Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supplementary information

Salt screening for reverse electrodialysis

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List of salts, including the B parameter of the Bromley model. [1]

In this study 174 salts investigated as they are available in Table S1.

Table S1. List of investigated salts with parameter B.

1-1 Salts											
Salt name		**B**	Salt Name		**B**	Salt Name		**B**	Salt Name		**B**
1	NH_4Br	-0.0066	26	**Li Tol**	0.023	51	**LiBr**	0.1527	76	HNO_3	0.0776
2	NH_4ClO_4	-0.064	27	**LiOH**	-0.0097	52	**NaH Adipate**	0.0461	77	$TlCH_3CO_2$	-0.0224
3	NH_4I	0.021	28	**LiCl**	0.1283	53	**NaH Malonate**	-0.0011	78	**TlCl**	0.0372
4	NH_4Cl	0.02	29	**LiI**	0.1815	54	**NaH Succinate**	0.0113	79	$TlNO_3$	-0.2340
5	NH_4NO_3	-0.0358	30	$LiNO_3$	0.0938	55	**Na Heptylate**	-0.0467			
6	**NaCl**	0.0579	31	$LiClO_4$	0.1702	56	**Na Pelargonate**	-0.304			
7	KCH_3CO_2	0.1188	32	$LiHCO_2$	0.0443	57	**Na Propionate**	0.1325			
8	**KBr**	0.0296	33	$LiCH_3CO_2$	0.0722	58	**NaTol**	-0.02			
9	**KCl**	0.024	34	**NaSCN**	0.0758	59	$RbCH_3CO_2$	0.1239			
10	**KF**	0.0565	35	NaH_2PO_4	-0.0460	60	**RbF**	0.065			
11	**KI**	0.0428	36	$NaNO_3$	-0.0128	61	**RbCl**	0.0157			
12	KNO_3	-0.0862	37	$NaClO_4$	0.0330	62	**RbBr**	0.0111			
13	$TlNO_3$	-0.234	38	$NaClO_3$	0.0127	63	**RbI**	0.0108			
14	**KSCN**	0.0137	39	**NaI**	0.0994	64	$RbNO_3$	-0.0869			
15	$KClO_3$	-0.0739	40	**NaBr**	0.0749	65	**CsCl**	0.0025			
16	$KBrO_3$	-0.0884	41	**NaF**	0.0041	66	**CsI**	-0.0188			
17	KH_2PO_4	-0.1124	42	$TlClO_4$	-0.1288	67	$CsNO_3$	-0.1173			
18	$KClO_4$	-0.1637	43	$NaBrO_3$	-0.0278	68	$CsCH_3CO_2$	0.1272			
19	$KHCO_2$	0.0821	44	$NaCH_3CO_2$	0.1048	69	**CsF**	0.0906			
20	**KOH**	0.1131	45	$NaHCO_2$	0.0519	70	**CsOH**	0.1299			
21	KH_2AsO_4	-0.0798	46	**NaOH**	0.0747	71	**CsBr**	-0.0039			
22	**KH Adipate**	0.0286	47	**Na Butyrate**	0.1474	72	**HBr**	0.1734			
23	**KH Malonate**	-0.0227	48	**Na Caproate**	0.048	73	**HCl**	0.1433			
24	**KH Succinate**	-0.0035	49	**Na Caprylate**	-0.1419	74	$HClO_4$	0.1639			
25	**K Tol**	-0.0559	50	NaH_2ASO_4	-0.0291	75	**HI**	0.2054			

Table S1. Continued

2-1 Salts					
Salt Name		B	Salt Name		B
1	$Ba(CH_3CO_2)_2$	0.0357	26	$MgCl_2$	0.1129
2	$BaBr_2$	0.0852	27	$Mg(ClO_4)_2$	0.176
3	$BaCl_2$	0.0638	28	MgI_2	0.1695
4	$Ba(ClO_4)_2$	0.0938	29	$Mg(NO_3)_2$	0.1014
5	BaI_2	0.1254	30	$MnCl_2$	0.0869
6	$Ba(NO_3)_2$	-0.0545	31	$NiCl_2$	0.1039
7	$Ba(OH)_2$	-0.024	32	$Pb(ClO_4)_2$	0.0987
8	$CaBr_2$	0.1179	33	$Pb(NO_3)_2$	-0.0606
9	$CaCl_2$	0.0948	34	$SrBr_2$	0.1038
10	$Ca(ClO_4)_2$	0.1457	35	$SrCl_2$	0.0847
11	CaI_2	0.144	36	$Sr(ClO_4)_2$	0.1254
12	$Ca(NO_3)_2$	0.041	37	SrI_2	0.1339
13	$CdBr_2$	-0.1701	38	$Sr(NO_3)_2$	0.0138
14	$CdCl_2$	-0.1448	39	UO_2Cl_2	0.1157
15	CdI_2	-0.2497	40	$UO_2(ClO_4)_2$	0.2267
16	$Cd(NO_3)_2$	0.0719	41	$UO_2(NO_3)_2$	0.1296
17	$CoBr_2$	0.1361	42	$ZnBr_2$	0.0911
18	$CoCl_2$	0.1016	43	$ZnCl_2$	0.0364
19	CoI_2	0.1683	44	$Zn(ClO_4)_2$	0.1755
20	$Co(NO_3)_2$	0.0912	45	ZnI_2	0.1341
21	$CuCl_2$	0.0654	46	$Zn(NO_3)_2$	0.1002
22	$Cu(NO_3)_2$	0.0797			
23	$FeCl_2$	0.0961			
24	$Mg(CH_3CO_2)_2$	0.0339			
25	$MgBr_2$	0.1419			

1-2 Salts		
Salt Name		B
1	Cs_2SO_4	-0.0012
2	H_2SO_4	0.0606
3	K_2CO_3	0.0372
4	K_2CrO_4	-0.0003
5	K_2HAsO_4	0.0296
6	K_2HPO_4	-0.0096
7	K_2SO_4	-0.032
8	Li_2SO_4	0.0207
9	Na_2CO_3	0.0089
10	Na_2CrO_4	0.0096
11	Na_2Fumarate	0.0366
12	Na_2HAsO_4	0.0022
13	Na_2HPO_4	-0.0265
14	Na_2Maleate	-0.0029
15	Na_2SO_4	-0.0204
16	$Na_2S_2O_3$	-0.0005
17	$(NH_4)_2SO_4$	-0.0287
18	Rb_2SO_4	-0.0091
2-2 Salts		
Salt Name		B
1	$BeSO_4$	-0.0301
2	$CdSO_4$	-0.0371
3	$CuSO_4$	-0.0364
4	$MgSO_4$	-0.0153
5	$NiSO_4$	-0.0296

2-2 Salts		
Salt Name		B
6	$ZnSO_4$	-0.024
1-3 Salts		
Salt Name		B
1	K_3AsO_4	0.0551
2	$K_3Fe(CN)_6$	0.0195
3	K_3PO_4	0.0344
4	Na_3AsO_4	0.0159
5	Na_3PO_4	0.0043
3-1 Salts		
Salt Name		B
1	$AlCl_3$	0.1089
2	$CeCl_3$	0.0815
3	$Co(En)_3Cl_3$	-0.0251
4	$CrCl_3$	0.1026
5	$Cr(NO_3)_3$	0.0919
6	$EuCl_3$	0.0867
7	$Ga(ClO_4)_3$	0.1607
8	$LaCl_3$	0.0818
9	$La(NO_3)_3$	0.0868
10	$NdCl_3$	0.0815
11	$PrCl_3$	0.0805
12	$ScCl_3$	0.0969
13	$SmCl_3$	0.0848
14	YCl_3	0.0882

Table S1. Continued

3-2 Salts		
Salt Name		**B**
1	$Al_2(SO_4)_3$	-0.0044
2	$Cr_2(SO_4)_3$	0.0122
4-1 Salts		
Salt Name		**B**
1	$ThCl_4$	0.1132
2	$Th(NO_3)_4$	0.0894
1-4 Salts		
Salt Name		**B**
1	$K_4Fe(CN)_6$	0.0085
2	$K_4Mo(CN)_8$	0.011

Activity coefficient calculations

At 25 ^{o}C, the activity coefficient of different salts calculated using the model presented by Bromley. Based on this model, the activity coefficient can be calculated by the following equation:

$$log\gamma_{\pm}^{\frac{1}{|z_{+}z_{-}|}} = \frac{-0.511\sqrt{I}}{1+\sqrt{I}} + \frac{(0.06+0.6B)I}{(1+\frac{1.5}{|Z_{-}Z_{+}|}I)^2} + \frac{BI}{|Z_{-}Z_{+}|}$$

where $\gamma_{\pm}$ is the mean activity coefficient of salt solution and Z_{-} and Z_{+} are the charges of the anion and cation in the electrolyte. The parameter B is specific for each salt dissolved in the water, and it is presented in the Bromley model. The list of investigated salts, including parameter B, is available in Table 1. The parameter I in the Eq. 1 indicates the ionic strength of the salt solution. For a salt solution including n components, ionic strength can be calculated using the following equation.

$$I = \frac{1}{2}\sum_{i}^{n} m_i z_i^2$$

Table S2A. List of ammonium salts (1-1 salts) with calculated activity coefficient in the concentrations between 0.001-6 mol.kg^{-1}. $|Z_{+}| = |Z_{-}| = 1$

molality (m)	Ionic strength (I)	NH_4Br	NH_4ClO_4	NH_4I	NH_4Cl	NH_4NO_3
0.001	0.001	0.964	0.964	0.964	0.964	0.964
0.1	0.1	0.759	0.745	0.767	0.766	0.752
0.5	0.5	0.622	0.575	0.646	0.645	0.598
1	1	0.558	0.483	0.598	0.597	0.518
1.5	1.5	0.520	0.422	0.576	0.574	0.468
2	2	0.494	0.376	0.564	0.561	0.430
2.5	2.5	0.474	0.338	0.559	0.555	0.399
3	3	0.458	0.306	0.557	0.553	0.373
3.5	3.5	0.445	0.278	0.558	0.553	0.350
4	4	0.434	0.254	0.561	0.556	0.330
4.5	4.5	0.423	0.232	0.565	0.559	0.312
5	5	0.414	0.213	0.571	0.564	0.295
5.5	5.5	0.406	0.195	0.577	0.570	0.280
6	6	0.398	0.179	0.585	0.577	0.265

Table S2B. List of lithium salts (1-1 salts) with calculated activity coefficient in the concentrations between 0.001-6 mol.kg^{-1}. $|Z_+| = |Z_-| = 1$

molality (m)	Ionic strength (I)	LiTol	LiOH	LiCl	LiI	$LiNO_3$
0.001	0.001	0.964	0.964	0.965	0.965	0.965
0.1	0.1	0.767	0.759	0.789	0.809	0.788
0.5	0.5	0.648	0.619	0.739	0.806	0.726
1	1	0.601	0.553	0.775	0.897	0.743
1.5	1.5	0.580	0.515	0.84	1.034	0.7845
2	2	0.570	0.487	0.924	1.215	0.837
2.5	2.5	0.565	0.466	1.029	1.443	0.898
3	3	0.565	0.449	1.157	1.726	0.966
3.5	3.5	0.567	0.434	1.312	2.076	1.04
4	4	0.571	0.421	1.449	2.506	1.12
4.5	4.5	0.577	0.410	1.726	3.034	1.206
5	5	0.584	0.400	2	3.6821	1.298
5.5	5.5	0.592	0.390	2.33	4.4757	1.395
6	6	0.601	0.382	2.73	5.4484	1.49

Table S2B. Continued

molality (m)	Ionic strength (I)	LiClO4	$LiCH_3CO_2$	$LiHCO_2$	LiBr
0.001	0.001	0.965	0.964	0.964	0.965
0.1	0.1	0.806	0.780	0.773	0.797
0.5	0.5	0.794	0.693	0.667	0.754
1	1	0.872	0.681	0.634	0.803
1.5	1.5	0.993	0.694	0.627	0.892
2	2	1.151	0.721	0.631	1.012
2.5	2.5	1.350	0.756	0.641	1.166
3	3	1.594	0.799	0.656	1.359
3.5	3.5	1.893	0.849	0.675	1.598
4	4	2.256	0.904	0.697	1.891
4.5	4.5	2.696	0.966	0.722	2.252
5	5	3.229	1.035	0.748	2.696
5.5	5.5	3.875	1.110	0.777	3.242
6	6	4.656	1.192	0.809	3.915

Table S2C. List of potassium salts (1-1 salts) with calculated activity coefficient in the concentrations between 0.001-6 mol.kg[-1]. $|Z_+| = |Z_-| = 1$

molality (m)	Ionic strength (I)	KCH_3CO_2	KBr	KCl	KF	KI
0.001	0.001	0.965	0.964	0.964	0.965	0.964
0.1	0.1	0.792	0.769	0.767	0.773	0.772
0.5	0.5	0.739	0.654	0.649	0.67	0.666
1	1	0.766	0.611	0.603	0.645	0.632
1.5	1.5	0.823	0.594	0.582	0.6455	0.623
2	2	0.900	0.588	0.572	0.658	0.626
2.5	2.5	0.996	0.588	0.569	0.678	0.636
3	3	1.110	0.592	0.569	0.705	0.650
3.5	3.5	1.243	0.599	0.572	0.738	0.667
4	4	1.397	0.608	0.577	0.777	0.687
4.5	4.5	1.574	0.619	0.583	0.821	0.710
5	5	1.778	0.631	0.591	0.871	0.735
5.5	5.5	2.011	0.644	0.600	0.927	0.763
6	6	2.279	0.659	0.610	0.989	0.792

Table S2C. Continued

molality (m)	Ionic strength (I)	KNO_3	KNO_2	KSCN	$KClO_3$	$KBrO_3$
0.001	0.001	0.964	0.964	0.964	0.964	0.964
0.1	0.1	0.740	0.745	0.765	0.743	0.739
0.5	0.5	0.557	0.591	0.640	0.567	0.556
1	1	0.456	0.524	0.587	0.471	0.454
1.5	1.5	0.389	0.492	0.560	0.407	0.386
2	2	0.338	0.460	0.545	0.358	0.334
2.5	2.5	0.296	0.443	0.535	0.319	0.292
3	3	0.261	0.425	0.529	0.285	0.257
3.5	3.5	0.232	0.413	0.526	0.256	0.228
4	4	0.206	0.401	0.5244	0.231	0.202
4.5	4.5	0.184	0.391	0.5241	0.209	0.180
5	5	0.164	0.382	0.5249	0.189	0.160
5.5	5.5	0.147	0.374	0.526	0.172	0.143
6	6	0.131	0.366	0.528	0.156	0.127

Table S2C. Continued

molality (m)	Ionic strength (I)	KH_2AsO_4	KH Adipate	KH Malonate	KH Succinate	KTol
0.001	0.001	0.964	0.964	0.964	0.964	0.964
0.1	0.1	0.741	0.768	0.755	0.760	0.747
0.5	0.5	0.562	0.653	0.608	0.625	0.581
1	1	0.464	0.610	0.536	0.562	0.492
1.5	1.5	0.398	0.592	0.491	0.526	0.435
2	2	0.348	0.585	0.458	0.502	0.390
2.5	2.5	0.308	0.584	0.431	0.483	0.354
3	3	0.274	0.588	0.409	0.469	0.324
3.5	3.5	0.244	0.594	0.390	0.457	0.297
4	4	0.219	0.602	0.373	0.446	0.274
4.5	4.5	0.197	0.612	0.358	0.437	0.253
5	5	0.177	0.624	0.344	0.429	0.234
5.5	5.5	0.159	0.636	0.331	0.422	0.216
6	6	0.144	0.650	0.318	0.416	0.201

Table 2C. Continued

Molality (m)	Ionic strength (I)	KH_2PO_4	$KClO_4$	$KHCO_2$	KOH
0.001	0.001	0.964	0.964	0.964	0.965
0.1	0.1	0.733	0.721	0.782	0.791
0.5	0.5	0.538	0.501	0.703	0.734
1	1	0.427	0.375	0.698	0.755
1.5	1.5	0.354	0.293	0.720	0.806
2	2	0.298	0.233	0.755	0.876
2.5	2.5	0.254	0.187	0.802	0.963
3	3	0.217	0.151	0.857	1.066
3.5	3.5	0.187	0.123	0.920	1.186
4	4	0.161	0.100	0.992	1.324
4.5	4.5	0.140	0.081	1.072	1.483
5	5	0.121	0.066	1.161	1.664
5.5	5.5	0.105	0.054	1.259	1.870
6	6	0.091	0.044	1.368	2.105

Table S2D. List of sodium salts (1-1 salts) with calculated activity coefficient in the concentrations between 0.001-6 mol.kg^{-1}. $|Z_+| = |Z_-| = 1$

molality	Ionic strength (I)	NaSCN	NaH_2PO_4	$NaNO_3$	$NaClO_4$	$NaClO_3$
0.001	0.001	0.965	0.965	0.965	0.965	0.964
0.1	0.1	0.789	0.750	0.758	0.770	0.764
0.5	0.5	0.713	0.590	0.617	0.657	0.639
1	1	0.709	0.505	0.550	0.617	0.586
1.5	1.5	0.726	0.451	0.509	0.602	0.558
2	2	0.754	0.410	0.480	0.598	0.542
2.5	2.5	0.79	0.376	0.458	0.600	0.532
3	3	0.832	0.348	0.439	0.607	0.525
3.5	3.5	0.881	0.323	0.424	0.616	0.521
4	4	0.935	0.301	0.410	0.628	0.519
4.5	4.5	0.996	0.281	0.397	0.641	0.5187
5	5	1.062	0.263	0.386	0.657	0.5189
5.5	5.5	1.135	0.246	0.376	0.674	0.519
6	6	1.213	0.231	0.366	0.692	0.521

Table S2D. Continued

molality (m)	Ionic strength (I)	NaI	NaBr	NaF	$NaNO_3$	$NaBrO_3$
0.001	0.001	0.965	0.965	0.964	0.964	0.964
0.1	0.1	0.789	0.783	0.762	0.756	0.754
0.5	0.5	0.722	0.697	0.631	0.631	0.604
1	1	0.734	0.687	0.573	0.589	0.529
1.5	1.5	0.772	0.701	0.541	0.574	0.482
2	2	0.823	0.73	0.520	0.563	0.447
2.5	2.5	0.887	0.768	0.505	0.560	0.419
3	3	0.963	0.816	0.494	0.557	0.395
3.5	3.5	1.051	0.871	0.486	0.5575	0.374
4	4	1.151	0.934	0.479	0.5572	0.356
4.5	4.5	1.269	1.005	0.474	0.5574	0.339
5	5	1.402	1.083	0.469	0.5577	0.324
5.5	5.5	1.552	1.169	0.465	0.5580	0.310
6	6	1.723	1.261	0.462	0.5584	0.297

Table S2D. Continued

molality (m)	Ionic strength (I)	$NaCH_3CO_2$	NaCl	$NaHCO_2$	NaOH	Na Butyrate
0.001	0.001	0.965	0.964	0.964	0.964	0.965
0.1	0.1	0.788	0.776	0.775	0.780	0.800
0.5	0.5	0.725	0.680	0.674	0.696	0.769
1	1	0.739	0.656	0.647	0.685	0.823
1.5	1.5	0.782	0.659	0.644	0.700	0.913
2	2	0.842	0.673	0.654	0.729	1.032
2.5	2.5	0.917	0.695	0.671	0.767	1.180
3	3	1.006	0.722	0.693	0.813	1.358
3.5	3.5	1.108	0.755	0.719	0.866	1.571
4	4	1.226	0.791	0.748	0.926	1.824
4.5	4.5	1.359	0.832	0.781	0.992	2.123
5	5	1.511	0.876	0.817	1.065	2.478
5.5	5.5	1.682	0.925	0.857	1.146	2.897
6	6	1.876	0.977	0.899	1.234	3.391

Table S2D. Continued

molality	Ionic strength (I)	Na Caproate	Na Caprylate	NaH_2AsO_4	NaH Adipate	NaH Malonate
0.001	0.001	0.964	0.964	0.964	0.964	0.964
0.1	0.1	0.774	0.726	0.754	0.773	0.761
0.5	0.5	0.671	0.516	0.603	0.669	0.627
1	1	0.640	0.396	0.527	0.637	0.566
1.5	1.5	0.635	0.317	0.479	0.631	0.531
2	2	0.642	0.259	0.444	0.636	0.508
2.5	2.5	0.655	0.213	0.415	0.648	0.490
3	3	0.674	0.176	0.391	0.665	0.477
3.5	3.5	0.696	0.147	0.370	0.685	0.466
4	4	0.722	0.122	0.351	0.709	0.456
4.5	4.5	0.750	0.102	0.334	0.735	0.448
5	5	0.781	0.086	0.319	0.764	0.442
5.5	5.5	0.815	0.072	0.305	0.796	0.436
6	6	0.852	0.060	0.291	0.829	0.430

Table S2D. Continued

molality (m)	Ionic strength (I)	NaH Succinate	Na Heptylate	Na Pelargonate	Na Propionate	Na Tol
0.001	0.001	0.964	0.964	0.963	0.965	0.964
0.1	0.1	0.764	0.749	0.687	0.796	0.756
0.5	0.5	0.638	0.589	0.413	0.753	0.611
1	1	0.584	0.504	0.263	0.793	0.539
1.5	1.5	0.556	0.449	0.175	0.865	0.496
2	2	0.539	0.408	0.119	0.961	0.464
2.5	2.5	0.527	0.374	0.081	1.080	0.438
3	3	0.520	0.346	0.056	1.222	0.417
3.5	3.5	0.515	0.320	0.039	1.390	0.399
4	4	0.512	0.298	0.027	1.587	0.383
4.5	4.5	0.511	0.278	0.018	1.817	0.368
5	5	0.5105	0.260	0.013	2.084	0.355
5.5	5.5	0.5107	0.243	0.009	2.395	0.342
6	6	0.511	0.228	0.006	2.757	0.331

Table S2E. List of thallium salts (1-1 salts) with calculated activity coefficient in the concentrations between 0.001-6 mol.kg^{-1}. $|Z_+| = |Z_-| = 1$

molality (m)	Ionic strength (I)	TlAc	TlCl	$TlClO_4$	$TlNO_3$
0.001	0.001	0.964	0.964	0.964	0.963
0.1	0.1	0.755	0.771	0.729	0.704
0.5	0.5	0.609	0.661	0.526	0.455
1	1	0.536	0.623	0.410	0.314
1.5	1.5	0.491	0.611	0.333	0.227
2	2	0.458	0.610	0.275	0.166
2.5	2.5	0.432	0.615	0.230	0.123
3	3	0.410	0.624	0.194	0.092
3.5	3.5	0.391	0.637	0.163	0.069
4	4	0.374	0.652	0.138	0.052
4.5	4.5	0.359	0.670	0.117	0.039
5	5	0.345	0.689	0.100	0.029
5.5	5.5	0.332	0.710	0.085	0.022
6	6	0.320	0.733	0.072	0.016

Table S2F. List of cesium salts (1-1 salts) with calculated activity coefficient in the concentrations between 0.001-6 mol.kg^{-1}. $|Z_+| = |Z_-| = 1$

molality (m)	Ionic strength (I)	CsCl	CsI	$CsNO_3$	$CsCH_3CO_2$	CsF
0.001	0.001	0.965	0.964	0.964	0.965	0.965
0.1	0.1	0.762	0.756	0.732	0.794	0.785
0.5	0.5	0.630	0.612	0.534	0.748	0.711
1	1	0.571	0.541	0.422	0.782	0.713
1.5	1.5	0.538	0.498	0.347	0.848	0.742
2	2	0.517	0.466	0.291	0.937	0.787
2.5	2.5	0.501	0.441	0.246	1.047	0.843
3	3	0.489	0.421	0.210	1.178	0.910
3.5	3.5	0.480	0.403	0.180	1.331	0.987
4	4	0.472	0.387	0.154	1.510	1.074
4.5	4.5	0.466	0.373	0.133	1.719	1.172
5	5	0.461	0.359	0.114	1.960	1.281
5.5	5.5	0.457	0.347	0.099	2.239	1.404
6	6	0.453	0.336	0.085	2.561	1.540

Table S2 F. Continued

molality (m)	Ionic strength (I)	CsBr	CsOH
0.001	0.001	0.964	0.965
0.1	0.1	0.760	0.795
0.5	0.5	0.624	0.751
1	1	0.562	0.787
1.5	1.5	0.526	0.857
2	2	0.501	0.949
2.5	2.5	0.482	1.064
3	3	0.467	1.200
3.5	3.5	0.455	1.361
4	4	0.445	1.549
4.5	4.5	0.435	1.768
5	5	0.427	2.022
5.5	5.5	0.420	2.317
6	6	0.414	2.659

Table S2G. List of rubidium salts (1-1 salts) with calculated activity coefficient in the concentrations between 0.001-6 mol.kg^{-1}. $|Z_+| = |Z_-| = 1$

molality	Ionic strength (I)	$RbCH_3CO_2$	RbF	RbCl	RbBr	RbI
0.001	0.001	0.965	0.964	0.965	0.964	0.964
0.1	0.1	0.793	0.778	0.766	0.764	0.764
0.5	0.5	0.745	0.687	0.642	0.637	0.637
1	1	0.776	0.668	0.591	0.583	0.583
1.5	1.5	0.838	0.676	0.565	0.555	0.555
2	2	0.923	0.696	0.550	0.538	0.537
2.5	2.5	1.027	0.725	0.542	0.527	0.526
3	3	1.150	0.760	0.537	0.519	0.518
3.5	3.5	1.296	0.800	0.535	0.515	0.513
4	4	1.465	0.846	0.534	0.511	0.510
4.5	4.5	1.660	0.896	0.535	0.510	0.508
5	5	1.886	0.952	0.537	0.5093	0.5075
5.5	5.5	2.147	1.013	0.540	0.5094	0.5074
6	6	2.446	1.079	0.544	0.510	0.508

Table S2G. Continued

molality (m)	Ionic strength (I)	$RbNO_3$
0.001	0.001	0.964
0.1	0.1	0.739
0.5	0.5	0.557
1	1	0.455
1.5	1.5	0.388
2	2	0.337
2.5	2.5	0.295
3	3	0.260
3.5	3.5	0.230
4	4	0.205
4.5	4.5	0.182
5	5	0.163
5.5	5.5	0.145
6	6	0.130

Table S2H. List of hydrogen salts (1-1 salts) with calculated activity coefficient in the concentrations between 0.001-6 mol.kg-1. $|Z_+| = |Z_-| = 1$

molality	Ionic strength (I)	HBr	HCl	$HClO_4$	HI	HNO_3
0.001	0.001	0.965	0.965	0.965	0.965	0.964
0.1	0.1	0.807	0.799	0.804	0.815	0.781
0.5	0.5	0.797	0.765	0.787	0.833	0.699
1	1	0.879	0.814	0.858	0.953	0.690
1.5	1.5	1.004	0.900	0.970	1.129	0.708
2	2	1.169	1.012	1.117	1.362	0.739
2.5	2.5	1.376	1.151	1.300	1.662	0.781
3	3	1.631	1.319	1.525	2.043	0.830
3.5	3.5	1.943	1.519	1.798	2.525	0.887
4	4	2.324	1.755	2.127	3.132	0.951
4.5	4.5	2.788	2.034	2.524	3.897	1.023
5	5	3.351	2.363	3.001	4.859	1.102
5.5	5.5	4.036	2.749	3.575	6.070	1.189
6	6	4.868	3.204	4.266	7.595	1.285

Table S2I. List of 1-2 salts with calculated activity coefficient in the concentrations between 0.001-1.2 mol.kg-1. $|Z_+| = 1, |Z_-| = 2$

molality	Ionic strength (I)	Cs_2SO_4	H_2SO_4	K_2CO_3	K_2CrO_4	K_2HAsO_4
0.001	0.003	0.885	0.886	0.886	0.885	0.886
0.1	0.3	0.458	0.495	0.481	0.459	0.476
0.2	0.6	0.386	0.441	0.419	0.387	0.413
0.3	0.9	0.346	0.415	0.387	0.347	0.379
0.4	1.2	0.318	0.400	0.367	0.319	0.357
0.5	1.5	0.298	0.391	0.353	0.299	0.341
0.6	1.8	0.282	0.385	0.342	0.283	0.329
0.7	2.1	0.269	0.383	0.335	0.270	0.321
0.8	2.4	0.258	0.383	0.330	0.259	0.314
0.9	2.7	0.249	0.384	0.326	0.250	0.309
1	3	0.241	0.387	0.323	0.242	0.305

Table S2I. Continued.

molality (m)	Ionic strength (I)	K_2HPO_4	K_2SO_4	Li_2SO_4	Na_2CO_3	Na_2CrO_4
0.001	0.003	0.885	0.885	0.885	0.885	0.885
0.1	0.3	0.454	0.441	0.471	0.464	0.465
0.2	0.6	0.379	0.361	0.405	0.394	0.395
0.3	0.9	0.337	0.316	0.369	0.356	0.357
0.4	1.2	0.309	0.284	0.345	0.331	0.331
0.5	1.5	0.287	0.260	0.328	0.311	0.312
0.6	1.8	0.270	0.241	0.315	0.297	0.298
0.7	2.1	0.256	0.225	0.305	0.285	0.286
0.8	2.4	0.244	0.212	0.297	0.275	0.276
0.9	2.7	0.234	0.200	0.290	0.267	0.268
1	3	0.225	0.190	0.285	0.260	0.261

Table S2I. Continued.

molality (m)	Ionic strength (I)	Na_2Fumarate	Na_2HAsO_4	Na_2HPO_4	Na_2 Maleate	Na_2SO_4
0.001	0.003	0.886	0.885	0.885	0.885	0.885
0.1	0.3	0.480	0.460	0.444	0.457	0.448
0.2	0.6	0.419	0.389	0.365	0.384	0.370
0.3	0.9	0.387	0.349	0.321	0.344	0.327
0.4	1.2	0.366	0.322	0.290	0.316	0.297
0.5	1.5	0.352	0.302	0.267	0.296	0.274
0.6	1.8	0.341	0.287	0.248	0.280	0.256
0.7	2.1	0.334	0.274	0.233	0.266	0.241
0.8	2.4	0.328	0.264	0.219	0.255	0.228
0.9	2.7	0.324	0.255	0.208	0.246	0.217
1	3	0.322	0.247	0.198	0.237	0.207

Table S2I. Continued.

molality (m)	Ionic strength (I)	$Na_2S_2O_3$	$(NH_4)_2SO_4$	Rb_2SO_4
0.001	0.003	0.885	0.885	0.885
0.1	0.3	0.459	0.443	0.454
0.2	0.6	0.386	0.364	0.379
0.3	0.9	0.346	0.319	0.338
0.4	1.2	0.319	0.288	0.309
0.5	1.5	0.299	0.264	0.288
0.6	1.8	0.283	0.245	0.271
0.7	2.1	0.270	0.230	0.257
0.8	2.4	0.259	0.216	0.245
0.9	2.7	0.250	0.205	0.235
1	3	0.242	0.195	0.226

Table S2J. List of 2-1 salts with calculated activity coefficient in the concentrations between 0.001-1.2 mol.kg^{-1}. $|Z_+| = 2, |Z_-| = 1$

molality (m)	Ionic strength (I)	$Ba(CH_3CO_2)_2$	$BaBr_2$	$BaCl_2$	$Ba(ClO_4)_2$	BaI_2
0.001	0.003	0.886	0.886	0.886	0.886	0.887
0.1	0.3	0.480	0.510	0.497	0.516	0.537
0.2	0.6	0.418	0.466	0.444	0.474	0.508
0.3	0.9	0.386	0.447	0.419	0.458	0.503
0.4	1.2	0.365	0.438	0.405	0.452	0.508
0.5	1.5	0.350	0.435	0.396	0.452	0.519
0.6	1.8	0.340	0.436	0.392	0.456	0.534
0.7	2.1	0.332	0.441	0.390	0.463	0.555
0.8	2.4	0.326	0.448	0.391	0.473	0.578
0.9	2.7	0.322	0.457	0.393	0.485	0.606
1	3	0.320	0.468	0.397	0.500	0.638

Table S2J. Continued.

molality (m)	Ionic strength (I)	$Ba(NO_3)_2$	$Ba(OH)_2$	$CaBr_2$	$CaCl_2$	$Ca(ClO_4)_2$
0.001	0.003	0.884	0.885	0.887	0.886	0.887
0.1	0.3	0.429	0.446	0.532	0.517	0.550
0.2	0.6	0.344	0.367	0.500	0.475	0.531
0.3	0.9	0.295	0.323	0.492	0.460	0.534
0.4	1.2	0.262	0.293	0.494	0.454	0.547
0.5	1.5	0.236	0.270	0.502	0.454	0.567
0.6	1.8	0.215	0.251	0.515	0.458	0.592
0.7	2.1	0.198	0.236	0.531	0.466	0.623
0.8	2.4	0.184	0.223	0.551	0.476	0.658
0.9	2.7	0.171	0.212	0.575	0.489	0.699
1	3	0.159	0.202	0.602	0.504	0.746

Table S2J. Continued.

molality (m)	Ionic strength (I)	CaI_2	$Ca(NO_3)_2$	$CdBr_2$	$CdCl_2$	CdI_2
0.001	0.003	0.887	0.886	0.883	0.883	0.882
0.1	0.3	0.549	0.483	0.371	0.383	0.336
0.2	0.6	0.529	0.423	0.267	0.282	0.225
0.3	0.9	0.532	0.392	0.210	0.226	0.165
0.4	1.2	0.544	0.372	0.171	0.187	0.127
0.5	1.5	0.563	0.358	0.142	0.159	0.100
0.6	1.8	0.587	0.349	0.120	0.136	0.080
0.7	2.1	0.617	0.342	0.102	0.118	0.065
0.8	2.4	0.651	0.338	0.088	0.103	0.053
0.9	2.7	0.691	0.335	0.075	0.090	0.043
1	3	0.736	0.333	0.065	0.079	0.035

Table S2J. Continued.

molality (m)	Ionic strength (I)	$Cd(NO_3)_2$	$CoBr_2$	$CoCl_2$	CoI_2	$Co(NO_3)_2$
0.001	0.003	0.886	0.887	0.887	0.887	0.886
0.1	0.3	0.502	0.544	0.521	0.566	0.514
0.2	0.6	0.452	0.520	0.482	0.558	0.472
0.3	0.9	0.429	0.519	0.469	0.571	0.455
0.4	1.2	0.417	0.528	0.465	0.595	0.448
0.5	1.5	0.410	0.544	0.467	0.626	0.447
0.6	1.8	0.408	0.564	0.474	0.664	0.450
0.7	2.1	0.408	0.589	0.484	0.709	0.456
0.8	2.4	0.411	0.619	0.497	0.761	0.465
0.9	2.7	0.416	0.654	0.513	0.820	0.477
1	3	0.423	0.693	0.531	0.888	0.490

Table S2J. Continued.

molality (m)	Ionic strength (I)	$CuCl_2$	$Cu(NO_3)_2$	$FeCl_2$	$Mg(CH_3CO_2)_2$	$MgBr_2$
0.001	0.003	0.886	0.886	0.886	0.886	0.887
0.1	0.3	0.498	0.507	0.517	0.479	0.548
0.2	0.6	0.446	0.460	0.477	0.416	0.527
0.3	0.9	0.421	0.439	0.461	0.384	0.528
0.4	1.2	0.407	0.429	0.456	0.362	0.540
0.5	1.5	0.399	0.425	0.456	0.348	0.558
0.6	1.8	0.395	0.424	0.461	0.337	0.581
0.7	2.1	0.393	0.427	0.469	0.329	0.609
0.8	2.4	0.395	0.432	0.480	0.323	0.643
0.9	2.7	0.397	0.440	0.493	0.318	0.681
1	3	0.402	0.449	0.509	0.315	0.724

Table S2J. Continued.

molality (m)	Ionic strength (I)	$MgCl_2$	$Mg(ClO_4)_2$	MgI_2	$Mg(NO_3)_2$	$MnCl_2$
0.001	0.003	0.941	0.888	0.887	0.887	0.886
0.1	0.3	0.727	0.571	0.567	0.521	0.511
0.2	0.6	0.703	0.567	0.559	0.482	0.467
0.3	0.9	0.696	0.584	0.573	0.469	0.449
0.4	1.2	0.696	0.612	0.597	0.465	0.441
0.5	1.5	0.701	0.647	0.629	0.467	0.438
0.6	1.8	0.708	0.690	0.668	0.473	0.440
0.7	2.1	0.718	0.740	0.713	0.483	0.445
0.8	2.4	0.731	0.799	0.766	0.496	0.453
0.9	2.7	0.745	0.866	0.827	0.512	0.462
1	3	0.761	0.942	0.896	0.530	0.474

Table S2J. Continued.

molality (m)	Ionic strength (I)	$NiCl_2$	$Pb(ClO_4)_2$	$Pb(NO_3)_2$	$SrBr_2$	$SrCl_2$
0.001	0.003	0.887	0.887	0.884	0.887	0.886
0.1	0.3	0.522	0.519	0.426	0.522	0.510
0.2	0.6	0.485	0.479	0.339	0.485	0.465
0.3	0.9	0.472	0.465	0.290	0.472	0.446
0.4	1.2	0.469	0.460	0.256	0.469	0.437
0.5	1.5	0.472	0.461	0.230	0.472	0.434
0.6	1.8	0.479	0.467	0.209	0.479	0.435
0.7	2.1	0.490	0.476	0.191	0.490	0.439
0.8	2.4	0.504	0.488	0.176	0.504	0.446
0.9	2.7	0.521	0.502	0.164	0.521	0.455
1	3	0.541	0.519	0.152	0.540	0.466

Table S2J. Continued.

molality (m)	Ionic strength (I)	$Sr(ClO_4)_2$	SrI_2	$Sr(NO_3)_2$	UO_2Cl_2	$UO_2(ClO_4)_2$
0.001	0.003	0.887	0.887	0.885	0.887	0.888
0.1	0.3	0.537	0.542	0.467	0.530	0.609
0.2	0.6	0.508	0.518	0.399	0.497	0.633
0.3	0.9	0.503	0.516	0.361	0.489	0.679
0.4	1.2	0.508	0.524	0.337	0.490	0.738
0.5	1.5	0.519	0.538	0.318	0.497	0.808
0.6	1.8	0.534	0.558	0.304	0.509	0.891
0.7	2.1	0.555	0.582	0.293	0.525	0.989
0.8	2.4	0.578	0.611	0.284	0.544	1.104
0.9	2.7	0.606	0.644	0.276	0.566	1.237
1	3	0.638	0.681	0.270	0.592	1.391

Table S2J. Continued.

molality (m)	Ionic strength (I)	$UO_2(NO_3)_2$	$ZnBr_2$	$ZnCl_2$	$Zn(ClO_4)_2$	ZnI_2
0.001	0.003	0.887	0.886	0.886	0.888	0.887
0.1	0.3	0.539	0.514	0.480	0.571	0.542
0.2	0.6	0.513	0.472	0.419	0.566	0.518
0.3	0.9	0.509	0.454	0.387	0.584	0.516
0.4	1.2	0.516	0.447	0.366	0.611	0.524
0.5	1.5	0.528	0.446	0.351	0.646	0.539
0.6	1.8	0.546	0.449	0.341	0.688	0.558
0.7	2.1	0.568	0.456	0.333	0.738	0.583
0.8	2.4	0.594	0.465	0.328	0.796	0.611
0.9	2.7	0.624	0.476	0.324	0.863	0.645
1	3	0.659	0.490	0.321	0.938	0.682

Table S2J. Continued.

molality (m)	Ionic strength (I)	$Zn(NO_3)_2$
0.001	0.003	0.887
0.1	0.3	0.520
0.2	0.6	0.481
0.3	0.9	0.467
0.4	1.2	0.463
0.5	1.5	0.465
0.6	1.8	0.471
0.7	2.1	0.480
0.8	2.4	0.493
0.9	2.7	0.508
1	3	0.525

Table S2K. List of 2-2 salts with calculated activity coefficient in the concentrations between 0.001-1 mol.kg^{-1}. $|Z_+| = |Z_-| = 2$

molality (m)	Ionic strength (I)	$BeSO_4$	$CdSO_4$	$CuSO_4$	$MgSO_4$	$NiSO_4$
0.001	0.008	0.681	0.680	0.680	0.681	0.681
0.1	0.8	0.123	0.119	0.119	0.131	0.123
0.2	1.6	0.082	0.078	0.078	0.091	0.082
0.3	2.4	0.062	0.058	0.059	0.071	0.062
0.4	3.2	0.050	0.046	0.047	0.059	0.050
0.5	4	0.042	0.038	0.038	0.050	0.042

Table S2K. Continued.

molality (m)	Ionic strength (I)	$ZnSO_4$
0.001	0.008	0.681
0.1	0.8	0.126
0.2	1.6	0.085
0.3	2.4	0.066
0.4	3.2	0.054
0.5	4	0.045

Table S2L. List of 1-3 salts with calculated activity coefficient in the concentrations between 0.001-1.2 mol.kg^{-1}. $|Z_+| = 1, |Z_-| = 3$

molality (m)	Ionic strength (I)	K_3AsO_4	$K_3Fe(CN)_6$	K_3PO_4	Na_3AsO_4	Na_3PO_4
0.001	0.006	0.779	0.778	0.778	0.778	0.777
0.1	0.6	0.290	0.262	0.273	0.259	0.251
0.2	1.2	0.248	0.210	0.225	0.206	0.195
0.3	1.8	0.229	0.183	0.201	0.179	0.167
0.4	2.4	0.218	0.166	0.186	0.162	0.148
0.5	3	0.212	0.154	0.176	0.149	0.135
0.6	3.6	0.210	0.146	0.170	0.140	0.125
0.7	4.2	0.210	0.139	0.165	0.134	0.117
0.8	4.8	0.212	0.135	0.163	0.128	0.111
0.9	5.4	0.216	0.131	0.161	0.124	0.106
1	6	0.222	0.128	0.161	0.121	0.101

Table S2M. List of 3-1 salts with calculated activity coefficient in the concentrations between 0.001-1.2 mol.kg^{-1}. $|Z_+| = 3, |Z_-| = 1$

molality (m)	Ionic strength (I)	$AlCl_3$	$CeCl_3$	$Co(EN)Cl_3$	$CrCl_3$	$Cr(NO_3)_3$
0.001	0.006	0.781	0.780	0.777	0.780	0.780
0.1	0.6	0.338	0.313	0.231	0.332	0.322
0.2	1.2	0.320	0.281	0.170	0.310	0.295
0.3	1.8	0.320	0.269	0.139	0.307	0.287
0.4	2.4	0.328	0.266	0.118	0.312	0.288
0.5	3	0.343	0.268	0.104	0.324	0.294
0.6	3.6	0.363	0.275	0.092	0.341	0.305
0.7	4.2	0.390	0.284	0.083	0.363	0.321
0.8	4.8	0.422	0.298	0.076	0.390	0.340
0.9	5.4	0.461	0.314	0.070	0.422	0.363
1	6	0.507	0.333	0.064	0.461	0.391

Table S2M. Continued.

molality (m)	Ionic strength (I)	$EuCl_3$	$Ga(ClO_4)_3$	$LaCl_3$	$La(NO_3)_3$	$NdCl_3$
0.001	0.006	0.780	0.782	0.780	0.780	0.780
0.1	0.6	0.317	0.392	0.313	0.317	0.313
0.2	1.2	0.288	0.408	0.281	0.288	0.281
0.3	1.8	0.278	0.441	0.270	0.278	0.269
0.4	2.4	0.277	0.486	0.267	0.277	0.266
0.5	3	0.281	0.543	0.269	0.281	0.268
0.6	3.6	0.290	0.616	0.275	0.290	0.275
0.7	4.2	0.302	0.707	0.285	0.302	0.284
0.8	4.8	0.318	0.819	0.299	0.318	0.298
0.9	5.4	0.338	0.957	0.315	0.338	0.314
1	6	0.361	1.126	0.334	0.361	0.333

Table S2M. Continued.

molality (m)	Ionic strength (I)	$PrCl_3$	$ScCl_3$	$SmCl_3$	YCl_3
0.001	0.006	0.780	0.780	0.780	0.780
0.1	0.6	0.312	0.327	0.316	0.319
0.2	1.2	0.280	0.302	0.285	0.290
0.3	1.8	0.268	0.297	0.275	0.281
0.4	2.4	0.264	0.299	0.273	0.280
0.5	3	0.266	0.308	0.276	0.285
0.6	3.6	0.272	0.321	0.284	0.294
0.7	4.2	0.281	0.340	0.295	0.307
0.8	4.8	0.294	0.362	0.310	0.324
0.9	5.4	0.309	0.390	0.329	0.345
1	6	0.328	0.422	0.350	0.369

Table S2N. List of 1-4 salts with calculated activity coefficient in the concentrations between 0.001-1.2 mol.kg^{-1}. $|Z_+| = 1, |Z_-| = 4$

molality (m)	Ionic strength (I)	$K_4Mo(CN)_8$	$K_4Fe(CN)_6$
0.001	0.01	0.656	0.655
0.1	1	0.134	0.133
0.2	2	0.063	0.097
0.3	3	0.082	0.079
0.4	4	0.071	0.068
0.5	5	0.063	0.061
0.6	6	0.058	0.055
0.7	7	0.054	0.051
0.8	8	0.051	0.048
0.9	9	0.049	0.046
1	10	0.047	0.044

Table S2O. List of 3-2 salts with calculated activity coefficient in the concentrations between 0.001-1.2 mol.kg[-1]. $|Z_+| = 3, |Z_-| = 2$

molality (m)	Ionic strength (I)	$Al_2(SO_4)_3$	$Cr_2(SO_4)_3$
0.001	0.015	0.468	0.469
0.1	1.5	0.037	0.044
0.2	3	0.023	0.030
0.3	4.5	0.017	0.023
0.4	6	0.013	0.019
0.5	7.5	0.010	0.016
0.6	9	0.008	0.014
0.7	10.5	0.007	0.012
0.8	12	0.006	0.011
0.9	13.5	0.005	0.010
1	15	0.005	0.010

Table S2P. List of 4-1 salts with calculated activity coefficient in the concentrations between 0.001-1.2 mol.kg[-1]. $|Z_+| = 4, |Z_-| = 1$

molality (m)	Ionic strength (I)	$ThCl_4$	$Th(NO_3)_4$
0.001	0.01	0.661	0.660
0.1	1	0.230	0.203
0.2	5	0.290	0.203
0.3	3	0.241	0.188
0.4	4	0.261	0.193
0.5	5	0.290	0.203
0.6	6	0.329	0.220
0.7	7	0.381	0.242
0.8	8	0.448	0.270
0.9	9	0.532	0.305
1	10	0.639	0.348

Theoretical open-circuit voltage and maximum power density calculations

Table S3. Calculated values of theoretical OCV and maximum gross power density for 1-1 salts at α= 100%, 0.95%, 90%, 85% and 80%. (Ψ=12)

Salt	$\Phi = \frac{\gamma_6}{\gamma_{0.5}}$	$\Psi = \frac{6}{0.5}$ =12, R= 1ohm, α= 100%		$\Psi = \frac{6}{0.5}$ =12, R=1ohm, α= 95%	
		OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)	OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
NH_4Br	0.6408	0.1048	0.0027	0.0996	0.0025
NH_4ClO_4	0.3123	0.0679	0.0012	0.0645	0.0010
NH_4I	0.9053	0.1226	0.0038	0.1164	0.0034
NH_4Cl	0.8941	0.1219	0.0037	0.1158	0.0034
NH_4NO_3	0.4446	0.0860	0.0019	0.0817	0.0017
NaCl	1.4370	0.1463	0.0054	0.1390	0.0048
KCH_3CO_2	3.0807	0.1855	0.0086	0.1762	0.0078
KBr	1.0083	0.1281	0.0041	0.1217	0.0037
KCl	0.9400	0.1245	0.0039	0.1183	0.0035
KF	1.4761	0.1477	0.0055	0.1403	0.0049
KI	1.1895	0.1366	0.0047	0.1298	0.0042
KNO_3	0.2365	0.0536	0.0007	0.0509	0.0006
KNO_2	0.6195	0.1031	0.0027	0.0979	0.0024
KSCN	0.8262	0.1179	0.0035	0.1120	0.0031
$KClO_3$	0.2759	0.0615	0.0009	0.0584	0.0009
$KBrO_3$	0.2301	0.0522	0.0007	0.0496	0.0006
KH_2PO_4	0.1704	0.0367	0.0003	0.0349	0.0003
$KClO_4$	0.0896	0.0037	0.0000	0.0035	0.0000
$KHCO_2$	1.9457	0.1619	0.0066	0.1538	0.0059
KOH	2.8685	0.1818	0.0083	0.1727	0.0075
KH_2ASO_4	0.2562	0.0577	0.0008	0.0548	0.0008
KH Asipate	0.9957	0.1275	0.0041	0.1211	0.0037
KH Malomate	0.5238	0.0945	0.0022	0.0897	0.0020
KH Succinate	0.6661	0.1068	0.0029	0.1015	0.0026

K Tol	0.3456	0.0731	0.0013	0.0694	0.0012
Li Tol	0.9283	0.1239	0.0038	0.1177	0.0035
LiOH	0.6164	0.1028	0.0026	0.0977	0.0024
LiCl	3.6942	0.1948	0.0095	0.1851	0.0086
LiI	6.7548	0.2258	0.0128	0.2145	0.0115
$LiNO_3$	2.0523	0.1646	0.0068	0.1564	0.0061
$LiClO_4$	5.8635	0.2186	0.0119	0.2076	0.0108
$LiHCO_2$	1.7188	0.1555	0.0060	0.1477	0.0055
$LiCH_3CO_2$	1.2120	0.1376	0.0047	0.1307	0.0043
NaSCN	1.7013	0.1550	0.0060	0.1472	0.0054
NaH_2PO_4	0.3912	0.0794	0.0015	0.0754	0.0014
$NaNO_3$	0.5929	0.1008	0.0025	0.0957	0.0022
$NaClO_4$	1.0521	0.1302	0.0042	0.1237	0.0038
$NaClO_3$	0.8160	0.1172	0.0034	0.1114	0.0031
NaI	2.3864	0.1724	0.0074	0.1638	0.0067
NaBr	1.8092	0.1581	0.0063	0.1502	0.0056
NaF	0.7327	0.1117	0.0031	0.1061	0.0028
$NaBrO_3$	0.4914	0.0912	0.0021	0.0866	0.0019
$NaCH_3CO_2$	2.5853	0.1765	0.0078	0.1677	0.0070
$NaHCO_2$	1.3330	0.1425	0.0051	0.1353	0.0046
NaOH	1.7735	0.1571	0.0062	0.1493	0.0056
Na Butyrate	4.4073	0.2039	0.0104	0.1937	0.0094
Na Caporate	1.2695	0.1399	0.0049	0.1329	0.0044
Na Caprylate	0.1177	0.0178	0.0001	0.0169	0.0001
NaH_2ASO_4	0.4835	0.0903	0.0020	0.0858	0.0018
NaH Adipate	1.2396	0.1387	0.0048	0.1318	0.0043
NaH Malonate	0.6865	0.1084	0.0029	0.1029	0.0026
NaH Succinate	0.8018	0.1163	0.0034	0.1105	0.0031
Na Heptylate	0.3878	0.0790	0.0016	0.0751	0.0014
Na Pelargonate	0.0155	-0.0865	0.0019	-0.0822	0.0017
Na Propionate	3.6572	0.1943	0.0094	0.1846	0.0085
NaTol	0.5418	0.0962	0.0023	0.0914	0.0021
$RbCH_3CO_2$	3.2838	0.1888	0.0089	0.1793	0.0080
RbF	1.5706	0.1509	0.0057	0.1433	0.0051
RbCl	0.8471	0.1191	0.0035	0.1132	0.0032

RbBr	0.7998	0.1162	0.0034	0.1104	0.0030
RbI	0.7968	0.1160	0.0034	0.1102	0.0030
$RbNO_3$	0.2344	0.0531	0.0007	0.0505	0.0006
CsCl	0.7181	0.1106	0.0030	0.1051	0.0027
CsI	0.5500	0.0970	0.0024	0.0921	0.0021
$CsNO_3$	0.1602	0.0336	0.0003	0.0319	0.0003
$CsCH_3CO_2$	3.4223	0.1909	0.0091	0.1814	0.0082
CsF	2.1642	0.1673	0.0070	0.1590	0.0063
CsOH	3.5400	0.1926	0.0093	0.1830	0.0084
CsBr	0.6628	0.1065	0.0028	0.1012	0.0026
HBr	6.1033	0.2206	0.0122	0.2096	0.0110
HCl	4.1867	0.2013	0.0101	0.1912	0.0091
$HClO_4$	0.0637	-0.0138	0.0000	-0.0131	0.0000
HI	9.1113	0.2412	0.0145	0.2291	0.0131
HNO_3	1.8391	0.1590	0.0063	0.1510	0.0057
$TlCH_3CO_2$	0.5258	0.0946	0.0022	0.0899	0.0020
TlCl	1.1089	0.1330	0.0044	0.1263	0.0040
$TlClO_4$	0.1387	0.0262	0.0002	0.0249	0.0002
$TlNO_3$	0.0372	-0.0415	0.0004	-0.0394	0.0004
LiBr	4.9122	0.2095	0.0110	0.1990	0.0099

Table S3. Continued.

Salt	$\Phi = \frac{\gamma_6}{\gamma_{0.5}}$	$\Psi = \frac{6}{0.5}$ =12, R= 1ohm, α= 90%		$\Psi = \frac{6}{0.5}$ =12, R=1ohm, α= 85%	
		OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)	OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
NH_4Br	0.6408	0.0943	0.0022	0.0891	0.0020
NH_4ClO_4	0.3123	0.0611	0.0009	0.0577	0.0008
NH_4I	0.9053	0.1103	0.0030	0.1042	0.0027
NH_4Cl	0.8941	0.1097	0.0030	0.1036	0.0027
NH_4NO_3	0.4446	0.0774	0.0015	0.0731	0.0013
NaCl	1.4370	0.1317	0.0043	0.1244	0.0039
KCH_3CO_2	3.0807	0.1669	0.0070	0.1577	0.0062
KBr	1.0083	0.1153	0.0033	0.1089	0.0030
KCl	0.9400	0.1120	0.0031	0.1058	0.0028
KF	1.4761	0.1329	0.0044	0.1255	0.0039
KI	1.1895	0.1229	0.0038	0.1161	0.0034
KNO_3	0.2365	0.0482	0.0006	0.0456	0.0005
KNO_2	0.6195	0.0928	0.0022	0.0876	0.0019
KSCN	0.8262	0.1061	0.0028	0.1002	0.0025
$KClO_3$	0.2759	0.0554	0.0008	0.0523	0.0007
$KBrO_3$	0.2301	0.0470	0.0006	0.0444	0.0005
KH_2PO_4	0.1704	0.0331	0.0003	0.0312	0.0002
$KClO_4$	0.0896	0.0034	0.0000	0.0032	0.0000
$KHCO_2$	1.9457	0.1457	0.0053	0.1376	0.0047
KOH	2.8685	0.1636	0.0067	0.1546	0.0060
KH_2ASO_4	0.2562	0.0519	0.0007	0.0491	0.0006
KH Asipate	0.9957	0.1147	0.0033	0.1083	0.0029
KH Malomate	0.5238	0.0850	0.0018	0.0803	0.0016
KH Succinate	0.6661	0.0961	0.0023	0.0908	0.0021
K Tol	0.3456	0.0658	0.0011	0.0621	0.0010
Li Tol	0.9283	0.1115	0.0031	0.1053	0.0028
LiOH	0.6164	0.0925	0.0021	0.0874	0.0019
$LiClO_3$	4.2342	0.1817	0.0082	0.1716	0.0074
LiCl	3.6942	0.1753	0.0077	0.1656	0.0069

LiI	6.7548	0.2032	0.0103	0.1920	0.0092
$LiNO_3$	2.0523	0.1482	0.0055	0.1399	0.0049
$LiNO_2$	1.9684	0.1462	0.0053	0.1381	0.0048
$LiClO_4$	5.8635	0.1967	0.0097	0.1858	0.0086
$LiHCO_2$	1.7188	0.1400	0.0049	0.1322	0.0044
$LiCH_3CO_2$	1.2120	0.1238	0.0038	0.1169	0.0034
NaSCN	1.7013	0.1395	0.0049	0.1317	0.0043
NaH_2PO_4	0.3912	0.0715	0.0012	0.0675	0.0011
$NaNO_3$	0.5929	0.0907	0.0020	0.0857	0.0018
$NaClO_4$	1.0521	0.1172	0.0034	0.1107	0.0030
$NaClO_3$	0.8160	0.1055	0.0028	0.0996	0.0025
NaI	2.3864	0.1551	0.0060	0.1465	0.0054
NaBr	1.8092	0.1423	0.0051	0.1344	0.0045
NaF	0.7327	0.1005	0.0025	0.0949	0.0023
$NaNO_2$	0.8840	0.1092	0.0030	0.1031	0.0027
$NaBrO_3$	0.4914	0.0821	0.0017	0.0775	0.0015
$NaCH_3CO_2$	2.5853	0.1588	0.0063	0.1500	0.0056
$NaHCO_2$	1.3330	0.1282	0.0041	0.1211	0.0037
NaOH	1.7735	0.1414	0.0050	0.1336	0.0045
Na Butyrate	4.4073	0.1835	0.0084	0.1733	0.0075
Na Caporate	1.2695	0.1259	0.0040	0.1189	0.0035
Na Caprylate	0.1177	0.0160	0.0001	0.0151	0.0001
NaH_2ASO_4	0.4835	0.0813	0.0017	0.0768	0.0015
NaH Adipate	1.2396	0.1248	0.0039	0.1179	0.0035
NaH Malonate	0.6865	0.0975	0.0024	0.0921	0.0021
NaH Succinate	0.8018	0.1047	0.0027	0.0989	0.0024
Na Heptylate	0.3878	0.0711	0.0013	0.0672	0.0011
Na Pelargonate	0.0155	-0.0779	0.0015	-0.0736	0.0014
Na Propionate	3.6572	0.1749	0.0076	0.1652	0.0068
NaTol	0.5418	0.0866	0.0019	0.0818	0.0017
NaValerate	3.2146	0.1689	0.0071	0.1595	0.0064
$RbCH_3CO_2$	3.2838	0.1699	0.0072	0.1605	0.0064
RbF	1.5706	0.1358	0.0046	0.1282	0.0041
RbCl	0.8471	0.1072	0.0028	0.1013	0.0025
RbBr	0.7998	0.1046	0.0027	0.0988	0.0024

RbI	0.7968	0.1044	0.0027	0.0986	0.0024
$\mathbf{RbNO_3}$	0.2344	0.0478	0.0006	0.0452	0.0005
CsCl	0.7181	0.0996	0.0024	0.0941	0.0022
CsI	0.5500	0.0873	0.0019	0.0824	0.0017
$\mathbf{CsNO_3}$	0.1602	0.0302	0.0002	0.0286	0.0002
$\mathbf{CsCH_3CO_2}$	3.4223	0.1718	0.0074	0.1623	0.0066
CsF	2.1642	0.1506	0.0057	0.1422	0.0051
CsOH	3.5400	0.1734	0.0075	0.1637	0.0067
CsBr	0.6628	0.0959	0.0023	0.0906	0.0021
HBr	6.1033	0.1986	0.0099	0.1875	0.0088
HCl	4.1867	0.1811	0.0082	0.1711	0.0073
$\mathbf{HClO_4}$	0.0637	-0.0124	0.0000	-0.0118	0.0000
HI	9.1113	0.2171	0.0118	0.2050	0.0105
$\mathbf{HNO_3}$	1.8391	0.1431	0.0051	0.1351	0.0046
$\mathbf{TlCH_3CO_2}$	0.5258	0.0852	0.0018	0.0804	0.0016
TlCl	1.1089	0.1197	0.0036	0.1130	0.0032
$\mathbf{TlClO_4}$	0.1387	0.0236	0.0001	0.0223	0.0001
$\mathbf{TlNO_3}$	0.0372	-0.0373	0.0003	-0.0353	0.0003
LiBr	4.9122	0.1885	0.0089	0.1780	0.0079

Table S3. Continued.

Salt	$\Phi = \frac{\gamma_6}{\gamma_{0.5}}$	$\Psi = \frac{6}{0.5}$ =12, R= 1ohm, α= 80%	
		OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
NH_4Br	0.6408	0.0838	0.0018
NH_4ClO_4	0.3123	0.0543	0.0007
NH_4I	0.9053	0.0981	0.0024
NH_4Cl	0.8941	0.0975	0.0024
NH_4NO_3	0.4446	0.0688	0.0012
NaCl	1.4370	0.1170	0.0034
KCH_3CO_2	3.0807	0.1484	0.0055
KBr	1.0083	0.1025	0.0026
KCl	0.9400	0.0996	0.0025
KF	1.4761	0.1182	0.0035
KI	1.1895	0.1093	0.0030
KNO_3	0.2365	0.0429	0.0005
KNO_2	0.6195	0.0825	0.0017
KSCN	0.8262	0.0943	0.0022
$KClO_3$	0.2759	0.0492	0.0006
$KBrO_3$	0.2301	0.0417	0.0004
KH_2PO_4	0.1704	0.0294	0.0002
$KClO_4$	0.0896	0.0030	0.0000
$KHCO_2$	1.9457	0.1295	0.0042
KOH	2.8685	0.1455	0.0053
KH_2ASO_4	0.2562	0.0462	0.0005
KH Asipate	0.9957	0.1020	0.0026
KH Malomate	0.5238	0.0756	0.0014
KH Succinate	0.6661	0.0854	0.0018
K Tol	0.3456	0.0585	0.0009
Li Tol	0.9283	0.0991	0.0025
LiOH	0.6164	0.0823	0.0017
$LiClO_3$	4.2342	0.1615	0.0065
LiCl	3.6942	0.1559	0.0061
LiI	6.7548	0.1807	0.0082

$LiNO_3$	2.0523	0.1317	0.0043
$LiNO_2$	1.9684	0.1300	0.0042
$LiClO_4$	5.8635	0.1749	0.0076
$LiHCO_2$	1.7188	0.1244	0.0039
$LiCH_3CO_2$	1.2120	0.1100	0.0030
NaSCN	1.7013	0.1240	0.0038
NaH_2PO_4	0.3912	0.0635	0.0010
$NaNO_3$	0.5929	0.0806	0.0016
$NaClO_4$	1.0521	0.1042	0.0027
$NaClO_3$	0.8160	0.0938	0.0022
NaI	2.3864	0.1379	0.0048
NaBr	1.8092	0.1265	0.0040
NaF	0.7327	0.0894	0.0020
$NaNO_2$	0.8840	0.0971	0.0024
$NaBrO_3$	0.4914	0.0729	0.0013
$NaCH_3CO_2$	2.5853	0.1412	0.0050
$NaHCO_2$	1.3330	0.1140	0.0032
NaOH	1.7735	0.1257	0.0039
Na Butyrate	4.4073	0.1631	0.0067
Na Caporate	1.2695	0.1120	0.0031
Na Caprylate	0.1177	0.0142	0.0001
NaH_2ASO_4	0.4835	0.0723	0.0013
NaH Adipate	1.2396	0.1110	0.0031
NaH Malonate	0.6865	0.0867	0.0019
NaH Succinate	0.8018	0.0931	0.0022
Na Heptylate	0.3878	0.0632	0.0010
Na Pelargonate	0.0155	-0.0692	0.0012
Na Propionate	3.6572	0.1554	0.0060
NaTol	0.5418	0.0770	0.0015
NaValerate	3.2146	0.1501	0.0056
$RbCH_3CO_2$	3.2838	0.1510	0.0057
RbF	1.5706	0.1207	0.0036
RbCl	0.8471	0.0953	0.0022
RbBr	0.7998	0.0930	0.0022
RbI	0.7968	0.0928	0.0022

$RbNO_3$	0.2344	0.0425	0.0005
CsCl	0.7181	0.088	0.0019
CsI	0.5500	0.0776	0.0015
$CsNO_3$	0.1602	0.0269	0.0002
$CsCH_3CO_2$	3.4223	0.1527	0.0058
CsF	2.1642	0.1339	0.0045
CsOH	3.5400	0.1541	0.0059
CsBr	0.6628	0.0852	0.0018
HBr	6.1033	0.1765	0.0078
HCl	4.1867	0.1610	0.0065
$HClO_4$	0.0637	-0.0111	0.0000
HI	9.1113	0.1930	0.0093
HNO_3	1.8391	0.1272	0.0040
$TlCH_3CO_2$	0.5258	0.0757	0.0014
TlCl	1.1089	0.1064	0.0028
$TlClO_4$	0.1387	0.0210	0.0001
$TlNO_3$	0.0372	-0.0332	0.0003
LiBr	4.9122	0.1676	0.0070

Table S4. Calculated values of theoretical OCV and maximum power density for 1-2 salts at α= 100%. (Ψ=2)

Salt	$\Phi = \frac{\gamma_1}{\gamma_{0.5}}$	$\Psi = \frac{1}{0.5} = 2$, R= 1ohm, α= 100%	
		OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
Cs_2SO_4	0.8076	0.0185	8.534E-05
H_2SO_4	0.9916	0.0264	1.740E-04
K_2CO_3	0.9174	0.0234	1.368E-04
K_2CrO_4	0.8100	0.0186	8.641E-05
K_2HAsO_4	0.8946	0.0224	1.256E-04
K_2HPO_4	0.7854	0.0174	7.570E-05
K_2SO_4	0.7291	0.0145	5.281E-05
Li_2SO_4	0.8685	0.0213	1.132E-04

Na_2CO_3	0.8351	0.0198	9.770E-05
Na_2CrO_4	0.8371	0.0199	9.859E-05
Na_2Fumarate	0.9156	0.0233	1.359E-04
Na_2HAsO_4	0.8168	0.0189	8.941E-05
Na_2HPO_4	0.7425	0.0152	5.805E-05
Na_2Maleate	0.8030	0.0183	8.334E-05
Na_2SO_4	0.7577	0.0160	6.415E-05
$Na_2S_2O_3$	0.8095	0.0186	8.617E-05
$(NH_4)_2SO_4$	0.7371	0.0150	5.593E-05
Rb_2SO_4	0.7867	0.0175	7.626E-05

Table S5. Calculated values of theoretical OCV and maximum gross power density for 2-2 salts at α= 100%. (Ψ =2.5)

Salt	$\Phi = \frac{\gamma_{0.5}}{\gamma_{0.2}}$	$\Psi = \frac{0.5}{0.2}$ =2.5, R= 1ohm, α= 100%	
		OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
$BeSO_4$	0.5119	0.0063	1.003E-05
$CdSO_4$	0.4921	0.0053	7.092E-06
$CuSO_4$	0.4941	0.0054	7.363E-06
$MgSO_4$	0.5562	0.0085	1.792E-05
$NiSO_4$	0.5133	0.0064	1.026E-05
$ZnSO_4$	0.5297	0.0072	1.301E-05

Table S6. Calculated values of theoretical OCV and maximum gross power density for 2-1 salts at α= 100%. (Ψ =2)

Salt	$\Phi = \frac{\gamma_1}{\gamma_{0.5}}$	$\Psi = \frac{1}{0.5}$ =2, R= 1ohm, α= 100%	
		OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
$Ba(CH_3CO_2)_2$	0.9129	0.0232	1.345E-04
$BaBr_2$	1.0760	0.0295	2.181E-04
$BaCl_2$	1.0022	0.0268	1.795E-04
$Ba(ClO_4)_2$	1.1071	0.0306	2.346E-04
BaI_2	1.2296	0.0347	3.006E-04
$Ba(NO_3)_2$	0.6766	0.0117	3.396E-05
$Ba(OH)_2$	0.7487	0.0156	6.052E-05
$CaBr_2$	1.1994	0.0337	2.842E-04
$CaCl_2$	1.1108	0.0308	2.366E-04
$Ca(ClO_4)_2$	1.3154	0.0373	3.474E-04
CaI_2	1.3080	0.0371	3.433E-04
$Ca(NO_3)_2$	0.9291	0.0239	1.425E-04
$CdBr_2$	0.4609	-0.0031	2.463E-06
$CdCl_2$	0.5013	0.0001	2.462E-09
CdI_2	0.3538	-0.0133	4.439E-05
$Cd(NO_3)_2$	1.0295	0.0278	1.936E-04
$CoBr_2$	1.2741	0.0360	3.248E-04
$CoCl_2$	1.1362	0.0316	2.501E-04
CoI_2	1.4179	0.0402	4.034E-04
$Co(NO_3)_2$	1.0976	0.0303	2.295E-04
$CuCl_2$	1.0075	0.0270	1.822E-04
$Cu(NO_3)_2$	1.0565	0.0288	2.078E-04
$FeCl_2$	1.1156	0.0309	2.391E-04
$Mg(CH_3CO_2)_2$	0.9074	0.0230	1.319E-04
$MgBr_2$	1.2989	0.0368	3.384E-04
$MgCl_2$	1.0861	0.0299	2.234E-04
$Mg(ClO_4)_2$	1.4546	0.0412	4.234E-04
MgI_2	1.4236	0.0403	4.065E-04
$Mg(NO_3)_2$	1.1354	0.0316	2.497E-04
$MnCl_2$	1.0821	0.0298	2.213E-04
$NiCl_2$	1.1449	0.0319	2.548E-04
$Pb(ClO_4)_2$	1.1253	0.0313	2.443E-04
$Pb(NO_3)_2$	0.6630	0.0109	2.956E-05
$SrBr_2$	1.1445	0.0319	2.546E-04

Table S6. Continued

$SrCl_2$	1.0742	0.0295	2.171E-04
$Sr(ClO_4)_2$	1.2296	0.0347	3.006E-04
SrI_2	1.2648	0.0358	3.198E-04
$Sr(NO_3)_2$	0.8488	0.0204	1.040E-04
UO_2Cl_2	1.1907	0.0334	2.795E-04
$UO_2(ClO_4)_2$	1.7214	0.0476	5.674E-04
$UO_2(NO_3)_2$	1.2469	0.0352	3.100E-04
$ZnBr_2$	1.0973	0.0303	2.293E-04
$ZnCl_2$	0.9150	0.0233	1.356E-04
$Zn(ClO_4)_2$	1.4522	0.0411	4.221E-04
ZnI_2	1.2657	0.0358	3.202E-04
$Zn(NO_3)_2$	1.1309	0.0315	2.473E-04

Table S7. Calculated values of theoretical OCV and maximum gross power density for 1-3 salts at α= 100%. (Ψ =2)

Salt	$\Phi = \frac{\gamma_1}{\gamma_{0.5}}$	$\Psi = \frac{1}{0.5} = 2$, R= 1ohm, α= 100%	
		OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
K_3AsO_4	1.0454	0.0253	1.595E-04
$K_3Fe(CN)_6$	0.8303	0.0174	7.540E-05
K_3PO_4	0.9143	0.0207	1.068E-04
Na_3AsO_4	0.8111	0.0166	6.863E-05
Na_3PO_4	0.7525	0.0140	4.899E-05

Table S8. Calculated values of theoretical OCV and maximum gross power density for 3-1 salts at α= 100%. (Ψ =2)

Salt	$\Phi = \frac{\gamma_1}{\gamma_{0.5}}$	$\Psi = \frac{1}{0.5} = 2$, R= 1ohm, α= 100%	
		OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
$AlCl_3$	1.4809	0.0372	3.457E-04
$CeCl_3$	1.2402	0.0311	2.420E-04
$Co(En)_3Cl_3$	0.6221	0.0075	1.399E-05
$CrCl_3$	1.4217	0.0358	3.202E-04
$Cr(NO_3)_3$	1.3266	0.0334	2.791E-04
$EuCl_3$	1.2827	0.0323	2.602E-04
$Ga(ClO_4)_3$	2.0707	0.0487	5.921E-04
$LaCl_3$	1.2426	0.0312	2.430E-04

Table S8. Continued.

$LaNO_3$	1.0868	0.0266	1.767E-04
$NdCl_3$	1.0744	0.0262	1.715E-04
$PrCl_3$	1.0721	0.0261	1.706E-04
$ScCl_3$	1.1107	0.0273	1.868E-04
$SmCl_3$	1.0821	0.0264	1.748E-04
YCl_3	1.0900	0.0267	1.781E-04

Table S9. Calculated values of theoretical OCV and maximum gross power density for 3-2 salts at α= 100%. (Ψ =2)

Salt	$\Phi = \frac{\gamma_1}{\gamma_{0.5}}$	$\Psi = \frac{1}{0.5} = 2$, R= 1ohm, α= 100%	
		OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
$Al_2(SO_4)_3$	0.493	-0.0003	2.4507E-08
$Cr_2(SO_4)_3$	0.635	0.005	6.5220E-06

Table S10. Calculated values of theoretical OCV and maximum gross power density for 4-1 salts at α= 100%. (Ψ =2)

Salt	$\Phi = \frac{\gamma_1}{\gamma_{0.5}}$	$\Psi = \frac{1}{0.5} = 2$, R= 1ohm, α= 100%	
		OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
$ThCl_4$	2.2014	0.0476	5.6647E-04
$Th(NO_3)_4$	1.7098	0.0395	3.8976E-04

Table S11. Calculated values of theoretical OCV and maximum gross power density for 1-4 salts at α= 100%. (Ψ =2)

Salt	$\Phi = \frac{\gamma_1}{\gamma_{0.5}}$	$\Psi = \frac{1}{0.5} = 2$, R= 1ohm, α= 100%	
		OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
$K_4Mo(CN)_8$	0.7437	0.0127	4.0628E-05
$K_4Fe(CN)_6$	0.7242	0.0119	3.5376E-05

Effect of permselectivity, membrane resistance, and concentration ratio on the theoretical open circuit voltage and maximum power density of a RED cell.

The selected salts with higher OCV compared to NaCl (marked green in Table 3) are investigated in this section using different scenarios of permselectivity (α), stack resistance (R), and concentration ration (Ψ).

Table S12. Effect of the change in the permselectivity (10% and 20 %) on theoretical OCV and maximum gross power density of a RED cell; Stack resistance and concentration ratio are constant.

Salt	$\Psi=\frac{6}{0.5}=12$, R=1, α=100%			$\Psi=\frac{6}{0.5}=12$, R=1, α=90%		$\Psi=\frac{6}{0.5}=12$, R=1, α=80%	
	$\Phi=\frac{\gamma_6}{\gamma_{0.5}}$	OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)	OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)	OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
NaCl	1.4370	0.1463	0.0054	0.1317	0.0043	0.1170	0.0034
KCH_3CO_2	3.0807	0.1855	0.0086	0.1669	0.0070	0.1484	0.0055
KF	1.4761	0.1477	0.0055	0.1329	0.0044	0.1182	0.0035
$KCHO_2$	1.9457	0.1619	0.0066	0.1457	0.0053	0.1295	0.0042
KOH	2.8685	0.1818	0.0083	0.1636	0.0067	0.1455	0.0053
LiCl	3.6942	0.1948	0.0095	0.1753	0.0077	0.1559	0.0061
LiI	6.7548	0.2258	0.0128	0.2032	0.0103	0.1807	0.0082
$LiNO_3$	2.0523	0.1646	0.0068	0.1482	0.0055	0.1317	0.0043
$LiClO_4$	5.8635	0.2186	0.0119	0.1967	0.0097	0.1749	0.0076
$LiCH_3CO_2$	1.7188	0.1555	0.0060	0.1400	0.0049	0.1244	0.0039
NaSCN	1.7013	0.1550	0.0060	0.1395	0.0049	0.1240	0.0038
NaI	2.3864	0.1724	0.0074	0.1551	0.0060	0.1379	0.0048
NaBr	1.8092	0.1581	0.0063	0.1423	0.0051	0.1265	0.0040
$NaCH_3CO_2$	2.5853	0.1765	0.0078	0.1588	0.0063	0.1412	0.0050
NaOH	1.7735	0.1571	0.0062	0.1414	0.0050	0.1257	0.0039
Na Butyrate	4.4073	0.2039	0.0104	0.1835	0.0084	0.1631	0.0067

Table S12. Continued.

Na Propionate	3.6572	0.1943	0.0094	0.1749	0.0076	0.1554	0.0060
$RbCH_3CO_2$	3.2838	0.1888	0.0089	0.1699	0.0072	0.1510	0.0057
RbF	1.5706	0.1509	0.0057	0.1358	0.0046	0.1207	0.0036
$CsCH_3CO_2$	3.4223	0.1909	0.0091	0.1718	0.0074	0.1527	0.0058
CsF	2.1642	0.1673	0.0070	0.1506	0.0057	0.1339	0.0045
CsOH	3.5400	0.1926	0.0093	0.1734	0.0075	0.1541	0.0059
HBr	6.1033	0.2206	0.0122	0.1986	0.0099	0.1765	0.0078
HCl	4.1867	0.2013	0.0101	0.1811	0.0082	0.1610	0.0065
HI	9.1113	0.2412	0.0145	0.2171	0.0118	0.1930	0.0093
HNO_3	1.8391	0.1590	0.0063	0.1431	0.0051	0.1272	0.0040
LiBr	4.9122	0.2095	0.0110	0.1885	0.0089	0.1676	0.0070

Table S13. Effect of the change in the stack resistance (10% and 20 %) on theoretical OCV and maximum power density of a RED cell; membrane permselectivity and concentration ratio are constant.

Salt	$\Psi= \frac{6}{0.5} = 12$, R=1, α=100%			$\Psi= \frac{6}{0.5} = 12$, R=1.1, α=100%		$\Psi= \frac{6}{0.5} = 12$, R=1.2, α=100%	
	$\Phi= \frac{\gamma_6}{\gamma_{0.5}}$	OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)	OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)	OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
NaCl	1.4370	0.1463	0.0054	0.1463	0.0049	0.1463	0.0045
KCH_3CO_2	3.0807	0.1855	0.0086	0.1855	0.0078	0.1855	0.0072
KF	1.4761	0.1477	0.0055	0.1477	0.0050	0.1477	0.0045
$KCHO_2$	1.9457	0.1619	0.0066	0.1619	0.0060	0.1619	0.0055
KOH	2.8685	0.1818	0.0083	0.1818	0.0075	0.1818	0.0069
LiCl	3.6942	0.1948	0.0095	0.1948	0.0086	0.1948	0.0079
LiI	6.7548	0.2258	0.0128	0.2258	0.0116	0.2258	0.0106

Table S13. Continued.

$LiNO_3$	2.0523	0.1646	0.0068	0.1646	0.0062	0.1646	0.0056
$LiClO_4$	5.8635	0.2186	0.0119	0.2186	0.0109	0.2186	0.0100
$LiCH_3CO_2$	1.7188	0.1555	0.0060	0.1555	0.0055	0.1555	0.0050
NaSCN	1.7013	0.1550	0.0060	0.1550	0.0055	0.1550	0.0050
NaI	2.3864	0.1724	0.0074	0.1724	0.0068	0.1724	0.0062
NaBr	1.8092	0.1581	0.0063	0.1581	0.0057	0.1581	0.0052
$NaCH_3CO_2$	2.5853	0.1765	0.0078	0.1765	0.0071	0.1765	0.0065
NaOH	1.7735	0.1571	0.0062	0.1571	0.0056	0.1571	0.0051
Na Butyrate	4.4073	0.2039	0.0104	0.2039	0.0094	0.2039	0.0087
Na Propionate	3.6572	0.1943	0.0094	0.1943	0.0086	0.1943	0.0079
$RbCH_3CO_2$	3.2838	0.1888	0.0089	0.1888	0.0081	0.1888	0.0074
RbF	1.5706	0.1509	0.0057	0.1509	0.0052	0.1509	0.0047
$CsCH_3CO_2$	3.4223	0.1909	0.0091	0.1909	0.0083	0.1909	0.0076
CsF	2.1642	0.1673	0.0070	0.1673	0.0064	0.1673	0.0058
CsOH	3.5400	0.1926	0.0093	0.1926	0.0084	0.1926	0.0077
HBr	6.1033	0.2206	0.0122	0.2206	0.0111	0.2206	0.0101
HCl	4.1867	0.2013	0.0101	0.2013	0.0092	0.2013	0.0084
HI	9.1113	0.2412	0.0145	0.2412	0.0132	0.2412	0.0121
HNO_3	1.8391	0.1590	0.0063	0.1590	0.0057	0.1590	0.0053
LiBr	4.9122	0.2095	0.0110	0.2095	0.0100	0.2095	0.0091

Table S14. Effect of the change in the concentration ratio (10% and 20 %) on theoretical OCV and maximum power density of a RED cell; membrane permselectivity and stack resistance are constant.

Salt	$\Psi = \frac{6}{0.5} = 12$, R=1, α=100%			$\Psi = \frac{5.4}{0.5} = 10.8$, R=1, α=100%		
	$\Phi = \frac{\gamma_6}{\gamma_{0.5}}$	OCV_{th} (volt)	Maximum Power Density (W/m^2)	$\Phi = \frac{\gamma_{5.4}}{\gamma_{0.5}}$	OCV_{th} (volt)	Maximum Power Density (W/m^2)
NaCl	1.4370	0.1463	0.0054	1.3453	0.1375	0.0047
KCH_3CO_2	3.0807	0.1855	0.0086	2.6524	0.1724	0.0074

Table S14. Continued.

KF	1.4761	0.1477	0.0055	1.4931	0.1429	0.0051
$KCHO_2$	1.9457	0.1619	0.0066	1.7618	0.1514	0.0057
KOH	2.8685	0.1818	0.0083	2.4891	0.1691	0.0072
LiCl	3.6942	0.1948	0.0095	2.9905	0.1786	0.0080
LiI	6.7548	0.2258	0.0128	5.3357	0.2083	0.0108
$LiNO_3$	2.0523	0.1646	0.0068	1.9764	0.1573	0.0062
$LiClO_4$	5.8635	0.2186	0.0119	4.7041	0.2018	0.0102
$LiCH_3CO_2$	1.7188	0.1555	0.0060	1.5777	0.1457	0.0053
NaSCN	1.7013	0.1550	0.0060	1.6063	0.1466	0.0054
NaI	2.3864	0.1724	0.0074	2.1319	0.1612	0.0065
NaBr	1.8092	0.1581	0.0063	1.6248	0.1472	0.0054
$NaCH_3CO_2$	2.5853	0.1765	0.0078	2.2692	0.1644	0.0068
NaOH	1.7735	0.1571	0.0062	1.6223	0.1471	0.0054
Na Butyrate	4.4073	0.2039	0.0104	3.6483	0.1888	0.0089
Na Propionate	3.6572	0.1943	0.0094	3.0900	0.1802	0.0081
$RbCH_3CO_2$	3.2838	0.1888	0.0089	2.8075	0.1753	0.0077
RbF	1.5706	0.1509	0.0057	1.4560	0.1416	0.0050
$CsCH_3CO_2$	3.4223	0.1909	0.0091	2.9127	0.1772	0.0078
CsF	2.1642	0.1673	0.0070	1.9369	0.1562	0.0061
CsOH	3.5400	0.1926	0.0093	3.0018	0.1787	0.0080
HBr	6.1033	0.2206	0.0122	4.8750	0.2037	0.0104
HCl	4.1867	0.2013	0.0101	3.4854	0.1864	0.0087
HI	9.1113	0.2412	0.0145	6.9646	0.2220	0.0123
HNO_3	1.8391	0.1590	0.0063	1.6756	0.1488	0.0055
LiBr	4.9122	0.2095	0.0110	3.9794	0.1932	0.0093

Table S14. Continued.

Salt	$\Psi = \frac{4.8}{0.5} = 9.6$, R=1, α=100%		
	$\Phi = \frac{\gamma_{4.8}}{\gamma_{0.5}}$	OCV_{th} (volt)	Maximum Gross Power Density (W/m^2)
NaCl	1.2619	0.1282	0.0041
KCH_3CO_2	2.2886	0.1588	0.0063
KF	1.3872	0.1330	0.0044
$KCHO_2$	1.5987	0.1403	0.0049
KOH	2.1645	0.1559	0.0061
LiCl	2.5467	0.1642	0.0067
LiI	4.2241	0.1902	0.0090
$LiNO_3$	1.7649	0.1454	0.0053
$LiClO_4$	3.7824	0.1846	0.0085
$LiCH_3CO_2$	1.4513	0.1354	0.0046
NaSCN	1.4703	0.1360	0.0046
NaI	1.8891	0.1489	0.0055
NaBr	1.4890	0.1367	0.0047
$NaCH_3CO_2$	1.9959	0.1517	0.0058
NaOH	1.4871	0.1366	0.0047
Na Butyrate	3.0267	0.1731	0.0075
Na Propionate	2.6165	0.1656	0.0069
$RbCH_3CO_2$	2.4056	0.1613	0.0065
RbF	1.3527	0.1317	0.0043
$CsCH_3CO_2$	2.4844	0.1630	0.0066
CsF	1.7372	0.1446	0.0052
CsOH	2.5509	0.1643	0.0068
HBr	3.9025	0.1862	0.0087
HCl	2.9078	0.1711	0.0073
HI	5.3356	0.2022	0.0102
HNO_3	1.5300	0.1381	0.0048
LiBr	3.2776	0.1772	0.0079

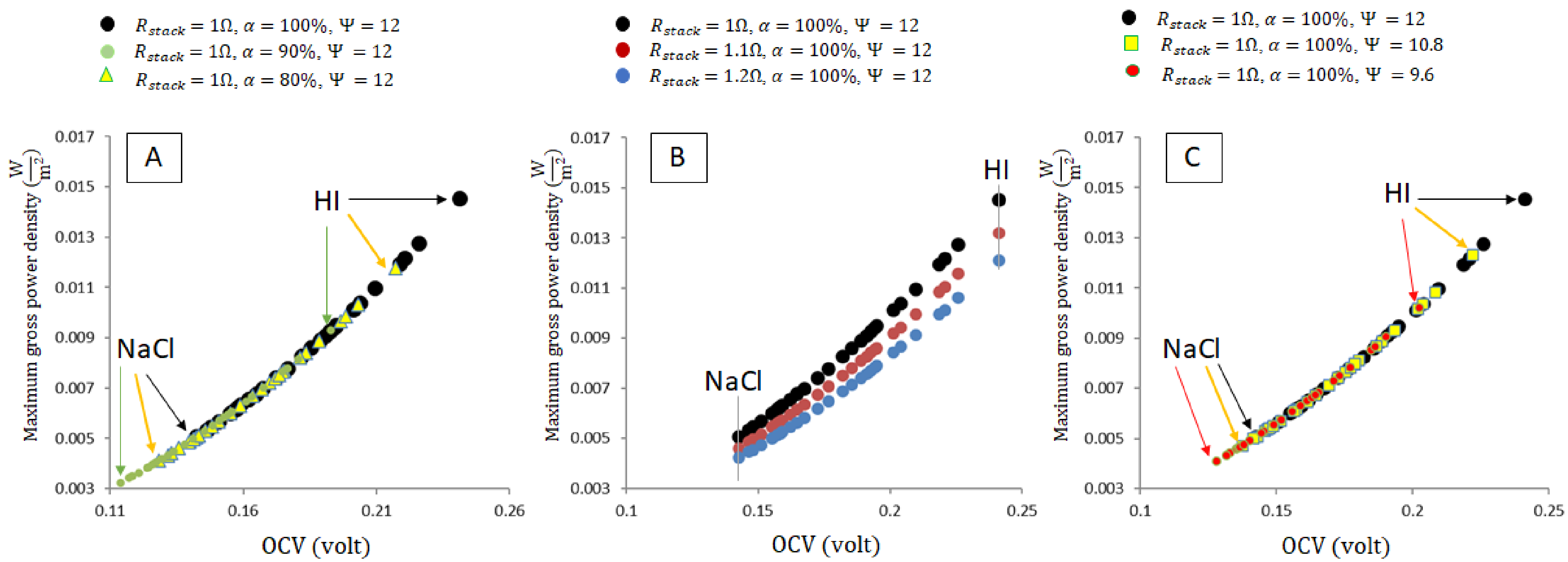

Figure S1. Effect of permselectivity, stack resistance, and concentration ratio on the maximum gross power density.

Hazard analysis

Selected salts with promising OCV_{th}(compared to NaCl) analyzed in terms of hazard potential. To assess the hazard potential of each salt, the protocols of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) were employed. For hazard analysis, three hazard classes, consisting of health, environmental, and physical hazards, were taken into account. The hazard potential of each salt defined as a parameter, including three hazard classes, as defined below.

Hazard potential =(environmental hazard, health hazard, physical hazard)

$$\text{Hazard class} = \text{Min}(\text{category 1}, \text{category2}\ , \text{category3}, \dots)$$

$$\text{Health hazard} = \text{Min}(\text{X1}, \text{X2}\ , \text{X3}, \dots, \text{X11})$$

$$\text{Environmental hazard} = \text{Min}(\text{Y1}, \text{Y2})$$

$$\text{Physical hazard} = \text{Min}(\text{Z1}, \text{Z2}, \text{Z3}, \dots, \text{Z8})$$

Table S15. Hazard analysis of selected salts with higher OCV than the reference salt (NaCl).

Hazards		NaCl	KF	RbF	NaSCN	$LiCH_3CO_2$	NaOH	NaBr
Health Hazards	X1= Acute toxicity	4	3	4	4	4	4	4
	X2= Skin corrosion	4	4	4	4	4	1	4
	X3= Skin irritation	4	4	4	4	4	4	4
	X5= Eye Effects	4	4	4	1	4	2	4
	X6= Sensitization (Skin or Eye)	4	4	4	4	4	4	4
	X7= Germ cell mutagenicity	4	4	4	4	4	4	4
	X8= Carcinogenicity	4	4	2	4	4	4	4
	X9= Reproductive toxicity	4	4	4	4	4	4	4
	X10= Target organ systemic toxicity: single and repeated exposure	4	4	4	4	4	4	4
	X11= Aspiration toxicity	4	4	4	4	4	4	4
Environmental Hazards	Y1= Acute Aquatic Toxicity	4	4	4	3	4	3	4
	Y2= Chronic Aquatic Toxicity	4	4	4	3	4	4	4
Physical Hazard	Z1= Explosives	4	4	4	4	4	4	4
	Z2=Flammable liquids	4	4	4	4	4	4	4
	Z3=Substances which in contact with water emit flammable gases	4	4	4	4	4	4	4
	Z5= Oxidizing liquids	4	4	4	4	4	4	4
	Z6= Substances corrosive to metal	4	4	4	4	4	1	4
	Z7= Pyrophoric liquids	4	4	4	4	4	4	4
	Z8= Oxidizing solids	4	4	4	4	4	4	4

Table S15. Continued.

Hazards		HNO_3	$KCHO_2$	$LiNO_3$	CsF	NaI	$NaCH_3CO_2$	KOH
Health Hazards	X1= Acute toxicity	4	4	4	3	4	4	4
	X2= Skin corrosion	1	4	4	4	4	4	1
	X3= Skin irritation	1	4	4	2	2	4	4
	X5= Eye Effects	1	4	2	1	2	4	1
	X6= Sensitization (Skin or Eye)	4	4	4	4	4	4	4
	X7= Germ cell mutagenicity	4	4	4	4	4	4	4
	X8= Carcinogenicity	4	4	4	4	4	4	4
	X9= Reproductive toxicity	4	4	4	2	4	4	4
	X10= Target organ systemic toxicity: single and repeated exposure	4	4	4	4	1	4	4
	X11= Aspiration toxicity	4	4	4	4	4	4	4
Environmental Hazards	Y1= Acute Aquatic Toxicity	4	4	4	4	1	4	3
	Y2= Chronic Aquatic Toxicity	4	4	4	4	4	4	4
Physical Hazard	Z1= Explosives	4	4	4	4	4	4	4
	Z2=Flammable liquids	4	4	4	4	4	4	4
	Z3=Substances which in contact with water emit flammable gases	4	4	4	4	4	4	4
	Z5= Oxidizing liquids	3	4	4	4	4	4	4
	Z6= Substances corrosive to metal	4	4	4	4	4	4	1
	Z7= Pyrophoric liquids	4	4	3	4	4	4	4
	Z8= Oxidizing solids	4	4	4	4	4	4	4

Table S15. Continued.

Hazards		KCH_3CO_2	$CsCH_3CO_2$	$RbCH_3CO_2$	CsOH	$C_3H_5NaO_2$	LiCl	HCl
Health Hazards	X1= Acute toxicity	4	4	4	4	4	4	4
	X2= Skin corrosion	4	4	4	1	4	4	1
	X3= Skin irritation	4	4	4	4	4	2	4
	X5= Eye Effects	4	4	4	1	2	2	1
	X6= Sensitization (Skin or Eye)	4	4	4	4	4	4	4
	X7= Germ cell mutagenicity	4	4	4	4	4	4	4
	X8= Carcinogenicity	4	4	4	4	4	4	4
	X9= Reproductive toxicity	4	4	4	4	4	4	4
	X10= Target organ systemic toxicity: single and repeated exposure	4	4	4	4	4	4	3
	X11= Aspiration toxicity	4	4	4	4	4	4	4
Environmental Hazards	Y1= Acute Aquatic Toxicity	4	4	4	4	4	4	4
	Y2= Chronic Aquatic Toxicity	4	4	4	4	4	4	4
Physical Hazard	Z1= Explosives	4		4	4	4	4	4
	Z2=Flammable liquids	4	4	4	4	4	4	4
	Z3=Substances which in contact with water emit flammable gases	4	4	4	4	4	4	4
	Z5= Oxidizing liquids	4	4	4	4	4	4	4
	Z6= Substances corrosive to metal	4	4	4	4	4	4	1
	Z7= Pyrophoric liquids	4	4	4	4	4	4	4
	Z8= Oxidizing solids	4	4	4	4	4	4	4

Table S15. Continued.

Hazards		$C_4H_7NaO_2$	LiBr	$LiClO_4$	HBr	LiI	HI
Health Hazards	X1= Acute toxicity	4	4	4	3	4	4
	X2= Skin corrosion	4	4	4	1	4	1
	X3= Skin irritation	2	2	2	4	4	4
	X5= Eye Effects	2	2	2	1	4	1
	X6= Sensitization (Skin or Eye)	4	1	4	4	4	4
	X7= Germ cell mutagenicity	4	4	4	4	4	4
	X8= Carcinogenicity	4	4	4	4	4	4
	X9= Reproductive toxicity	4	4	4	4	4	4
	X10= Target organ systemic toxicity: single and repeated exposure	3	4	3	3	4	4
	X11= Aspiration toxicity	4	4	4	4	4	4
Environmental Hazards	Y1= Acute Aquatic Toxicity	4	4	4	4	4	4
	Y2= Chronic Aquatic Toxicity	4	4	4	4	4	4
Physical Hazard	Z1= Explosives	4	4	4	4	4	4
	Z2=Flammable liquids	4	4	4	4	4	4
	Z3=Substances which in contact with water emit flammable gases	4	4	4	4	4	4
	Z5= Oxidizing liquids	4	4	4	4	4	4
	Z6= Substances corrosive to metal	4	4	4	4	4	4
	Z7= Pyrophoric liquids	4	4	4	4	4	4
	Z8= Oxidizing solids	4	4	2	4	4	4

Hazard potential =(environmental hazard, health hazard, physical hazard)

Table S16. The hazard potential of selected salts.

Salt	Health Hazard	Environmental Hazard	Physical Hazard
NaCl	4	4	4
KF	3	4	4
RbF	2	4	4
NaSCN	1	3	4
$LiCH_3CO_2$	4	4	4
NaOH	1	3	1
NaBr	4	4	4
HNO_3	1	4	3
$KHCO_2$	4	4	4
$LiNO_3$	2	4	3
CsF	1	4	4
NaI	1	1	4
$NaCH_3CO_2$	4	4	4
KOH	1	3	1
KCH_3CO_2	4	4	4
$CsCH_3CO_2$	4	4	4
$RbCH_3CO_2$	4	4	4
CsOH	1	4	4
$C_3H_5NaO_2$	2	4	4
LiCl	2	4	4
HCl	1	4	1
$C_4H_7NaO_2$	2	4	4
LiBr	1	4	4
$LiClO_4$	2	4	2
HBr	1	4	4
LiI	4	4	4
HI	1	4	4

Cost analysis of salts

Table S17. Price of the selected salts per kg.

Salt	Price ($\frac{USD}{Kg} \times 100$)
$NaCl$	0.63
KF	4.26
RbF	246
$NaSCN$	3.6
$LiCH_3CO_2$	4.02
$NaOH$	1.01
$NaBr$	1.12
HNO_3	3
$KHCO_2$	0.92
$LiNO_3$	5.88
CsF	13.3
NaI	4.06
$NaCH_3CO_2$	0.89
KOH	1.18
KCH_3CO_2	1.38
$RbCH_3CO_2$	109.2
$CsCH_3CO_2$	20.1
$CsOH$	4.66
$C_3H_5NaO_2$	0.6
$LiCl$	2.8
HCl	16
$C_4H_7NaO_2$	684
$LiBr$	2.24
$LiClO_4$	9.2
HBr	11
LiI	40
HI	12

The prices were obtained from the webpage of Sigma-Aldrich company

Literature data related to RED experiments

Table S18. Literature data related to experimental studies of the RED system.

Year	Salt Type	m_c	m_d	Ψ	Temperature (K)	Φ	Reference
2020	NaCl	4	0.1	40	25	1.019	Avci et al.[2]
2020	NaCl	0.5	0.01	50	25	0.754	Liu et al.[3]
2020	NaCl	0.55	0.02	27.5	-	0.776	Ortiz-Martínez et al.[4]
2020	NaCl	0.5	0.01	50	25	0.754	Lee et al.
2019	KNO_3	6.22	2.11	2.947	40	0.382	Krakhella et al.[5]
2019	NaCl	0.75	0.017	44.117	25	0.755	Chen et al.[6]
2019	NaCl	0.5	0.017	29.411	25	0.774	Han et al.[7]
2019	Urine	12.4†	0.2†	62	25	-	Mercer et al.[8]
2019	NaCl	5	0.5	10	60	1.288	Tufa et al.
2019	NaCl	1.46	0.023	63.478	25	0.762	Choi et al.[9]
2019	Mixture	332†	2†	166	20	-	Mehdizadeh et al.
2019	Seawater/distillated water	53.7†	DI Water	53.7	28	-	Jwa et al.[10]
2019	NaOH-HCl	0.3	0.3	1	25	-	Mei et al.[11]
2018	Na_2SO_4	0.3	0.01	30	35	0.734	Tufa et al.[12]
2018	KNO_3	0.45	0.21	2.142	40	0.657	Skilbred et al.[13]
2018	NaCl	3.75	0.02	187.5	25	0.888	Olkis et al.[14]
2018	NaCl	0.5	0.01	50	25	0.754	Kang et al.[15]
2018	$BaCl_2/AgSO_4$	-		-	23		Yeon et al.
2018	NaCl	0.5	0.01	50	20	0.712	Rijnaarts et al.
2017	NaCl	4	0.017	235.294	25	0.901	Chen et al.[16]
2017	NH_4HCO_3	0.6	0.0120	50	25		Hidayat et al.[17]
2017	NaCl	0.6	0.006	100	25	0.729	Zhu et al.
2017	NaCl	0.513	0.017	30.176	20	0.773	Liu et al.[18]

Table S18. Continued.

2017	Mixture	30 wt% MDEA+H_2O+CO	DI water	-	-	-	Kim et al.[19]
2017	Mixture	0.507	0.017	29.823	25	-	Moreno et al.[20]
2016	NaCl	5	0.1	50	25	1.129	Tufa et al.[21]
2016	NaCl	3	0.025	120	25	0.841	van Egmond et al.[22]
2016	HCl − NaOH − NaCl	0.7	0.1	7	25	-	Kim et al.[23]
2016	NH_4HCO_3	2	0.02	100	25	-	Bevacqua et al.[24]
2016	NaCl	0.507	0.017	29.823	25	0.774	Moreno et al.[25]
2016	KCl	2	0.001	2000	25	0.593	Tsai et al.[26]
2016	NaCl	0.51	0.017	30	25	0.773	Kwak et al.[27]
2016	NaCl	0.1	0.01	10	25	0.861	Lee et al.[28]
2016	NaCl	0.5	0.01	50	25	0.754	Ji et al.[29]
2015	NaCl	0.58	0.017	34.117	25	0.767	Kim et al.[30]
2015	NH_4HCO_3	1.4	DW	-	25	-	Watson et al.[31]
2015	NaCl	0.5	0.25	2	20	0.946	Kingsbury et al.[32]
2015	NH_4HCO_3	1.5	0.01	150	25	-	Kwon et al.[33]
2015	NaCl	2.4	0.01	240	25	0.765	Kwon et al.
2015	NaCl	1.2	0.01	120	25	0.727	Kwon et al.[34]
2015	NaCl	5	0.1	50	40	1.129	Tedesco et. al[35]
2015	NaCl	5	0.5	10	20	1.288	Tufa et al.[36]
2015	NaCl	2.56	0.02	128	25	0.802	Chen et al.
2015	NaCl	5	0.01	500	25	0.972	Scialdone et al.[37]
2015	NaCl − Na_2SO_4	0.77	0.05	15.4	25	-	Sui et al.[38]
2015	NaCl	5	0.01	500	30	0.972	D'Angelo et al.[35]
2015	NaCl	0.5	0.017	29.411	20	0.774	Zhang et al.[39]
2015	KCl	0.1	0.0001	1000	25	0.776	Choi et al.[40]
2015	KCl	0.1	0.0001	1000	25	0.776	Chang et al.[41]
2015	NaCl	0.5	0.01	50	25	0.754	Zhang et al.[42]
2014	NH_4HCO_3	1.4	0.05	28	25	-	Hatzell et al.[43]

Table S18. Continued.

2014	NH_4HCO_3	1.5	DW		25		Hatzell et al.[44]
2014	NH_4HCO_3	0.052	0.017	3.058	25	0.930	Jande et al.[45]
2014	NaCl	5	0.01	500	25	0.972	Scialdone et al.[46]
2013	NaCl	0.513	0.017	30.176	25	0.773	Güler et al.[47]
2013	NH_4HCO_3	1.7	0.024	70.833	25	-	Luo et al.[48]
2013	NH_4HCO_3	1.1	0.011	100	25	-	Hatzell et al.[49]
2013	NaCl	0.508	0.017	29.882	25	0.972	Vermaas et al.[50]
2013	KCl	0.1	0.0001	1000	25	0.776	Ouyang et al.[51]
2013	NaCl	0.1	0.01	10	25	0.861	Kim et al.[52]
2012	NaCl	0.507	0.017	29.823	25	0.773	Guler et al.[53]
2012	NH_4HCO_3	1.4	0.0035	400	25	-	Nam et al.[54]
2012	NH_4HCO_3	1.5	0.02	75	25	-	Luo et al.[55]
2011	NaCl	0.507	0.017	29.823	25	0.774	Vermaas et al.[56]
2011	NaCl	0.6	0.012	50	25	0.751	Kim et al.[57]
2011	KCl − NaCl − LiCl	1000	1	0.001	20		Cao et al.[58]
2011	$CuSO_4$	1	0.001	1000	25	0.536	Sadeghian et al.[59]
2010	KCl	0.001	1	1000	25	0.625	Guo et al.[60]
2010	KCl	1000	1	1000	25	0.625	Kim et al.[61]
2009	NaCl	0.513	0.01711	30	25	0.773	Veerman et al.[62]
2008	NaCl	0.5	0.05	10	25	0.830	Długołęcki et al.[63]
2007	NaCl	3.48	0.02	174	25	0.866	Suda et al.[64]
2007	NaCl	0.645	0.0102	63.214	25	calculate	Turek et al.[65]

†The concentrations are based on the conductivity of Urine (mS/cm).

Analyzing experimental literature data related to theoretical OCV

Predicting the permselectivity and OCV of the literature data using the Nernst equation;

$$OCV = \bar{\alpha} N_{membrane} \frac{RT}{zF} \ln \left(\frac{m_c \gamma_c}{m_d \gamma_d}\right)$$

For assessing the effect of permselectivity and concentration ratio on the OCV, experimental data from literature analyzed (Table 16). In order to analyze the effect of concentration ratio and permselectivity on the theoretical OCV, the average permselectivity of CEM/AEM should be available. Several papers in the literature report the values presented by the membrane manufacturers. However, the permselectivity of the ion exchange membrane is variable in different operational conditions. Therefore, the average permselectivity of membranes in the papers with adequate information predicted using the Nernst equation ($\alpha_{\text{predicted}}$). Also, in the limited number of studies, the OCV of the RED system predicted using the reported value of permselectivity for the ion exchange membranes.

Table S19. Experimental literature data used for predicting the average permselectivity of membranes and theoretical OCV of the RED system.

Salt type	m_c ($\frac{mol}{L}$)	m_d ($\frac{mol}{L}$)	Temperature (K)	Φ	Ψ	$\frac{OCV_{reported}}{N_{cell}}$	$\frac{OCV_{predicted}}{N_{cell}}$	$\bar{\alpha}_{predicted} \times 100$	$\bar{\alpha}_{reported} \times 100$	Reference
NaCl	0.5	0.017	25	22.788	29.412	0.09	-	56.1	-	Han et al.[7]
NaCl	5	0.5	60	12.889	10	0.078	-	53.2	-	Tufa et al.[66]
NaCl	1.46	0.023	25	48.426	63.478	0.16	-	80.3	-	Choi et al.[9]
Na_2SO_4	0.3	0.01	35	22.038	30	0.06	-	36.5	-	Tufa et al.[12]
NaCl	0.5	0.01	20	35.621	50	0.027	-	15.0	-	Rijnaarts et al.[67]
NaCl	0.6	0.006	25	0.730	100	0.110	-	49.9	-	Zhu et al.[68]
NaCl	2.733	0.018	25	0.782	150	0.140	-	57.2	-	Luo et al.[69]
NaCl	0.513	0.017	20	0.773	30.176	0.155	-	97.4	-	Liu et al.[18]

NaCl	5	0.1	25	1.129	50	0.137	-	66.2	-	Tufa et al.[21]
NaCl	0.507	0.017	25	0.774	29.824	-	0.159	-	99	Moreno et al.[25]
NaCl	0.58	0.017	25	0.767	34.118	0.150	-	89.5	-	Kim et al.[30]
NaCl	2.4	0.01	25	0.766	240	-	0.254	-	95	Kwon et al.[34]
NaCl	1.2	0.01	25	0.727	120	-	0.218	-	95	Kwon et al.[34]
NaCl	5	0.1	40	1.129	50	0.13	-	59.2	-	Tedesco et al.[70]
NaCl	5	0.5	20	1.289	10	0.092	-	71.3	-	Tufa et al.[36]
NaCl	2.56	0.02	25	0.803	128	0.13	-	54.6	-	Chen et al.[71]
NaCl	5	0.01	30	0.973	500	0.32	-	99.1	-	Scialdone et al.[37]
NaCl	0.5	0.017	20	0.775	29.411	0.144	-	91.2	-	Zhang et al.[39]
NaCl	5	0.01	25	0.973	500	0.036	-	11.3	-	Scialdone et al.[46]
NaCl	0.507	0.017	25	0.774	29.823	-	0.157	97.5	-	Vermaas et al.[56]
NaCl	0.6	0.012	25	0.752	50	0.160	-	78.1	-	Kim et al.[57]
NaCl	0.513	0.017	25	0.773	30	0.130	-	79.7	-	Veerman et al.[62]
NaCl	3.48	0.02	25	0.866	174	0.169	-	64.6	-	Suda et al.[64]
NaCl	0.645	0.0102	25	0.743	63.214	0.070	-	35.4	-	Turek et al.[65]

Data related to ionic characterizations of salts.

Table S20. Ionic radius, charge density and contribution energy of some salts.

Salt	OCV_{th} (volt)	r_C (pm)[72]	r_A (pm)[72]	ρ_C(C.mm^{-3})[73]	ρ_A (C.mm^{-3})[73]	G_C (kJ.mol^{-1})[72]	G_A (kJ.mol^{-1})[72]	$r_{A/C}$	$\rho_{A/C}$	$E_{C/A}$
NaCl	0.146	102	181	24	8	-385	-270	1.775	0.333	1.425
NaBr	0.158	102	196	24	6	-385	-250	1.922	0.250	1.54
NaI	0.172	102	220	24	4	-385	-220	2.157	0.167	1.75
$\mathbf{CH_3CO_2Li}$	0.155	69	162	52	9	-510	-300	2.348	0.173	1.7
LiNO3	0.164	69	179	52	9	-510	-275	2.594	0.173	1.854
LiCl	0.194	69	181	52	8	-510	-270	2.623	0.154	1.888
LiBr	0.209	69	196	52	6	-510	-250	2.841	0.115	2.04
LiI	0.225	69	220	52	4	-510	-220	3.188	0.077	2.318
HNO3	0.158	30	179	1415	9	-1015	-275	5.967	0.006	3.690
HCl	0.201	30	181	1415	8	-1015	-270	6.033	0.006	3.759
HBr	0.220	30	196	1415	6	-1015	-250	6.533	0.004	4.06
HI	0.241	30	220	1415	4	-1015	-220	7.333	0.003	4.613

r: Ionic radius

ρ: Charge density of ion

G : Hydration enthalpy of ion defined by Marcus.[72]

Table S21. Ratio of the ionic radius ($\frac{r_C}{r_A}$) for different salts investigated in this study.

Salt	Radius of cation, r_C(nm)	Radius of cation, r_A(nm)	$(\frac{r_C}{r_A})$
NH_4Br	0.148	0.196	0.755
NH_4ClO_4	0.148	0.250	0.592
NH_4I	0.148	0.220	0.672
NH_4Cl	0.148	0.181	0.817
NH_4NO_3	0.148	0.179	0.826
NaCl	0.102	0.181	0.563
KCH_3CO_2	0.138	0.162	0.851
KBr	0.138	0.196	0.704
KCl	0.138	0.181	0.762
KF	0.138	0.133	1.037
KI	0.138	0.220	0.627
KNO_3	0.138	0.179	0.770
KNO_2	0.138	0.192	0.718
KSCN	0.138	0.213	0.647
$KClO_3$	0.138	0.200	0.69
$KBrO_3$	0.138	0.191	0.722
KH_2PO_4	0.138	NA	NA
$KClO_4$	0.138	0.250	0.552
$KHCO_2$	0.138	0.169	0.816
KOH	0.138	0.133	1.037
KH_2ASO_4	0.138	NA	NA
KH Asipate	0.138	NA	NA
KH Malomate	0.138	NA	NA
KH Succinate	0.138	NA	NA
K Tol	0.138	NA	NA
Li Tol	0.069	NA	NA
LiOH	0.069	0.133	0.518
LiCl	0.069	0.181	0.381
LiI	0.069	0.220	0.313
$LiNO_3$	0.069	0.179	0.385
$LiClO_4$	0.069	0.250	0.276
$LiHCO_2$	0.069	0.169	0.408
$LiCH_3CO_2$	0.069	0.162	0.425
NaSCN	0.102	0.213	0.478
NaH_2PO_4	0.102	0.200	0.51

$NaNO_3$	0.102	0.179	0.569
$NaClO_4$	0.102	0.250	0.408
$NaClO_3$	0.102	0.200	0.51
NaI	0.102	0.220	0.463
NaBr	0.102	0.196	0.520
NaF	0.102	0.133	0.766
$NaNO_2$	0.102	0.192	0.531
$NaBrO_3$	0.102	0.191	0.534
$NaCH_3CO_2$	0.102	0.162	0.629
$NaHCO_2$	0.102	0.169	0.603
NaOH	0.102	0.133	0.766
Na Butyrate	0.102	NA	NA
Na Caporate	0.102	NA	NA
Na Caprylate	0.102	NA	NA
NaH_2ASO_4	0.102	NA	NA
NaH Adipate	0.102	NA	NA
NaH Malonate	0.102	NA	NA
NaH Succinate	0.102	NA	NA
Na Heptylate	0.102	NA	NA
Na Pelargonate	0.102	NA	NA
Na Propionate	0.102	NA	NA
NaTol	0.102	NA	NA
$RbCH_3CO_2$	0.149	0.162	0.919
RbF	0.149	0.133	1.120
RbCl	0.149	0.181	0.823
RbBr	0.149	0.196	0.760
RbI	0.149	0.220	0.677
$RbNO_3$	0.149	0.179	0.832
CsCl	0.170	0.181	0.939
CsI	0.170	0.220	0.772
$CsNO_3$	0.170	0.179	0.949
$CsCH_3CO_2$	0.170	0.162	1.049
CsF	0.170	0.133	1.278
CsOH	0.170	0.133	1.278
CsBr	0.170	0.196	0.867
HBr	0.030	0.196	0.153
HCl	0.030	0.181	0.165
$HClO_4$	0.030	0.250	0.12
HI	0.030	0.220	0.136

HNO_3	0.030	0.179	0.167
$TlCH_3CO_2$	0.088	0.162	0.543
$TlCl$	0.088	0.181	0.486
$TlClO_4$	0.088	0.250	0.352
$TlNO_3$	0.088	0.179	0.491
$LiBr$	0.069	0.196	0.352
Cs_2SO_4	0.170	0.230	0.739
H_2SO_4	0.030	0.230	0.130
K_2CO_3	0.138	0.178	0.775
K_2CrO_4	0.138	0.240	0.575
K_2HAsO_4	0.138	NA	NA
K_2HPO_4	0.138	0.200	0.69
K_2SO_4	0.138	0.230	0.6
Li_2SO_4	0.069	0.230	0.3
Na_2CO_3	0.102	0.178	0.573
Na_2CrO_4	0.102	0.240	0.425
$Na_2Fumarate$	0.102	NA	NA
Na_2HAsO_4	0.102	NA	NA
Na_2HPO_4	0.102	NA	NA
$Na_2Maleate$	0.102	NA	NA
Na_2SO_4	0.102	0.230	0.443
$Na_2S_2O_3$	0.102	NA	NA
$(NH_4)_2SO_4$	0.148	0.230	0.643
Rb_2SO_4	0.149	0.230	0.647
$BeSO_4$	0.040	0.230	0.173
$CdSO_4$	0.170	0.230	0.739
$CuSO_4$	0.073	0.230	0.317
$MgSO_4$	0.072	0.230	0.313
$NiSO_4$	0.069	0.230	0.3
$ZnSO_4$	0.075	0.230	0.326
$Ba(CH_3CO_2)_2$	0.136	0.162	0.839
$BaBr_2$	0.136	0.196	0.693
$BaCl_2$	0.136	0.181	0.751
$Ba(ClO_4)_2$	0.136	0.250	0.544
BaI_2	0.136	0.220	0.618
$Ba(NO_3)_2$	0.136	0.179	0.759
$Ba(OH)_2$	0.136	0.133	1.022
$CaBr_2$	0.100	0.196	0.510

$CaCl_2$	0.100	0.181	0.552
$Ca(ClO_4)_2$	0.100	0.250	0.4
CaI_2	0.100	0.220	0.454
$Ca(NO_3)_2$	0.100	0.179	0.558
$CdBr_2$	0.095	0.196	0.484
$CdCl_2$	0.095	0.181	0.524
CdI_2	0.095	0.220	0.431
$Cd(NO_3)_2$	0.095	0.179	0.530
$CoBr_2$	0.075	0.196	0.382
$CoCl_2$	0.075	0.181	0.414
CoI_2	0.075	0.220	0.340
$Co(NO_3)_2$	0.075	0.179	0.418
$CuCl_2$	0.073	0.181	0.403
$Cu(NO_3)_2$	0.073	0.179	0.407
$FeCl_2$	0.078	0.181	0.430
$Mg(CH_3CO_2)_2$	0.072	0.162	0.444
$MgBr_2$	0.072	0.196	0.367
$MgCl_2$	0.072	0.181	0.397
$Mg(ClO_4)_2$	0.072	0.250	0.288
MgI_2	0.072	0.220	0.327
$Mg(NO_3)_2$	0.072	0.179	0.402
$MnCl_2$	0.083	0.181	0.458
$NiCl_2$	0.069	0.181	0.381
$Pb(ClO_4)_2$	0.118	0.250	0.472
$Pb(NO_3)_2$	0.118	0.179	0.659
$SrBr_2$	0.113	0.196	0.576
$SrCl_2$	0.113	0.181	0.624
$Sr(ClO_4)_2$	0.113	0.250	0.452
SrI_2	0.113	0.220	0.513
$Sr(NO_3)_2$	0.113	0.179	0.631
UO_2Cl_2	NA	0.181	NA
$UO_2(ClO_4)_2$	NA	0.250	NA
$UO_2(NO_3)_2$	NA	0.179	NA
$ZnBr_2$	0.075	0.196	0.382
$ZnCl_2$	0.075	0.181	0.414
$Zn(ClO_4)_2$	0.075	0.250	0.3
ZnI_2	0.075	0.220	0.340
$Zn(NO_3)_2$	0.075	0.179	0.418

K_3AsO_4	0.138	NA	NA
$K_3Fe(CN)_6$	0.138	NA	NA
K_3PO_4	0.138	0.238	0.579
Na_3AsO_4	0.102	NA	NA
Na_3PO_4	0.102	0.238	0.428
$AlCl_3$	0.053	0.181	0.292
$CeCl_3$	0.101	0.181	0.558
$Co(En)_3Cl_3$	0.075	0.181	0.414
$CrCl_3$	0.062	0.181	0.342
$Cr(NO_3)_3$	0.062	0.179	0.346
$EuCl_3$	0.095	0.181	0.524
$Ga(ClO_4)_3$	0.062	0.250	0.248
$LaCl_3$	0.105	0.181	0.580
$LaNO_3$	0.105	0.179	0.586
$NdCl_3$	0.098	0.181	0.541
$PrCl_3$	0.100	0.181	0.552
$ScCl_3$	0.075	0.181	0.414
$SmCl_3$	0.096	0.181	0.530
YCl_3	0.090	0.181	0.497
$Al_2(SO_4)_3$	0.053	0.230	0.230
$Cr_2(SO_4)_3$	0.062	0.230	0.269
$ThCl_4$	0.100	0.181	0.552
$Th(NO_3)_4$	0.100	0.179	0.558
$K_4Mo(CN)_8$	0.138	NA	NA
$K_4Fe(CN)_6$	0.138	NA	NA

NA: The ionic radius is not available in the model presented by Markus.[73]

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