

## Supplementary Information

**Table A1.** Coefficients in polynormal regression of dielectric constant for pure solvents

	B <sub>0</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
Water	176	0	-0.328	0	0
MeOH	104.62	1000	9.018410 <sup>-2</sup>	-2.5998 10 <sup>-3</sup>	4.8503 10 <sup>-6</sup>
EtOH	68.47	0	-0.146	0	0
PrOH	100	0	-0.37	3.6 10 <sup>-4</sup>	0
ButOH	82.31	0	-0.304	3.0 10 <sup>-4</sup>	0

**Table A2:** Binary interaction parameters of water/ethanol/methanol

System	$\alpha_{ij}$	$\tau_{ij}$	$\tau_{ji}$
Water /EtOH	0.18	$\frac{(814.903 + 2.0078T)}{RT}$	$\frac{(-697.613 + 0.9765T)}{RT}$
Water /MeOH	0.10	$0.019T^2 - 21.66T + 2049$	$-0.019T^2 + 10.68T - 1730$
Water /PrOH	0.3	$5.3852 - \frac{1005.06}{T}$	$-2.5041 + \frac{850.78}{T}$
Water /ButOH	0.45	$-0.0237T - \frac{2016.15}{T} + 19.447$	$-0.0527T - \frac{3884.3}{T} + 30.3191$

**Table A3:** Solubility of KDP in water.

T, [K]	x, [-]	T, [K]	x, [-]
<i>Isothermal measurement</i>		<i>Polythermal measurement</i>	
308.15	0.0383	314.59	0.0426
313.15	0.042	318.15	0.0459
318.15	0.0459	318.29	0.0454
323.15	0.0495	319.49	0.0469
328.15	0.0531	322.72	0.0497
333.15	0.0589	323.15	0.0495
		324.93	0.0517
		325.48	0.0526
		328.15	0.0531
		333.15	0.0589
		338.15	0.0643

**Table A4:** Solubility of KDP in EtOH-water mixed solvents.

T, [K]	x, [-]	T, [K]	x, [-]	T, [K]	x, [-]	T, [K]	x, [-]
5% (w/w) EtOH		10% (w/w) EtOH		15% (w/w) EtOH		20% (w/w) EtOH	
316.3	0.0332	316.75	0.0248	310.5	0.0172	315.71	0.0161
321.7	0.0367	318.15	0.0275	314.4	0.0187	318.15	0.0164
324.8	0.0393	318.75	0.0276	318.1	0.0205	323.15	0.0185
327	0.0412	323.15	0.0296	322.6	0.0226	323.55	0.0184
333.3	0.0462	324.39	0.0299	327.3	0.0255	328.15	0.0208
		325.56	0.0312	332.2	0.0282	333.15	0.0234
		328.15	0.0329			338.15	0.0254
		333.15	0.0371				
		338.15	0.0417				

**Table A5:** Solubility of KDP in MeOH-water mixed solvents.

T, [K]	x, [-]	T, [K]	x, [-]	T, [K]	x, [-]
5% (w/w) MeOH		10% (w/w) MeOH		15% (w/w) MeOH	
302.95	0.0275	310.67	0.024	303.65	0.0163
309.05	0.0312	311.43	0.0249	306.55	0.0176
317.05	0.0364	314.75	0.0266	309.95	0.0191
322.15	0.0397	316.84	0.0285	314.65	0.0214
325.25	0.0418	318.81	0.0297	318.75	0.0224
327.35	0.0434	322.53	0.0318	323.45	0.0257
332.95	0.0477	324.72	0.0334	328.35	0.0276
		327.41	0.0351	333.65	0.0312
		330.46	0.0378		

**Table A6:** Solubility of KDP in PrOH-water mixed solvents.

T, [K]	x, [-]	T, [K]	x, [-]	T, [K]	x, [-]
5% (w/w) PrOH		10% (w/w) PrOH		15% (w/w) PrOH	
303.13	0.0294	303.05	0.023	303.94	0.0176
308.42	0.0326	308.31	0.0251	308.45	0.0196
313.56	0.0362	310.38	0.0266	311.55	0.0209
314.31	0.0371	315.55	0.0287	313.44	0.0216
320.63	0.0402	318.15	0.0321	315.75	0.0235
324.25	0.0428	322.05	0.0344	318.81	0.0241
330.65	0.0482	329.75	0.0395	321.92	0.0256
				328.74	0.0298

**Table A7:** Solubility of KDP in ButOH-water mixed solvents.

T, [K]	x, [-]	T, [K]	x, [-]	T, [K]	x, [-]
5% (w/w) ButOH		10% (w/w) ButOH		15% (w/w) ButOH	
303.14	0.0325	305.05	0.0251	302.12	0.0176
305.55	0.0334	311.12	0.0281	308.43	0.0213
311.19	0.0373	313.14	0.0297	314.75	0.0241

315.69	0.0399	315.25	0.0319	316.63	0.0251
317.63	0.0414	320.03	0.0348	320.19	0.0269
322.69	0.0447	323.12	0.0367	323.25	0.0285
326.19	0.0479	327.94	0.0404	330.56	0.0336
				333.26	0.0362

**Table A8:** Solubility of KDP in MeOH-EtOH-water mixed solvents.

T, [K]	x, [-]	T, [K]	x, [-]	T, [K]	x, [-]
2.5:2.5 % (w/w) MeOH-EtOH		5.0:5.0 % (w/w) MeOH-EtOH		7.5:7.5 % (w/w) MeOH-EtOH	
308.55	0.0301	312.96	0.0274	304.65	0.0179
311.71	0.0322	316.96	0.0299	307.25	0.0195
314.15	0.0334	318.28	0.0315	308.75	0.0208
320.15	0.0381	321.71	0.0337	312.9	0.0219
327.34	0.0428	326.21	0.0360	318.35	0.0250
332.34	0.0462	332.96	0.0415	331.55	0.0325
		333.65	0.0420	335.65	0.0346

**Table A9:** Solubility of KDP in water cited from literature [50].

T, [K]	S, [kg/kg water]	T, [K]	S, [kg/kg water]
293.1	0.2165	317.4	0.3558
298.7	0.2467	321.5	0.3844
303.2	0.2689	324.6	0.4122
304.4	0.2768	330.2	0.4491
309.4	0.3079	333.7	0.4823
321.6	0.324	317.4	0.3558
293.1	0.2165		
298.7	0.2467		

**Table A10:** Solubility of KDP in EtOH-water cited from literature [50].

T, [K]	S, [kg/kg water]	T, [K]	S, [kg/kg water]	T, [K]	S, [kg/kg water]	T, [K]	S, [kg/kg water]
5% (w/w) EtOH		10% (w/w) EtOH		15% (w/w) EtOH		20% (w/w) EtOH	
292.7	0.1465	293	0.1139	293.2	0.0883	292.8	0.0613
297.4	0.172	300.7	0.1412	298.2	0.1023	297.8	0.0751
303.3	0.1996	303.5	0.1517	302.6	0.1146	302.9	0.0888
310	0.2324	308.4	0.1699	305.8	0.124	307	0.1
316.3	0.2628	312.8	0.1869	310.5	0.1399	310.9	0.11
321.7	0.2935	317.3	0.2079	314.4	0.1523	314.1	0.12
324.8	0.3153	321.2	0.2289	318.1	0.1671	317.9	0.1331
327	0.3312	327.3	0.26	322.6	0.1849	322.1	0.1488
333.3	0.373			327.3	0.2053	329.1	0.1723
292.7	0.1465			332.2	0.2317	333.2	0.1928

**Table A11.** Estimated parameters for the modified Apelblat's and Bromley's equations. Mixed solvents composed from x% alcohols and (100-x)% water (on weight basis).

SLE Set	Solvent	Apelblat's parameter		
		a/R	b/R	c
1 <sup>st</sup>	Water	-825.4(81)	2.82(21)	-17.6(4)
2 <sup>nd</sup>	5%EtOH	-834.4(25)	4.00(75)	-23.8(4)
3 <sup>rd</sup>	10%EtOH	-839.6(77)	4.70(82)	-28.1(2)
4 <sup>th</sup>	15%EtOH	-840.3(98)	4.74(58)	-28.5(9)
5 <sup>th</sup>	20%EtOH	-839.6(72)	4.70(89)	-28.1(2)
6 <sup>th</sup>	5%MeOH	-830.0(25)	3.41(98)	-20.3(8)
7 <sup>th</sup>	10%MeOH	-839.5(22)	4.70(60)	-28.0(1)
8 <sup>th</sup>	15%MeOH	-835.4(51)	4.08(30)	-24.6(9)
9 <sup>th</sup>	5%PrOH	-826.2(56)	2.90(04)	-17.3(6)
10 <sup>th</sup>	10%PrOH	-835.6(73)	4.17(71)	-24.9(0)
11 <sup>th</sup>	15%PrOH	-834.3(60)	3.94(96)	-23.8(6)
12 <sup>th</sup>	5%ButOH	-825.3(29)	2.78(28)	-16.6(1)
13 <sup>th</sup>	10%ButOH	-834.1(82)	3.98(05)	-23.7(1)
14 <sup>th</sup>	15%ButOH	-837.8(89)	4.45(24)	-26.6(7)
15 <sup>th</sup>	2.5%:2.5% MeOH+EtOH	-834.3(17)	3.94(30)	-23.8(1)
16 <sup>th</sup>	5.0%:5.0% MeOH+EtOH	-841.0(48)	4.91(48)	-29.2(4)
17 <sup>th</sup>	7.5%:7.5% MeOH+EtOH	-828.3(08)	3.17(62)	-19.0(1)