Diarylethene based Ionic Liquids: Synthesis and Photodriven Solution Properties

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SUPPLEMENTARY INFORMATION

Section 1 – Conductivity studies

Table S1-1 - Conductivity evolution of GDILs aqueous solutions over UV irradiation time, at 25ºC.

	Conductivity (μS.cm^{-1})									
Solution / $t_{UV\ irradiation}$ (min)	KCl	IMC1	IMC2	IMC4	IMC6	IMC8	IMBENZ	PY	CH	ET3N
0	105	72	70	93	86	90	66	50	72	68
1	105	77	74	96	89	93	68	52	73	70
2	105	82	78	99	92	96	69	54	74	72
3	105	88	82	102	94	99	72	56	75	74
4	105	93	89	105	96	102	77	58	76	76
5	105	98	95	109	99	104	81	60	78	78
10	105	121	119	123	109	114	91	68	84	88
15	105	136	135	134	118	124	100	76	89	98
20	105	151	153	148	127	132	108	84	93	107
25	105	165	168	158	133	142	116	90	97	114
30	105	176	180	168	139	150	122	95	100	120
40	105	184	191	178	145	158	128	101	103	125
45	105	191	199	186	150	167	134	106	106	130
50	105	199	208	193	153	174	138	110	108	135
55	105	205	215	199	156	180	142	113	110	138
60	105	210	220	204	160	185	146	116	112	141
65	105	214	224	209	163	189	148	118	114	143
70	105	217	227	212	165	192	151	121	115	145
75	105	220	230	214	168	194	154	122	116	147
80	105	223	232	217	170	196	156	123	117	149
85	105	225	233	219	171	197	159	124	118	150
90	105	227	234	221	172	198	161	124	119	151
95	105	228	235	223	173	199	163	125	120	152
100	105	229	235	224	174	199	165	125	120	153
105	105	230	236	225	175	200	166	126	121	153
110	105	231	236	226	176	200	167	127	121	154
115	105	231	236	226	176	201	167	127	121	154
120	105	231	237	227	177	201	168	127	122	154

Table S1-2 - Conductivity of pure [C_2mim][SCN] and GDIL/[C_2mim][SCN] solutions before UV irradiation, at different temperatures.

	Conductivity (mS.cm^{-1})									
Solution / T (ºC)	**[C_2mim][SCN]**	**IMC1**	**IMC2**	**IMC4**	**IMC6**	**IMC8**	**IMBENZ**	**PY**	**CH**	**ET3N**
20	18.50	17.61	17.82	16.75	17.15	17.59	17.92	17.7	17.55	17.15
25	21.60	20.78	20.95	19.83	20.24	20.65	21.02	20.83	20.65	20.36
30	25.09	24.24	24.42	23.29	23.69	24.06	24.45	24.29	24.24	23.80
35	28.67	27.82	27.94	26.90	27.31	27.73	28.06	27.87	27.83	27.39
40	32.39	31.54	31.68	30.72	31.00	31.32	31.77	31.59	31.55	31.15
45	36.32	35.47	35.59	34.55	35.02	35.25	35.69	35.52	34.48	35.06
50	40.52	39.67	39.82	38.87	39.15	39.54	39.91	39.72	39.68	39.26

Table S1-3 - Conductivity of pure [C_2mim][SCN] pure and GDIL/[C_2mim][SCN] solutions after UV irradiation, at different temperatures.

	Conductivity (mS.cm^{-1})									
Solution / T (ºC)	**[C_2mim] [SCN]**	**IMC1**	**IMC2**	**IMC4**	**IMC6**	**IMC8**	**IMBENZ**	**PY**	**CH**	**ET3N**
20	18.50	20.01	19.51	17.64	17.41	18.29	18.32	18.5	18.15	18.27
25	21.60	23.13	22.64	20.74	20.66	21.34	21.48	21.63	21.26	21.42
30	25.09	26.59	26.1	24.2	24.52	24.76	24.89	25.09	24.72	24.89
35	28.67	30.17	29.68	27.74	28.08	28.53	28.49	28.67	28.28	28.42
40	32.39	33.89	33.4	31.46	31.77	32.06	32.25	32.39	31.97	32.08
45	36.32	37.82	37.33	35.33	35.68	35.99	36.18	36.32	35.88	35.98
50	40.52	42.03	41.53	39.53	39.84	40.2	40.39	40.52	40.04	40.13

Table S1-4 - Conductivity evolution of pure [C_2mim][SCN], KCl and BTF6 solutions in [C_2mim][SCN] over UV irradiation time, at 25ºC

	Conductivity (mS.cm^{-1})		
Solution / **$t_{UV\ irradiation}$ (min)**	**[C_2mim][SCN]**	**KCl**	**BTF6**
0	21.60	22.11	21.05
10	21.60	22.10	21.03
20	21.60	22.10	21.02
30	21.60	22.10	21.01
40	21.60	22.10	21.01
50	21.60	22.10	21.00
60	21.60	22.10	21.00
70	21.60	22.10	21.00
80	21.60	22.10	20.99
90	21.60	22.10	20.99
100	21.60	22.10	20.99
110	21.60	22.11	20.99
120	21.60	22.10	20.98
130	21.60	22.10	20.98
140	21.60	22.10	20.98
150	21.60	22.10	20.98
160	21.60	22.10	20.98
170	21.60	22.10	20.98
180	21.60	22.10	20.98
190	21.60	22.10	20.98
200	21.60	22.10	20.98
210	21.60	22.10	20.98
220	21.60	22.10	20.98
230	21.60	22.10	20.98
240	21.60	22.10	20.98

Table S1-5 - Conductivity evolution of GDIL/[C_2mim][SCN] solutions over UV irradiation time, at 25ºC

	Conductivity (mS.cm^{-1})								
Solution / **$t_{Uv\ irradiation}$ (min)**	**IMC1**	**IMC2**	**IMC4**	**IMC6**	**IMC8**	**IMBENZ**	**PY**	**CH**	**ET3N**
0	20.78	20.95	19.83	20.24	20.65	21.02	20.83	20.65	20.36
10	21.05	21.13	19.88	20.32	20.79	21.07	20.96	20.80	20.43
20	21.26	21.28	19.94	20.39	20.85	21.14	21.01	20.85	20.53
30	21.40	21.40	20.01	20.44	20.90	21.18	21.08	20.89	20.63
40	21.52	21.45	20.09	20.48	20.94	21.22	21.14	20.95	20.71
50	21.62	21.65	20.15	20.51	20.99	21.25	21.20	20.99	20.79
60	21.75	21.77	20.23	20.55	21.04	21.28	21.25	21.03	20.85
70	21.87	21.86	20.29	20.58	21.09	21.30	21.31	21.07	20.91
80	21.98	21.99	20.35	20.61	21.12	21.32	21.36	21.10	20.97
90	22.11	22.08	20.41	20.63	21.15	21.34	21.40	21.12	21.02
100	22.22	22.16	20.45	20.65	21.17	21.36	21.44	21.15	21.08
110	22.33	22.21	20.49	20.65	21.19	21.38	21.48	21.16	21.14
120	22.43	22.27	20.53	20.66	21.21	21.40	21.51	21.17	21.19
130	22.53	22.34	20.57	20.66	21.23	21.41	21.53	21.19	21.23
140	22.62	22.41	20.59	20.66	21.25	21.42	21.55	21.19	21.27
150	22.71	22.48	20.61	20.66	21.27	21.43	21.57	21.21	21.31
160	22.78	22.53	20.63	20.66	21.29	21.45	21.59	21.21	21.34
170	22.89	22.57	20.65	20.65	21.30	21.46	21.60	21.22	21.36
180	22.97	22.59	20.67	20.66	21.31	21.46	21.61	21.23	21.38
190	23.02	22.61	20.69	20.66	21.32	21.47	21.61	21.24	21.40
200	23.05	22.63	20.71	20.66	21.33	21.47	21.62	21.25	21.41
210	23.09	22.63	20.73	20.66	21.33	21.48	21.63	21.25	21.41
220	23.11	22.64	20.74	20.66	21.34	21.48	21.63	21.26	21.42
230	23.13	22.64	20.74	20.66	21.34	21.48	21.63	21.26	21.42
240	23.13	22.64	20.74	20.66	21.34	21.48	21.63	21.26	21.42

Table S1-6 - Conductivity of pure [C_2mim][NTf_2] and GDIL/[C_2mim][NTf_2] solutions before UV irradiation, at different temperatures.

	Conductivity (mS.cm^{-1})									
Solution / T (ºC)	**[C_2mim][NTf_2]**	**IMC1**	**IMC2**	**IMC4**	**IMC6**	**IMC8**	**IMBENZ**	**PY**	**CH**	**ET3N**
20	8.82	10.08	9.939	9.638	9.389	9.05	8.988	9.334	9.253	9.734
25	10.39	11.74	11.62	11.26	11.02	10.65	10.58	10.97	10.85	11.39
30	12.11	13.55	13.39	13.02	12.76	12.4	12.3	12.72	12.54	13.15
35	14.15	15.48	15.25	14.86	14.59	14.28	14.2	14.54	14.44	14.98
40	16.22	17.51	17.29	16.79	16.58	16.34	16.07	16.6	16.34	16.88
45	18.44	19.55	19.24	18.76	18.63	18.44	18.22	18.6	18.46	18.91
50	20.7	21.8	21.47	20.98	20.83	20.67	20.41	20.71	20.66	21.05

Table S1-7 - Conductivity of pure [C_2mim][NTf_2] and GDIL/[C_2mim][NTf_2] solutions after UV irradiation, at different temperatures.

	Conductivity (mS.cm^{-1})									
Solution / T (ºC)	**[C_2mim][NTf_2]**	**IMC1**	**IMC2**	**IMC4**	**IMC6**	**IMC8**	**IMBENZ**	**PY**	**CH**	**ET3N**
20	8.82	8.542	8.135	8.297	8.482	8.887	8.349	8.953	9.107	9.43
25	10.39	10.09	9.978	10.2	10.47	10.73	10.11	10.48	10.71	11.09
30	12.11	11.64	11.78	12.17	12.51	12.86	11.85	12.22	12.43	12.75
35	14.15	13.22	13.74	14.38	14.79	15.19	13.71	14.71	14.33	14.57
40	16.22	14.76	15.61	16.59	17.05	17.42	15.66	16.23	15.93	16.36
45	18.44	16.32	17.6	18.88	19.34	19.75	16.95	18.49	18.06	18.41
50	20.70	17.89	19.59	21.29	21.6	22.09	19.47	20.71	20.28	20.51

Table S1-8 - Conductivity evolution of pure [C_2mim][NTf_2], KCl and BTF6 solutions in [C_2mim][NTf_2] over UV irradiation time, at 25ºC

	Conductivity ($mS.cm^{-1}$)		
Solution / **$t_{UV\ irradiation}$ (min)**	**[C_2mim][NTf_2]**	**KCl**	**BTF6**
0	10.39	10.5	10.5
10	10.39	10.5	10.5
20	10.39	10.5	10.6
30	10.39	10.5	10.6
40	10.39	10.5	10.6
50	10.39	10.5	10.6
60	10.39	10.5	10.6
70	10.39	10.5	10.6
80	10.39	10.5	10.6
90	10.39	10.5	10.6
100	10.39	10.5	10.7
110	10.39	10.5	10.7
120	10.39	10.5	10.7
130	10.39	10.5	10.7
140	10.39	10.5	10.7
150	10.39	10.5	10.7
160	10.39	10.5	10.7
170	10.39	10.5	10.7
180	10.39	10.5	10.7
190	10.39	10.5	10.7
200	10.39	10.5	10.7
210	10.39	10.5	10.7
220	10.39	10.5	10.7
230	10.39	10.5	10.7
240	10.39	10.5	10.7

Table S1-9 - Conductivity evolution of GDIL/[C_2mim][NTf_2] solutions over UV irradiation time, at 25ºC

	Conductivity ($mS.cm^{-1}$)								
Solution / $t_{UV\ irradiation}$ (min)	IMC1	IMC2	IMC4	IMC6	IMC8	IMBENZ	PY	CH	ET3N
0	11.7	11.6	11.3	11.0	10.7	10.6	11.0	10.9	11.4
10	11.6	11.5	11.1	11.0	10.7	10.5	10.9	10.8	11.4
20	11.4	11.3	11.0	10.9	10.7	10.5	10.9	10.8	11.4
30	11.3	11.2	10.9	10.9	10.7	10.5	10.9	10.8	11.3
40	11.2	11.1	10.8	10.8	10.7	10.4	10.8	10.8	11.3
50	11.0	11.0	10.7	10.8	10.7	10.4	10.8	10.8	11.3
60	11.0	10.9	10.7	10.8	10.7	10.4	10.8	10.8	11.3
70	10.9	10.8	10.6	10.7	10.7	10.3	10.8	10.8	11.2
80	10.8	10.7	10.6	10.7	10.7	10.3	10.8	10.8	11.2
90	10.7	10.6	10.5	10.6	10.7	10.3	10.7	10.8	11.2
100	10.6	10.5	10.5	10.6	10.7	10.3	10.7	10.8	11.2
110	10.5	10.4	10.4	10.6	10.7	10.2	10.7	10.8	11.2
120	10.4	10.3	10.4	10.6	10.7	10.2	10.7	10.8	11.2
130	10.4	10.2	10.3	10.5	10.7	10.2	10.6	10.7	11.2
140	10.3	10.2	10.3	10.5	10.7	10.2	10.6	10.7	11.2
150	10.3	10.1	10.3	10.5	10.7	10.1	10.6	10.7	11.1
160	10.2	10.1	10.2	10.5	10.7	10.1	10.6	10.7	11.1
170	10.2	10.1	10.2	10.5	10.7	10.1	10.6	10.7	11.1
180	10.2	10.0	10.2	10.5	10.7	10.1	10.6	10.7	11.1
190	10.2	10.0	10.2	10.5	10.7	10.1	10.5	10.7	11.1
200	10.1	10.0	10.2	10.5	10.7	10.1	10.5	10.7	11.1
210	10.1	10.0	10.2	10.5	10.7	10.1	10.5	10.7	11.1
220	10.1	10.0	10.2	10.5	10.7	10.1	10.5	10.7	11.1
230	10.1	10.0	10.2	10.5	10.7	10.1	10.5	10.7	11.1
240	10.1	10.0	10.2	10.5	10.7	10.1	10.5	10.7	11.1

Section S2 – Viscosity studies

Table S2-1 - Viscosity of pure [C_2mim][SCN] and GDIL/[C_2mim][SCN] solutions before UV irradiation, at different temperatures.

	Viscosity (mPa.s)									
Solution / T (ºC)	[C_2mim][SCN]	IMC1	IMC2	IMC4	IMC6	IMC8	IMBENZ	PY	CH	ET3N
20	28.067	27.930	27.904	27.786	28.263	28.186	28.432	28.354	27.822	27.896
25	23.590	23.479	23.453	23.364	23.742	23.685	23.877	23.815	23.391	23.450
30	20.072	19.979	19.951	19.882	20.191	20.143	20.305	20.249	19.909	19.953
35	17.265	17.194	17.168	17.108	17.364	17.328	17.459	17.414	17.133	17.171
40	14.999	14.946	14.915	14.867	15.079	15.060	15.164	15.126	14.892	14.92
45	13.144	13.101	13.076	13.036	13.216	13.201	13.289	13.252	13.059	13.083
50	11.614	11.579	11.561	11.522	11.676	11.668	11.74	11.711	11.545	11.565

Table S2-2 - Viscosity of pure [C_2mim][SCN] and GDIL/[C_2mim][SCN] solutions after UV irradiation, at different temperatures.

	Viscosity (mPa.s)									
Solution / T (ºC)	[C_2mim][SCN]	IMC1	IMC2	IMC4	IMC6	IMC8	IMBENZ	PY	CH	ET3N
20	28.067	27.630	27.960	28.216	28.180	28.084	28.363	28.091	28.224	28.331
25	23.590	23.250	23.516	23.708	23.685	23.579	23.834	23.607	23.708	23.806
30	20.072	19.791	20.012	20.169	20.151	20.062	20.281	20.075	20.166	20.254
35	17.265	17.034	17.222	17.350	17.335	17.267	17.448	17.266	17.347	17.423
40	14.999	14.807	14.968	15.073	15.063	15.006	15.163	15.001	15.071	15.139
45	13.144	12.986	13.125	13.212	13.206	13.158	13.294	13.150	13.212	13.272
50	11.614	11.480	11.601	11.675	11.672	11.631	11.750	11.620	11.676	11.728

Table S2-3 - Viscosity of pure [C_2mim][NTf_2] and GDIL/[C_2mim][NTf_2] solutions before UV irradiation, at different temperatures.

	Viscosity (mPa.s)									
Solution / T (ºC)	[C_2mim][NTf_2]	IMC1	IMC2	IMC4	IMC6	IMC8	IMBENZ	PY	CH	ET3N
20	39.825	37.780	38.735	38.598	38.540	37.967	36.590	35.747	35.770	36.447
25	33.153	31.561	32.288	32.159	32.119	31.681	30.568	29.914	29.897	30.448
30	27.948	26.672	27.254	27.149	27.110	26.766	25.856	25.343	25.309	25.768
35	23.833	22.803	23.271	23.184	23.153	22.875	22.116	21.693	21.658	22.042
40	20.540	19.688	20.078	20.004	19.975	19.749	19.107	18.751	18.721	19.044
45	17.873	17.159	17.484	17.421	17.395	17.206	16.655	16.360	16.331	16.608
50	15.678	15.075	15.352	15.299	15.276	15.118	14.633	14.389	14.362	14.602

Table S2-4 - Viscosity of pure [C_2mim][NTf_2] and GDIL/[C_2mim][NTf_2] solutions after UV irradiation, at different temperatures.

	Viscosity (mPa.s)									
Solution / T (ºC)	[C_2mim][NTf_2]	IMC1	IMC2	IMC4	IMC6	IMC8	IMBENZ	PY	CH	ET3N
20	39.825	38.308	38.802	35.843	37.278	39.379	37.883	37.636	37.863	38.710
25	33.153	31.949	32.317	29.994	31.110	32.797	31.717	31.403	31.602	32.335
30	27.948	26.969	27.250	25.380	26.294	27.648	26.779	26.534	26.675	27.270
35	23.833	23.024	23.259	21.716	22.480	23.578	22.839	22.683	22.795	23.277
40	20.540	19.861	20.057	18.763	19.410	20.323	19.720	19.584	19.654	20.050
45	17.873	17.286	17.451	16.367	16.914	17.678	17.228	17.058	17.114	17.445
50	15.678	15.168	15.313	14.393	14.864	15.504	15.148	14.991	15.062	15.304

Section S3 – Density studies

Table S3-1 - Density of pure [C_2mim][SCN] and GDIL/[C_2mim][SCN] solutions before UV irradiation, at different temperatures.

	Density ($g.cm^{-3}$)									
Solution / T (ºC)	[C_2mim][SCN]	IMC1	IMC2	IMC4	IMC6	IMC8	IMBENZ	PY	CH	ET3N
20	1.1193	1.1196	1.1196	1.1195	1.1194	1.1195	1.1197	1.1197	1.1197	1.1196
25	1.1163	1.1166	1.1166	1.1165	1.1163	1.1165	1.1167	1.1166	1.1167	1.1166
30	1.1133	1.1135	1.1136	1.1135	1.1133	1.1135	1.1137	1.1136	1.1136	1.1136
35	1.1103	1.1105	1.1106	1.1104	1.11033	1.1105	1.1107	1.1106	1.1106	1.1106
40	1.1073	1.1076	1.1076	1.1075	1.1073	1.1075	1.1077	1.1076	1.1077	1.1076
45	1.1043	1.1046	1.1047	1.1045	1.1044	1.1045	1.1047	1.1047	1.1047	1.1046
50	1.1013	1.1016	1.1017	1.1015	1.1014	1.1015	1.1017	1.1017	1.1017	1.1016

Table S3-2 - Density of pure [C_2mim][SCN] and GDIL/[C_2mim][SCN] solutions after UV irradiation, at different temperatures.

	Density ($g.cm^{-3}$)									
Solution / T (ºC)	[C_2mim][SCN]	IMC1	IMC2	IMC4	IMC6	IMC8	IMBENZ	PY	CH	ET3N
20	1.1193	1.1194	1.1196	1.1196	1.1196	1.1195	1.1197	1.1196	1.1196	1.1195
25	1.1163	1.1164	1.1166	1.1166	1.1165	1.1165	1.1166	1.1165	1.1166	1.1165
30	1.1133	1.1134	1.1136	1.1136	1.1135	1.1135	1.1136	1.1135	1.1136	1.1135
35	1.1103	1.1104	1.1106	1.1106	1.1105	1.1105	1.1106	1.1105	1.1106	1.1105
40	1.1073	1.1074	1.1076	1.1076	1.1075	1.1075	1.1076	1.1075	1.1076	1.1075
45	1.1043	1.1044	1.1046	1.1046	1.1046	1.1045	1.1047	1.1045	1.1046	1.1045
50	1.1013	1.1015	1.1017	1.1017	1.1016	1.1015	1.1017	1.1016	1.1017	1.1015

Table S3-3 - Density of pure [C_2mim][NTf_2] and GDIL/[C_2mim][NTf_2] solutions before UV irradiation, at different temperatures.

	Density (g.cm^{-3})									
Solution / T (ºC)	[C_2mim][NTf_2]	IMC1	IMC2	IMC4	IMC6	IMC8	IMBENZ	PY	CH	ET3N
20	1.5242	1.5212	1.5229	1.5239	1.5239	1.5239	1.5241	1.5241	1.5241	1.5240
25	1.5192	1.5162	1.5179	1.5189	1.5189	1.5189	1.5191	1.5191	1.5191	1.5190
30	1.5142	1.5112	1.5129	1.5139	1.5139	1.5139	1.5140	1.5141	1.5141	1.5140
35	1.5092	1.5062	1.5079	1.5089	1.5089	1.5089	1.5091	1.5091	1.5091	1.5090
40	1.5042	1.4963	1.5029	1.5039	1.5039	1.5039	1.5041	1.5041	1.5042	1.5041
45	1.4992	1.4963	1.4979	1.4989	1.4990	1.4989	1.4991	1.4991	1.4992	1.4991
50	1.4943	1.4920	1.4930	1.4940	1.4940	1.4940	1.4942	1.4942	1.4943	1.4941

Table S3-4 - Density of pure [C_2mim][NTf_2] and GDIL/[C_2mim][NTf_2] solutions after UV irradiation, at different temperatures.

	Density (g.cm^{-3})									
Solution / T (ºC)	[C_2mim][NTf_2]	IMC1	IMC2	IMC4	IMC6	IMC8	IMBENZ	PY	CH	ET3N
20	1.5242	1.5213	1.5235	1.5237	1.5237	1.5238	1.5245	1.5239	1.5240	1.5240
25	1.5192	1.5163	1.5185	1.5187	1.5187	1.5188	1.5195	1.5189	1.5190	1.5190
30	1.5142	1.5113	1.5135	1.5137	1.5137	1.5138	1.5145	1.5139	1.5140	1.5139
35	1.5092	1.5063	1.5086	1.5087	1.5087	1.5088	1.5095	1.5089	1.5090	1.5090
40	1.5042	1.5014	1.5036	1.5037	1.5037	1.5038	1.5045	1.5039	1.5040	1.5040
45	1.4992	1.4964	1.4986	1.4987	1.4988	1.4989	1.4996	1.4990	1.4991	1.4990
50	1.4943	1.4914	1.4937	1.4938	1.4938	1.4939	1.4946	1.4940	1.4941	1.4941