blade + hot pressing at 100 °C	1.85	8.9	60 °C in dark.	[73]
PAA-PEG + PANI-G + PtNi	Pressing	18.4	8.64	10 days IN (20-28 °C, 40-60% RH)	[121]
GPE + 4 wt. % of urea dissolved in LiI/I ₂	Pressing	0.43	6.8	-	[110]
10 wt. % PVDF-HFP + 5 wt% HPMC + 0.1M I ₂ + 0.1 M NaI + 0.5 M TBP + 0.5 M BMII in ACN	Pressing	0.9	5.3	-	[111]
PEG gel 3 wt. % in 0.2 M of Co (II), 0.02 M of Co (III), 0.1 M of LiClO ₄ , 0.5 M BPTP	Pressing	1.15	5.1	-	[123]
5% PEO-EM-AGE + 0.2 M [Co(bpy) ₃] ²⁺ + 0.07M [Co(bpy) ₃] ³⁺ + 0.05M Li ⁺ + 0.2M TBP	Vacuum filling	-	3.6	1000h under 1 Sun and 40 °C	[109]
PU-PEG 2000 soaked in LE (1.5 g NaI, 0.15 g I ₂ , and 15 mL PC)	Pressing	3.42	3.41	At-rest at RT	[122]

Table S2. Photovoltaic performances of DSSCs using liquid and (quasi-) solid electrolytes based on ionic liquids under AM 1.5 simulated solar light irradiation. Please refer to corresponding references for electrolyte components abbreviation full description.

Electrolyte physical state	Composition of the electrolytes	Electrolyte deposition	σ (mS/cm)	J_{sc} (mA/cm ²)	V_{oc} (V)	FF (%)	η (%)	Stability	Ref
Liquid	0.05 M I ₂ , 0.075 M LiI, 0.3 M TBP, 0.025 M THAI, 0.6M DMPI	Vacuum filling	-	24.30	0.72	68	12	-	[128]
	0.05 M I ₂ , 0.02 M LiI, 0.3 M TBP, 0.05 M THAI, 0.6M EMIMI in ACN:THF (95:5, v:v)	Filling	10.9	22.2	0.71	73	11.5	-	[125]
	0.07 M I ₂ , 0.05 M LiI, 0.05 M NaI, 0.50 M DMPII, 0.10 M EMIMI, 0.05 M TBAI, 0.05 M THAI, 0.40 M TBP, and 0.10 M GuSCN in MeCN/VN/THF (8 : 1 : 1 v/v)	Injection filling	-	18.36	1.01	77	11.2	-	[31]
	HeMII/NMBI/GuNCS	Vacuum filling	6	13.52	0.72	70	6.85	-	[129]
	BMTII in ACN (concentration unknown)	Injection filling	0.8	12.49	0.73	64	6.63	2 months at RT	[130]
	0.05 M I ₂ , 0.1 M LiI, 0.6 M DMPII, 0.5 M TBP, BMIBr	Injection filling	-	12.2	0.80	67	6.54	45 days at RT	[131]
	0.24 M I ₂ , 0.78M LiI, 3.92 M TBP, 4.71M P122-TFSA, 2% SiO ₂	Vacuum filling	-	12.4	0.72	65	5.86	5 months at RT	[132]
Quasi-solid	7.5 wt. % I ₂ , 22.7 wt.% TPAI, 8 wt.% BMIMI, 0.08 g PhCh , 0.02 g PEO, 0.50 g EC, 0.60 g DMF, TPAI	Pressing	13.5	19.61	0.71	71	9.61	-	[133]
	0.05 M I ₂ , 0.1 M LiI, 0.6 M PMIMI, 0.1 M GuSCN, 0.5 M TBP, and ACN + 20 wt% P(VA-co-MMA) + 5% TiO ₂ filler	Screen-printing and pressing	7.5	16.93	0.75	74	9.4	1000h at 30 °C	[71]
	50 mM I ₂ , 0.1 M LiI, 0.8 M DMIMI, 0.5 M tBP, 0.1 M GuSCN, MPN solvent + 9 wt.% PEO/PVDF with 0.6 wt% ZnO	Screen-printing + pressing	-	14.39	0.80	73	8.50	1200h at RT	[41]
Solid	50 mM I ₂ , 0.1 M LiI, 0.1 M GuSCN, 0.5 M TBP, 0.8 M DMIMI in MPN + PEO/PMMA (7/3) + 10 wt% TiO ₂	Screen-printing + hot pressing at 100 °C	1.29	16.64	0.77	71	9.12	150h in RT	[134]
	50 mM I ₂ , 0.1M LiI, 0.8M DMIMI, 0.5MtBP, 0.1N GuSCN in MPN + 9% PEO/PVDF + 4% TiO ₂	Screen-printing + hot pressing at 100 °C	1.8	16.10	0.77	72	8.91	500h at 60°C in dark	[73]

Table S3. Best photovoltaic performances for the iodide containing PILs - based DSSCs reported in literature. Please refer to corresponding references for electrolyte components abbreviation full description.

Electrolyte composition	Electrolyte deposition	σ (mS/cm ²)	J _{sc} (mA/cm ²)	V _{oc} (V)	FF (%)	PCE (%)	Stability	Ref.
0.1 M LiI, 0.05 M I ₂ , 0.6 M DMPI, 0.5 M TBP in ACN/MPN20 + 20 wt.% POEI-TEMPO	Injection filling	-	16.60	0.81	73	9.83	2000h at 100 mW/cm ²	[146]
FII-P membrane swelled with 0.6 M DMPI, 0.035 M I ₂ , 0.1 M GuSCN, 0.5 M TBP, in MPN/ACN	Pressing	11.5	17.03	0.78	-	9.26	1500h	[148]
30 wt% POEI-IS, 0.2 M KSeCN, 0.05 M (SeCN) ₂ in ACN	Injection filling	7.0	13.85	0.82	71	8.18	1000h RT	[151]
PEBII	Pressing	0.2	19.0	0.74	58	8.0	-	[150]
0.1 M LiI, 0.05 M I ₂ , 0.5 M TBP and 0.3 M POEI-II in ACN/MPN	Drop casted	10.4	13.97	0.78	66	7.19	1000h in dark at 50 °C	[152]
HII/DMIMI 1 :0.7, I ₂ in 1,6-Bis(1H-imidazole-1-yl)hexane	Drop casting + RT curing	1.3	11.69	0.79	71	6.55	600h RT	[102]
0.05 M I ₂ , 0.05 M TBP, 16 wt.% PMAPI in GB	Drop casting	4.9	14.20	0.80	57	6.45	30 days in dark	[147]
PMMA/PIL/PIN membrane swelled with 0.1 M LiI, 0.05 M I ₂ , 0.5 M TBP, 0.6 M of PMIMI in VN:ACN 15:85	Pressing + RT curing	5.8	12.8	0.79	58	5.96	100h at RT and 100 mW/cm ²	[73]