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Glycerol as a source of designer solvents: physico-chemical properties of low melting mixtures containing glycerol ethers and ammonium salts

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1. Product characterization

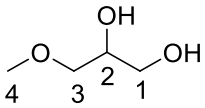
Gas chromatography was carried out in a Hewlett Packard 7890 series II Gas Chromatograph using a column of phenyl silicone 5.5% (Zebron Inferno 30 m x 0.25 mm x 0.25 µm) and Helium as carrier gas. Temperature program: Initial temperature 80 º C for 3 min., Temperature gradient 5 ºC min^{-1} until 110 ºC, Temperature gradient 20 ºC min^{-1} until 230 ºC, 230 ºC isotherm for 5 min. Injector temperature 280 ºC. Detector temperature 250 ºC.

^{1}H-, ^{13}C- and ^{19}F-NMR spectra (DMSO-d_6, δ ppm, *J* Hz) were obtained using a Bruker AV-400 instrument with TMS as standard. High Resolution Mass spectroscopy was carried out in a Bruker MicroTof-Q, by electrospray ionization.

Boiling points were determined using differential scanning calorimetric (DSC) analysis in a TA Instruments DSC-Q20, calibrated with indium, using micropore aluminum pans, with a temperature gradient of 20ºC·min^{-1} in a range of 298–673K, at atmospheric pressure. Boiling points were determined using onset temperature.

2. Products description

2.1 Glycerol ethers description



3-Methoxypropan-1,2-diol [1.0.0], CAS 623-39-2: Colorless liquid, b.p. = 222 ºC. **^{1}H NMR** (400 MHz, [d_6]DMSO, 25 ºC): δ 4.61 (d, 1H, *J* = 5.1 Hz, OH_2), 4.46 (t, 1H, *J* = 5.7 Hz, OH_1), 3.56 (sext, 1H, *J* = 5.1 Hz, H_2), 3.18-3.36 (m, 4H, H_1, H_{3a}, H_{3b}), 3.23 (s, 3H, H_4). **^{13}C NMR** (100 MHz, [d_6]DMSO, 25 ºC): δ 74.2 (CH_2, C_3), 70.3 (CH, C_2), 62.9 (CH_2, C_1), 58.3 (CH_3, C_4). **HRMS** (ESI^+): *m/z* calc. = 129.0522, *m/z* found = 129.0527 ($M+Na^+$).

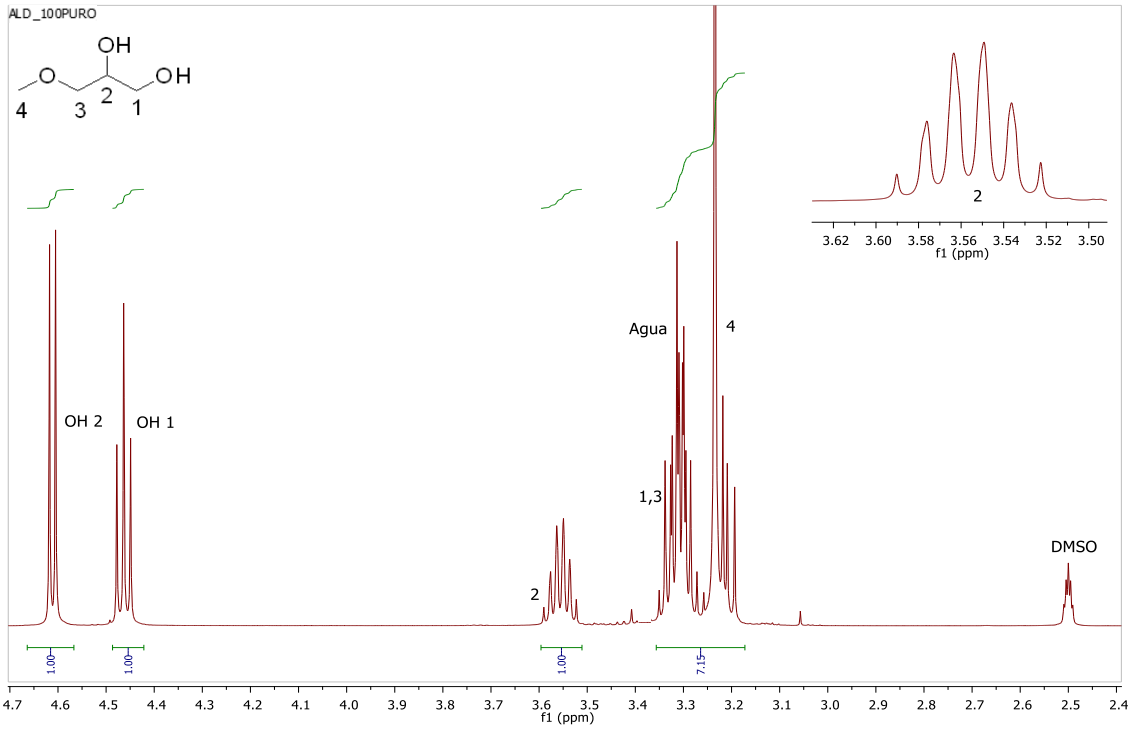


Figure S-1. ^{1}H-RMN of 3-methoxypropan-1,2-diol [1.0.0].

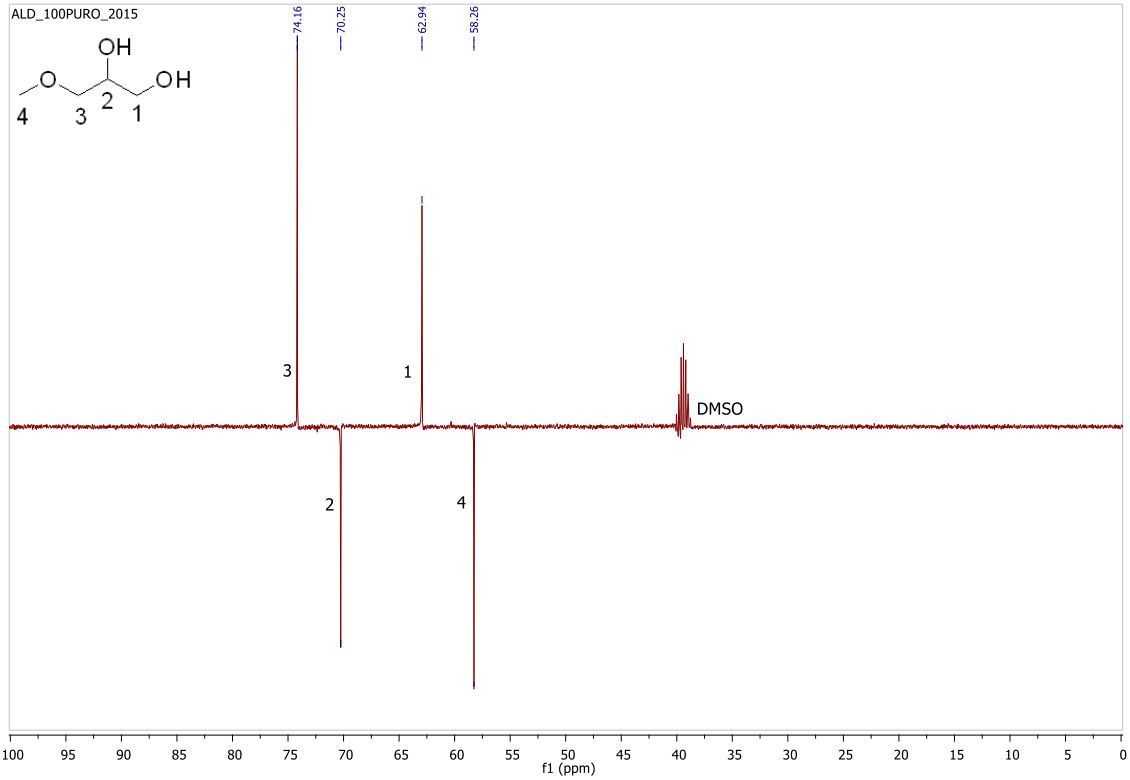


Figure S-2. ^{13}C-RMN (APT) of 3-methoxypropan-1,2-diol [1.0.0].

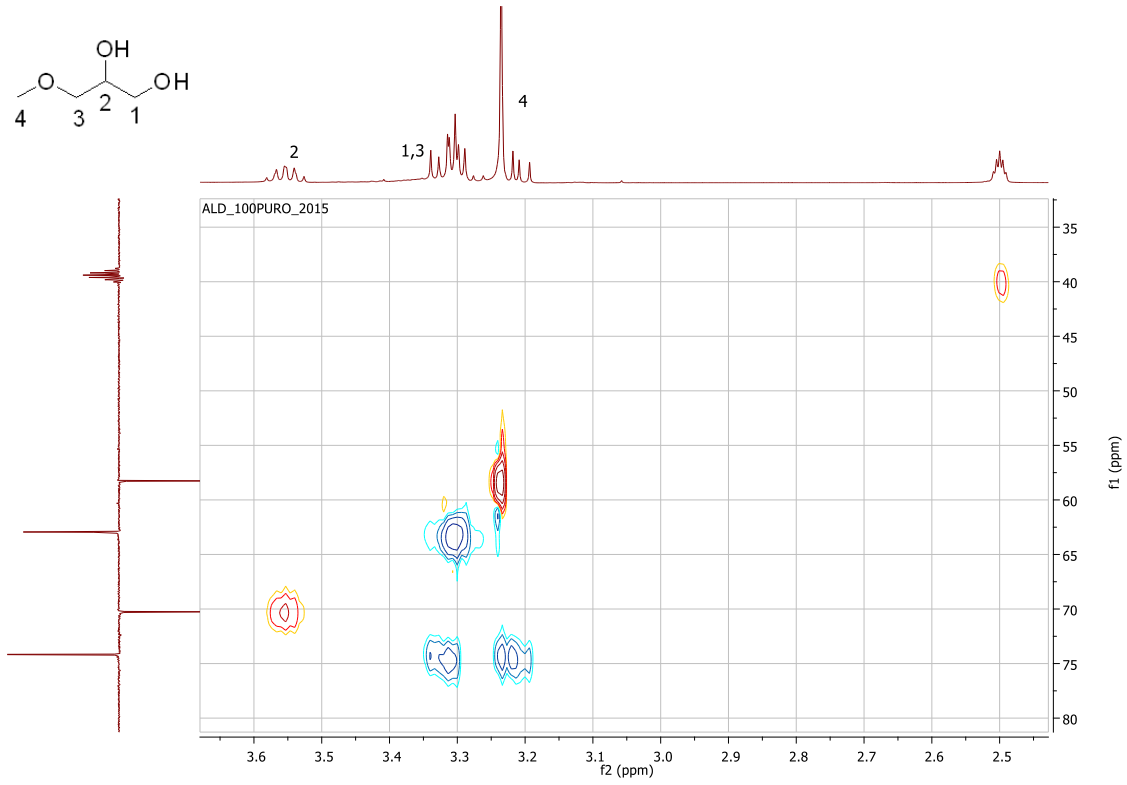
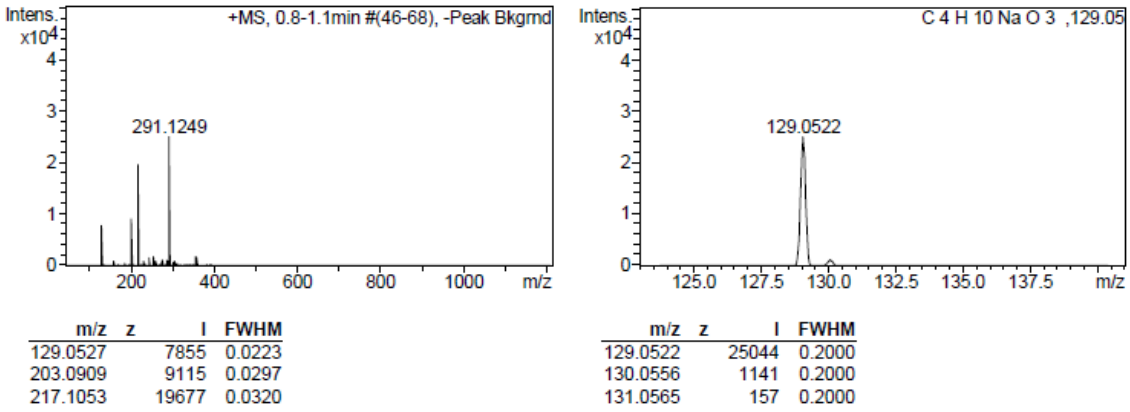


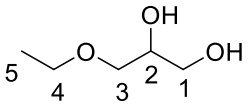
Figure S-3. HSQC of 3-methoxypropan-1,2-diol [1.0.0].



m/z	z	I	FWHM
129.0527		7855	0.0223
203.0909		9115	0.0297
217.1053		19677	0.0320

m/z	z	I	FWHM
129.0522		25044	0.2000
130.0556		1141	0.2000
131.0565		157	0.2000

Figure S4. HRMS of 3-methoxypropan-1,2-diol [1.0.0].



3-Ethoxypropan-1,2-diol [2.0.0], CAS 1874-62-0: Colorless liquid, b.p. = 221 ºC. **^{1}H NMR** (400 MHz, [d_6]DMSO, 25 ºC): δ 4.59 (d, 1H, *J* = 5.1 Hz, OH_2), 4.45 (t, 1H, *J* = 5.7 Hz, OH_1), 3.55 (sext, 1H, *J* = 5.3 Hz, H_2), 3.42 (q, 2H, *J* = 7.0 Hz, H_4), 3.21-3.37 (m, 4H, H_1, H_{3a}, H_{3b}), 1.10 (t, 3H, *J* = 7.0 Hz, H_5). **^{13}C NMR** (100 MHz, [d_6]DMSO, 25 ºC): δ 72.3 (CH_2, C_3), 70.8 (CH, C_2), 66.0 (CH_2, C_4), 63.4 (CH_2, C_1), 15.4 (CH_3, C_5). **HRMS** (ESI$^+$): *m/z* calc. = 143.0679, *m/z* found = 143.0680 ($M+Na^+$).

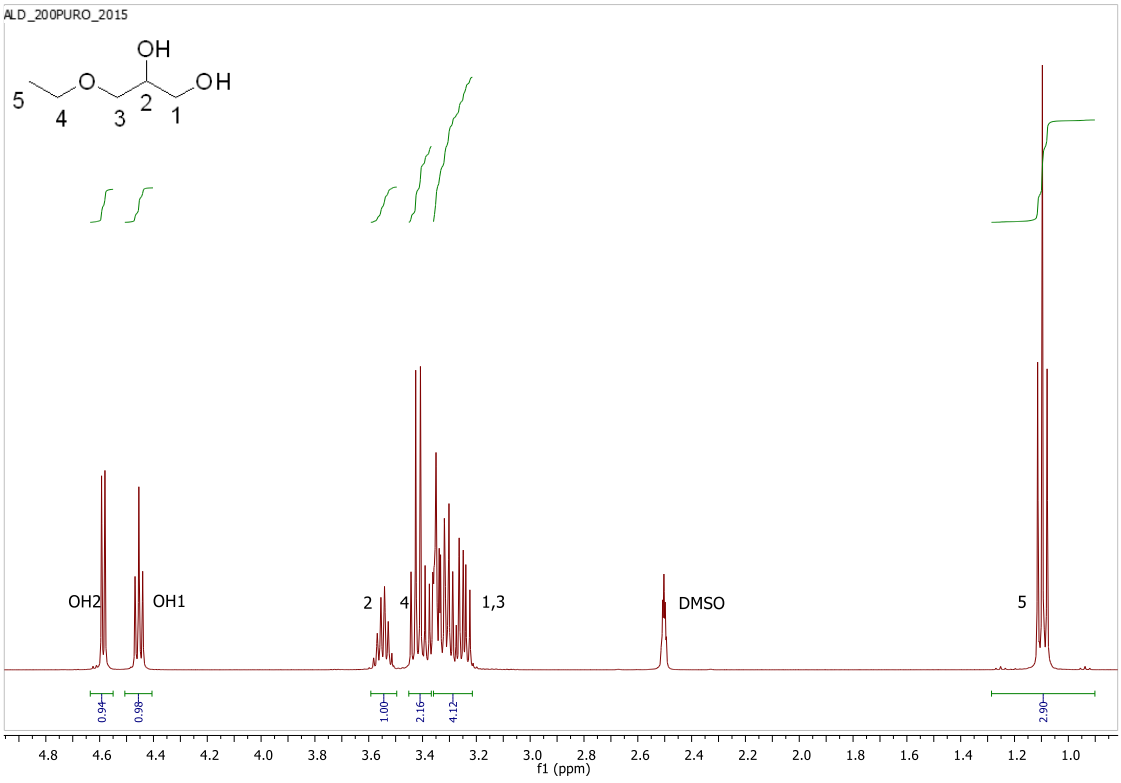


Figure S-5. ^{1}H-RMN of 3-ethoxypropan-1,2-diol [2.0.0].

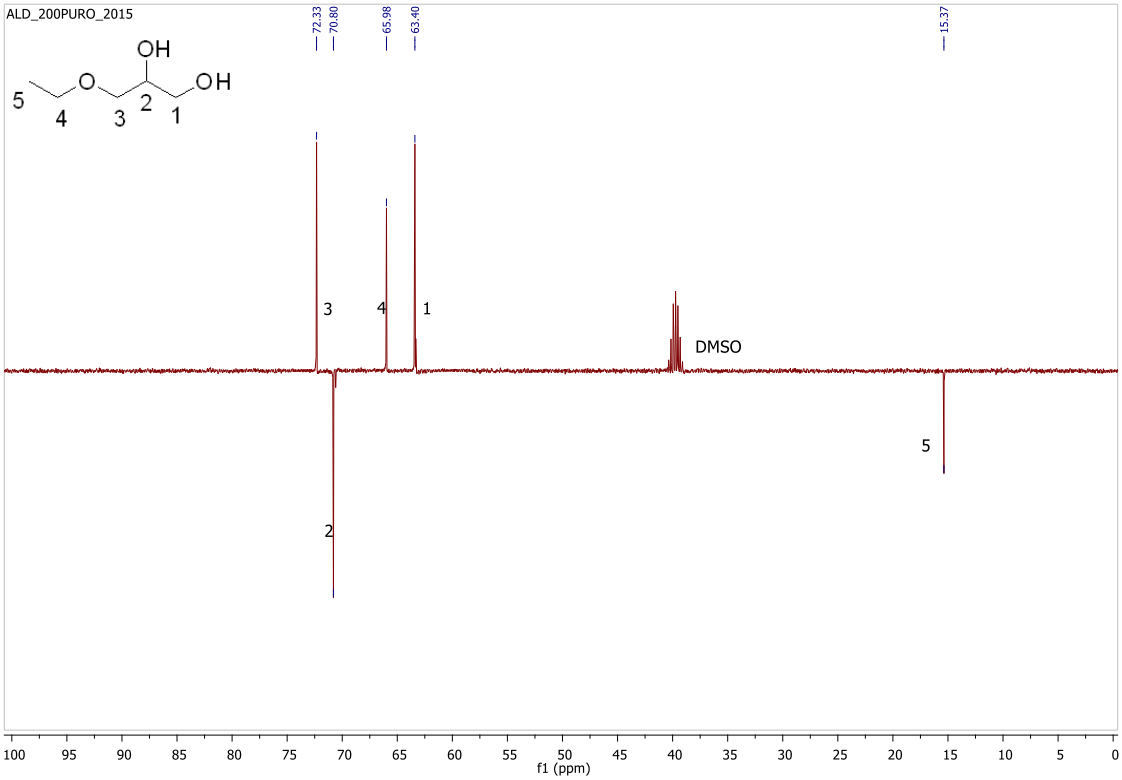


Figure S-6. ^{13}C-RMN (APT) of 3-ethoxypropan-1,2-diol [2.0.0].

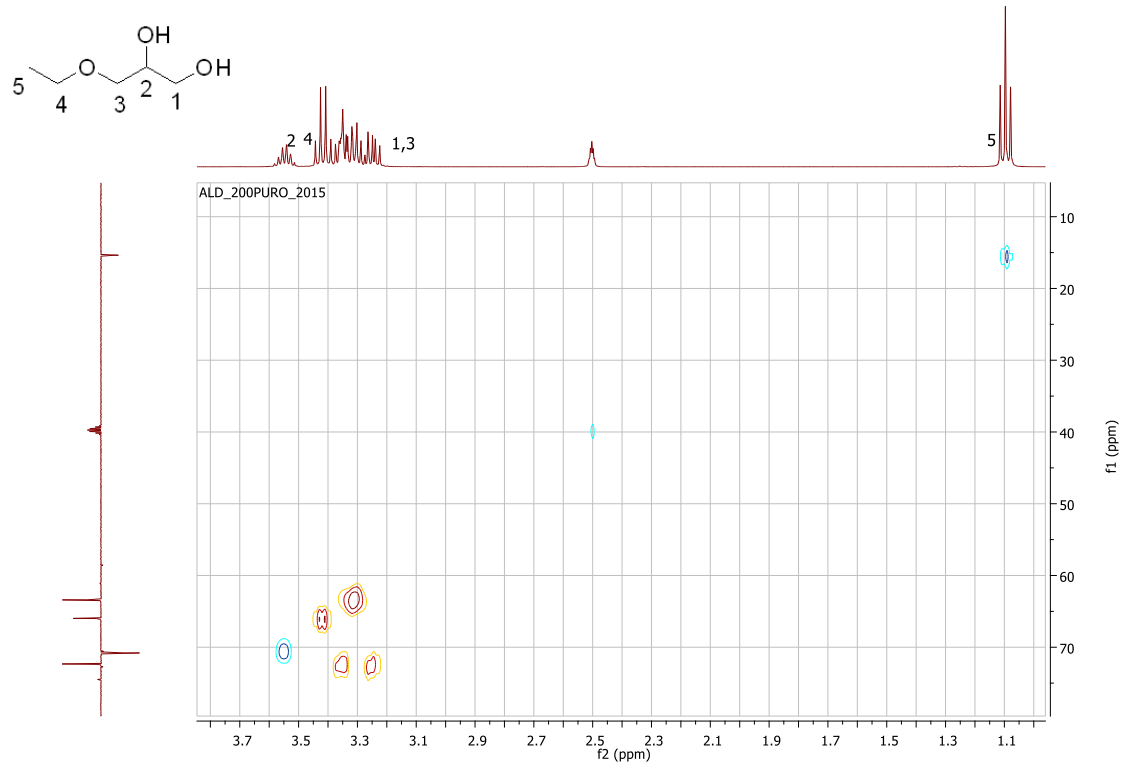
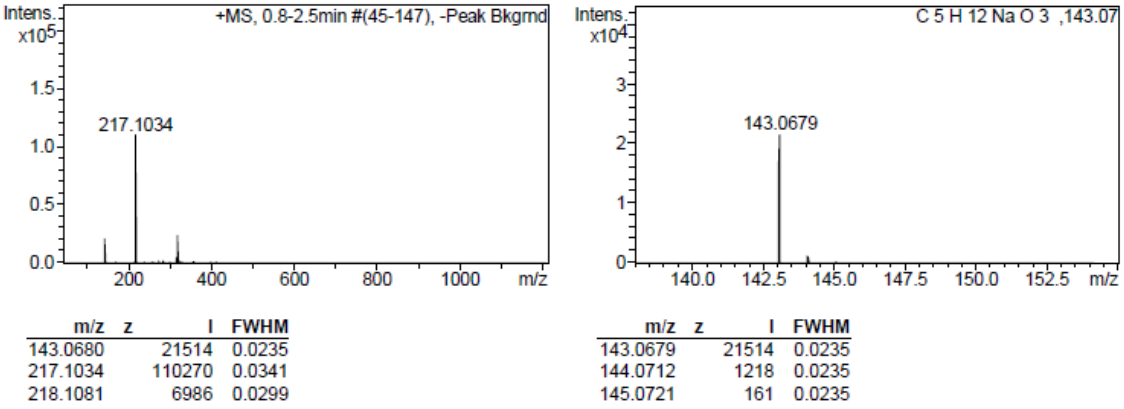


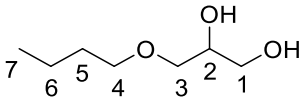
Figure S7. HSQC of 3-ethoxypropan-1,2-diol [2.0.0].



m/z	z	I	FWHM
143.0680		21514	0.0235
217.1034		110270	0.0341
218.1081		6986	0.0299

m/z	z	I	FWHM
143.0679		21514	0.0235
144.0712		1218	0.0235
145.0721		161	0.0235

Figure S-8. HRMS of 3-ethoxypropan-1,2-diol [2.0.0].



3-Butoxypropan-1,2-diol [4.0.0], CAS 624-52-2: Colorless liquid, b.p. = 250 ºC. **^{1}H NMR** (400 MHz, [d_6]DMSO, 25 ºC): δ 4.54 (d, 1H, J = 5.1 Hz, OH_2), 4.41 (t, 1H, J = 5.7 Hz, OH_1), 3.49-3.57 (sext, 1H, J = 5.2 Hz, H_2), 3.34 (t, 2H, J = 6.7 Hz, H_4), 3.19-3.32 (m, 4H, H_1, H_{3a}, H_{3b}), 1.44 (quint, 2H, J = 7.6 Hz, H_5), 1.29 (sext, 2H, J = 7.3 Hz, H_6), 0.85 (t, 3H, J = 7.4 Hz, H_7). **^{13}C NMR** (100 MHz, [d_6]DMSO, 25 ºC): δ 72.3 (CH_2, C_3), 70.6 (CH, C_2), 70.2 (CH_2, C_4), 63.2 (CH_2, C_1), 31.4 (CH_2, C_5), 18.9 (CH_2, C_6), 13.8 (CH_3, C_7). **HRMS** (ESI^+): m/z calc. = 171.0992, m/z found = 171.0996 ($M+Na^+$).

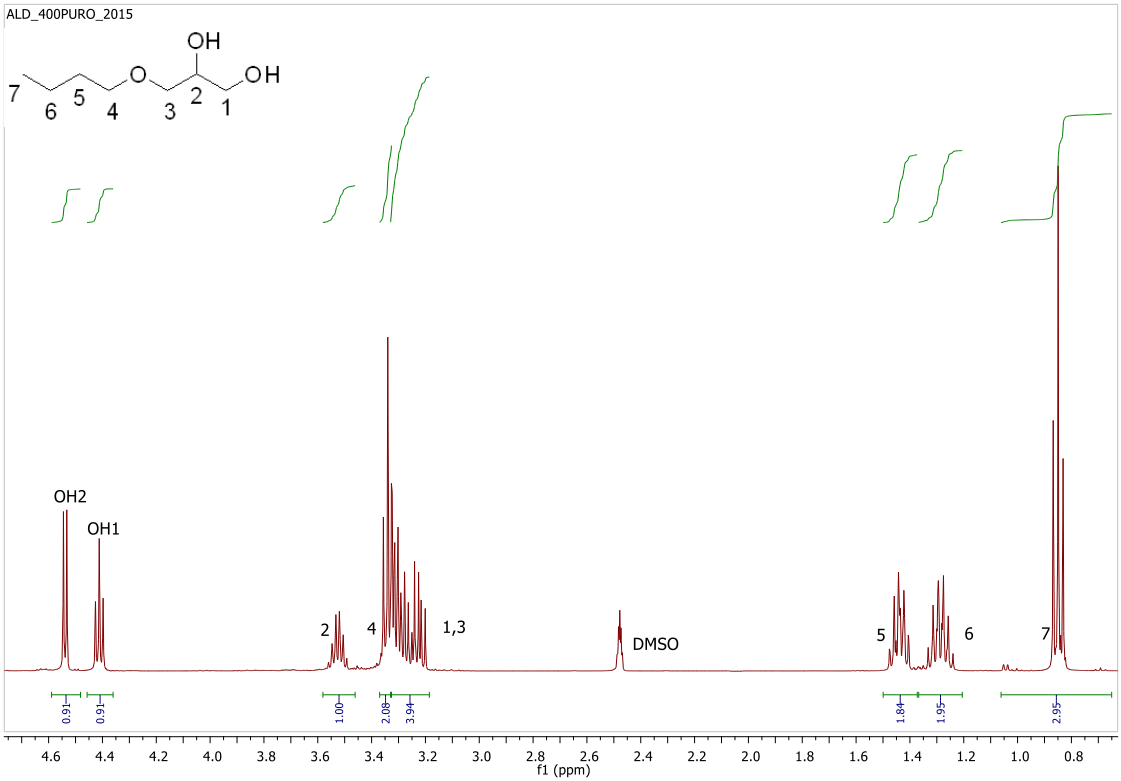


Figure S-9. ^{1}H-RMN of 3-butoxypropan-1,2-diol [4.0.0].

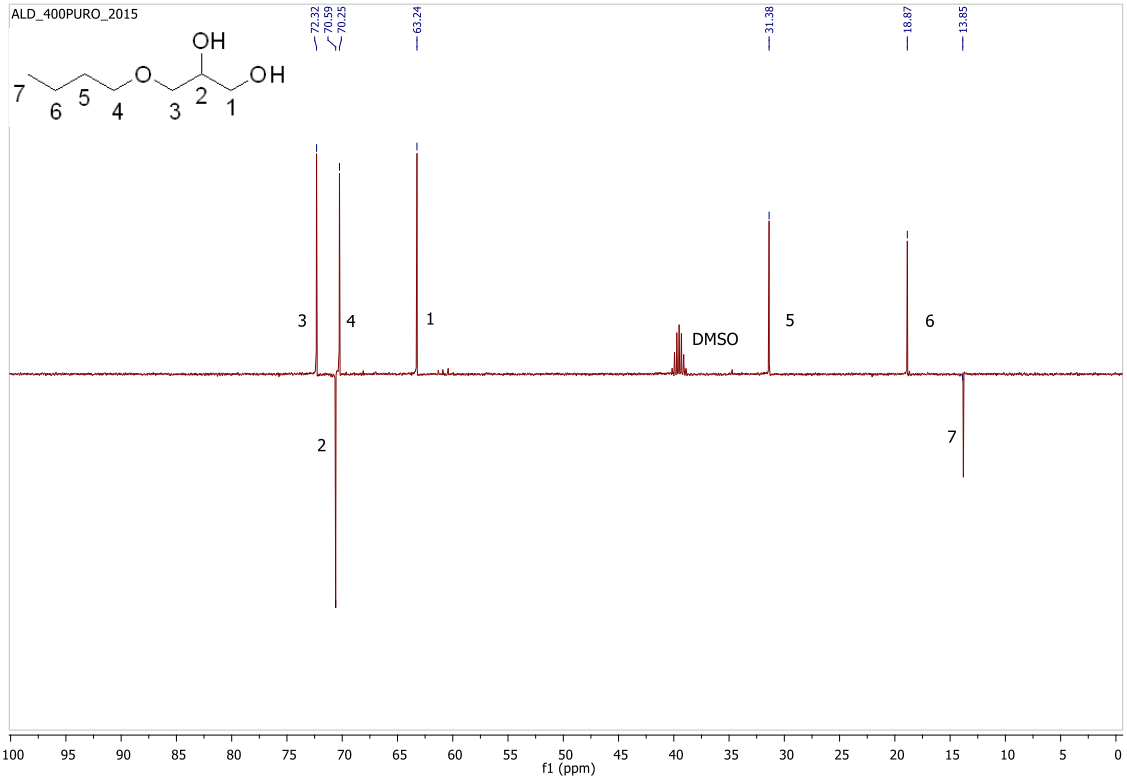


Figure S-10. ^{13}C-RMN (APT) of 3-butoxypropan-1,2-diol [4.0.0].

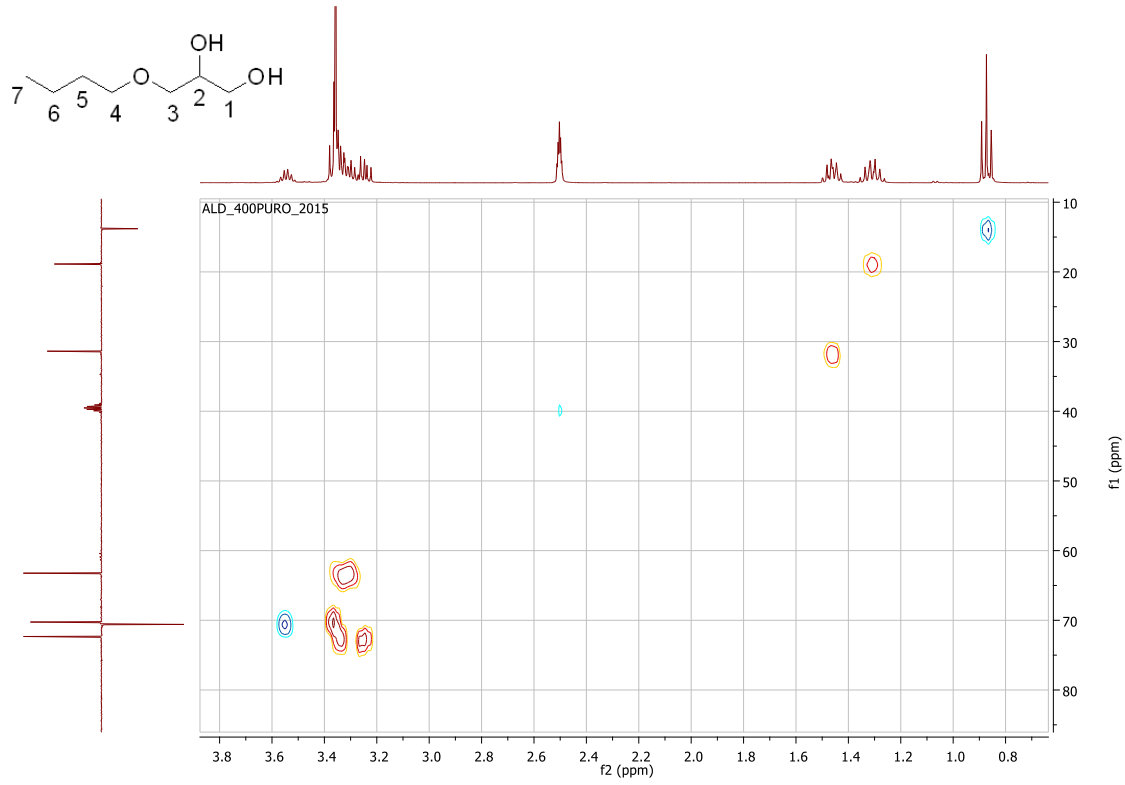
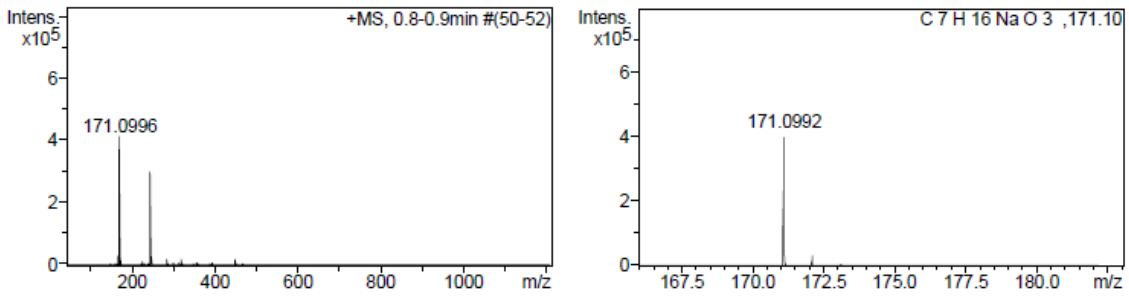


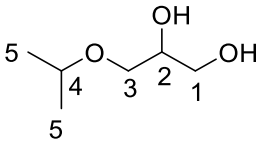
Figure S-11. HSQC of 3-butoxypropan-1,2-diol [4.0.0].



m/z	z	I	FWHM
168.0921		27789	0.0246
171.0996		413426	0.0267
172.1036		25679	0.0235

m/z	z	I	FWHM
171.0992		413426	0.0267
172.1025		32534	0.0267
173.1034		3659	0.0267

Figure S-12. HRMS of 3-butoxypropan-1,2-diol [4.0.0].



3-Isopropoxypropan-1,2-diol [3i.0.0]: Colorless liquid, b.p. = 202 ºC. **^{1}H NMR** (400 MHz, [d_6]DMSO, 25 ºC): δ 4.52 (d, 1H, *J* = 5.0 Hz, OH_2), 4.42 (t, 1H, *J* = 5.7 Hz, OH_1), 3.46-3.56 (m, 2H, H_2, H_4), 3.21-3.38 (m, 4H, H_1, H_{3a}, H_{3b}), 1.07 (d, 6H, *J* = 6.1 Hz, H_5). **^{13}C NMR** (100 MHz, [d_6]DMSO, 25 ºC): δ 71.0 (CH, C_2), 71.0 (CH, C_4), 69.7 (CH_2, C_3), 63.3 (CH_2, C_1), 22.1 (CH_3, C_5). **HRMS** (ESI^+): *m/z* calc. = 157.0835, *m/z* found = 157.0839 ($M+Na^+$).

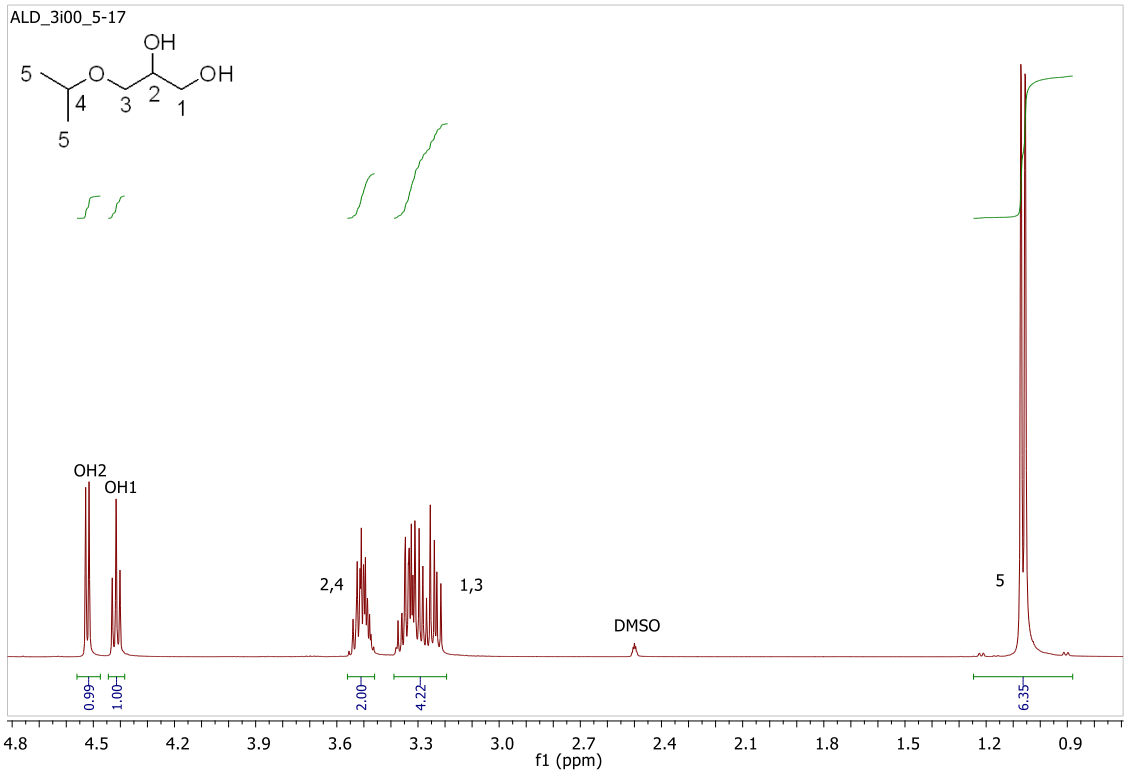


Figure S-13. ^{1}H-RMN of 3-isopropoxypropan-1,2-diol [3i.0.0].

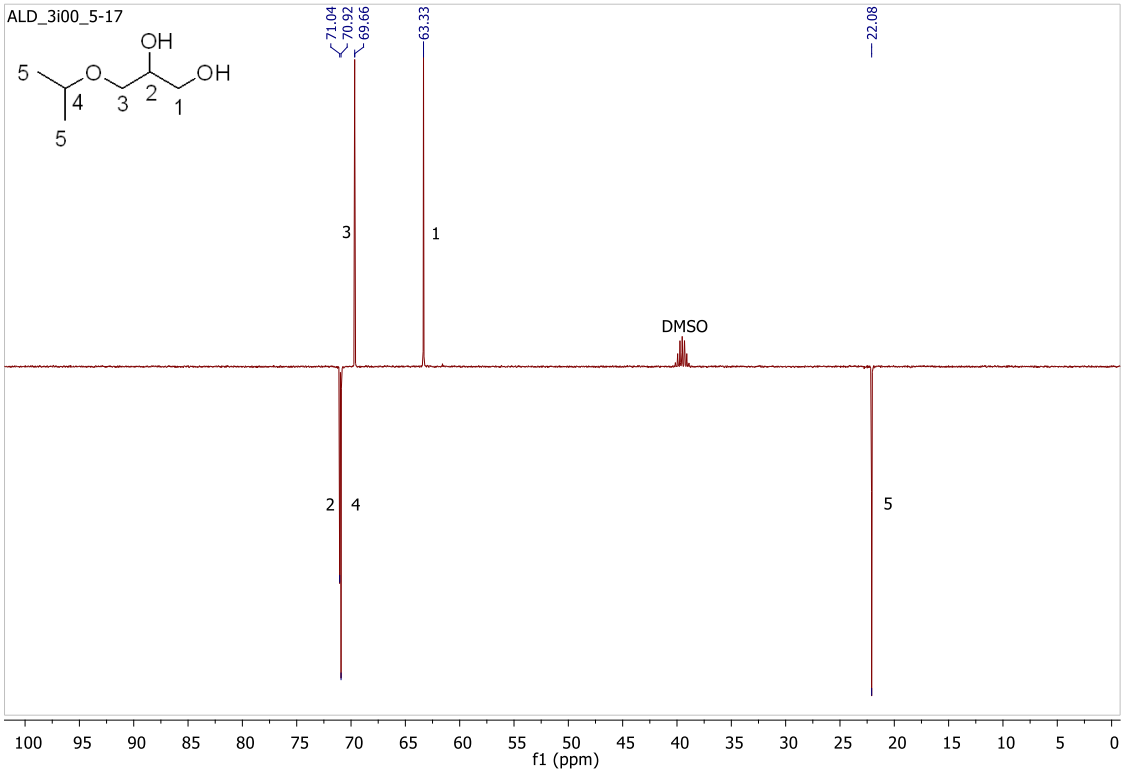


Figure S-14. ^{13}C-RMN (APT) of 3-isopropoxypropan-1,2-diol [3i.0.0].

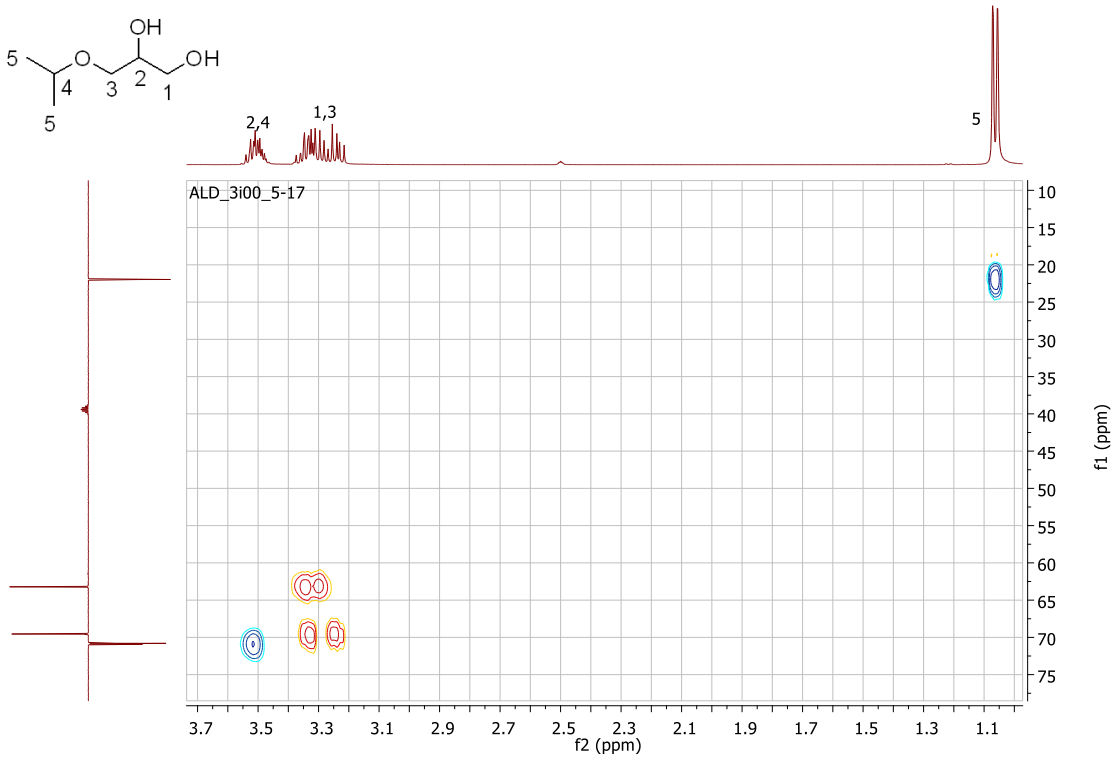
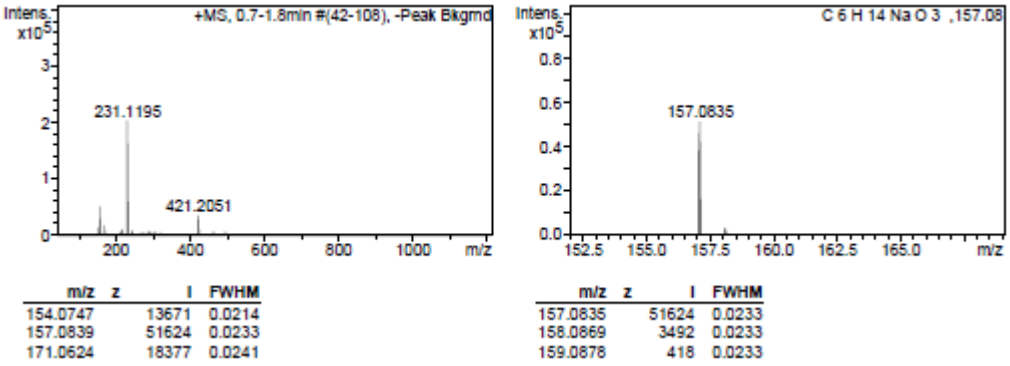


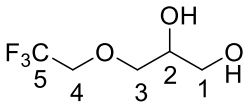
Figure S-15. HSQC of 3-isopropoxypropan-1,2-diol [3i.0.0].



m/z	z	I	FWHM
154.0747		13671	0.0214
157.0839		51624	0.0233
171.0624		18377	0.0241

m/z	z	I	FWHM
157.0835		51624	0.0233
158.0869		3492	0.0233
159.0878		418	0.0233

Figure S-16. HRMS of 3-isopropoxypropan-1,2-diol [3i.0.0].



3-(2,2,2-Trifluoroethoxy)propan-1,2-diol [3F.0.0], Colorless liquid, b.p. = 213 ºC, **^{1}H NMR** (400 MHz, [D_6]DMSO, 25 ºC): δ 4.80 (d, 1H, *J* = 5.2 Hz, OH_2), 4.57 (t, 1H, *J* = 5.6 Hz, OH_1), 4.05 (q, 2H, *J* = 9.4 Hz, H_4), 3.57-3.64 (m, 2H, H_2, H_{3a}), 3.45-3.52 (m, 1H, H_{3b}), 3.32 (dd, 2H, *J* = 5.6 Hz, 5.7 Hz, H_1). **^{13}C NMR** (100 MHz, [d_6]DMSO, 25 ºC): δ 124.6 (q, CF_3, *J* = 279.6 Hz, C_5), 73.9 (CH_2, C_3), 70.5 (CH, C_2), 67.7 (c, CH_2, *J* = 32.6 Hz, C_4), 62.7 (CH_2, C_1). **^{19}F NMR** (400 MHz, [d_6]DMSO, 25 ºC): δ –73.0 (t, CF_3, *J* = 9.4 Hz, F_5). **HRMS** (ESI^+): *m/z* calc. = 197.0396, *m/z* found = 197.0400 ($M+Na^+$).

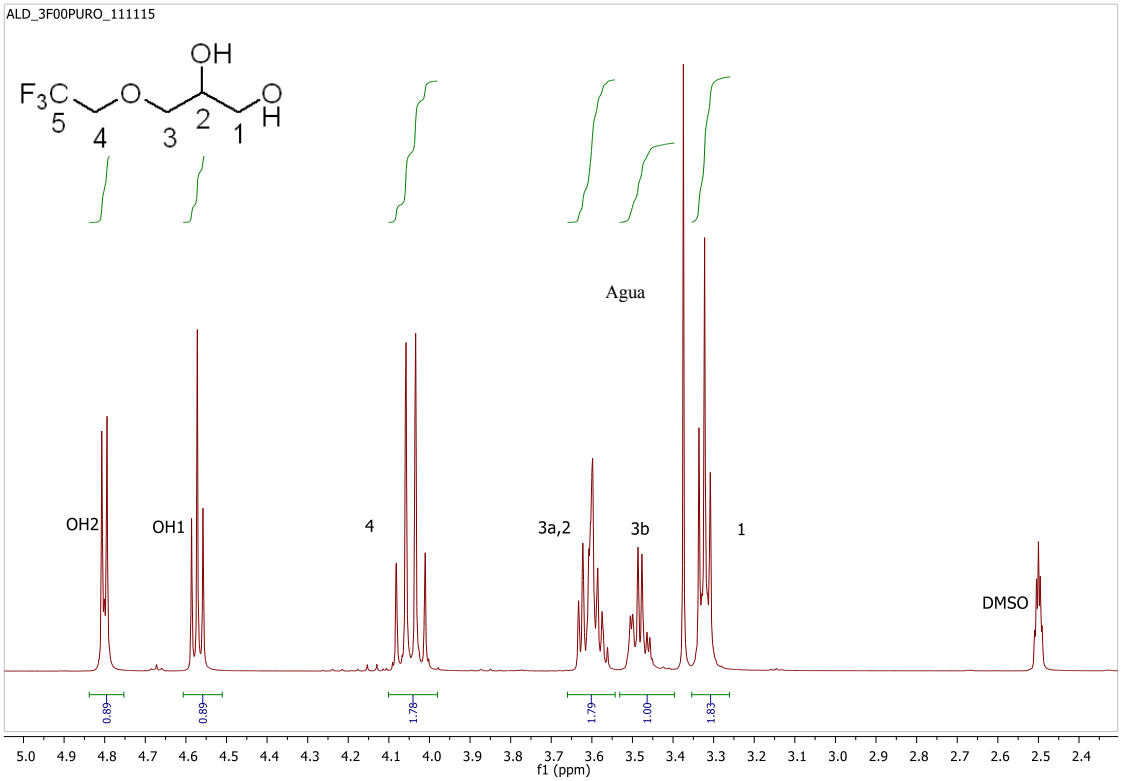


Figure S-17. ^{1}H-RMN of 3-(2,2,2-trifluoroethoxy)propan-1,2-diol [3F.0.0].

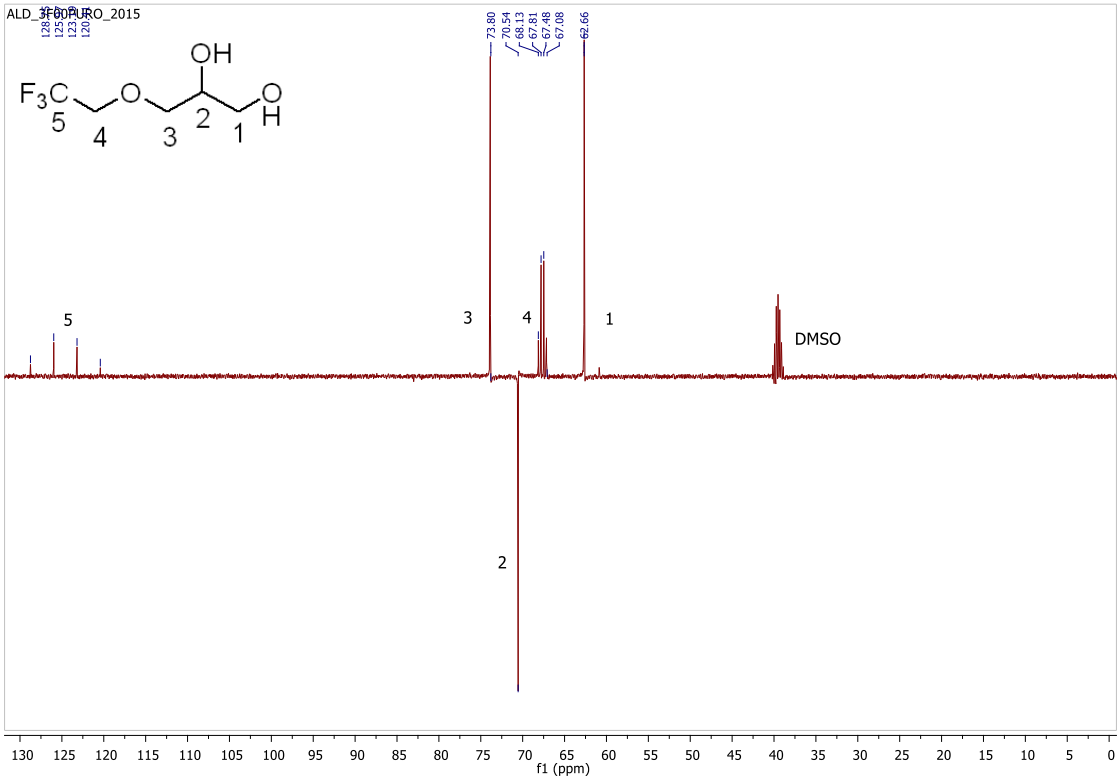


Figure S-18. ^{13}C-RMN (APT) of 3-(2,2,2-trifluoroethoxy)propan-1,2-diol [3F.0.0].

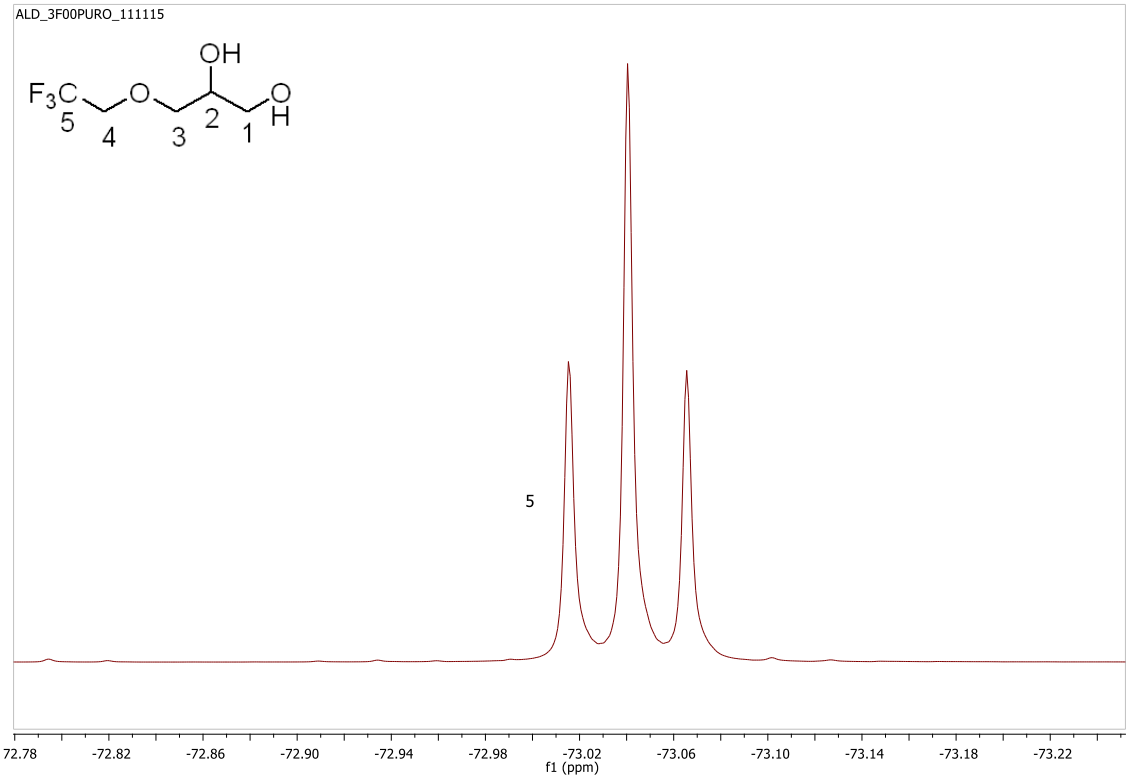


Figure S-19. ^{19}F-RMN of 3-(2,2,2-trifluoroethoxy)propan-1,2-diol [3F.0.0].

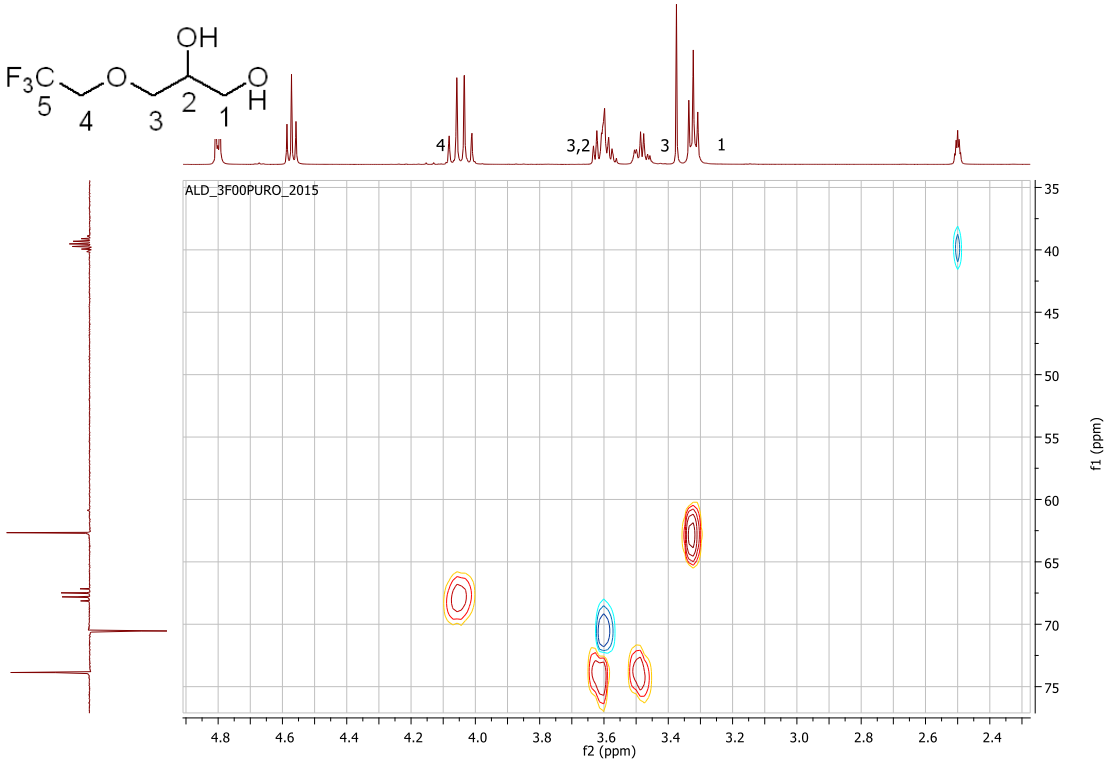


Figure S-20. HSQC of 3-(2,2,2-trifluoroethoxy)propan-1,2-diol [3F.0.0].

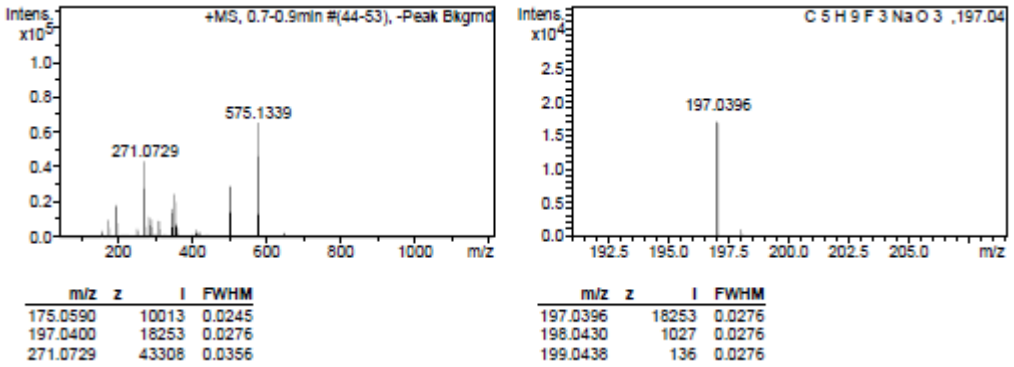
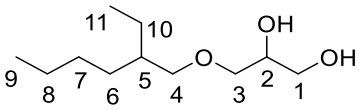


Figure S-21. HRMS of 3-(2,2,2-trifluoroethoxy)propan-1,2-diol [3F.0.0].



3-(2-Ethylhexyloxy)propan-1,2-diol [6(2).0.0], CAS 70445-33-9: Colorless liquid, b.p. = 285 ºC. **^{1}H NMR** (400 MHz, [d_6]DMSO, 25 ºC): δ 4.57 (d, 1H, J = 5.0 Hz, OH_2), 4.45 (t, 1H, J = 5.7 Hz, OH_1), 3,55 (sext, 1H, J = 5.5 Hz, H_2), 3.20-3.38 (m, 6H, H_1, H_3, H_4), 1.43 (sept, 1H, J = 5.9 Hz, H_5), 1.15-1.37 (m, 8H, H_6, H_7, H_8, H_{10}), 0.86 (t, 3H, J = 6.6 Hz, H_9), 0.83 (t, 3H, J = 7.4 Hz, H_{11}). **^{13}C NMR** (100 MHz, [d_6]DMSO, 25 ºC): δ 73.4 (CH_2, C_4), 72.6 (CH_2, C_3), 70.6 (CH, C_2), 63.3 (CH_2, C_1), 39.1 (CH, C_5), 30.0 (CH_2, C_6), 28.6 (CH_2, C_7), 23.4 (CH_2, C_{10}), 22.6 (CH_2, C_8), 14.0 (CH_3, C_9), 11.0 (CH_3, C_{11}). **HRMS** (ESI^+): m/z calc. = 227.1618, m/z found = 227.1607 (M+Na).

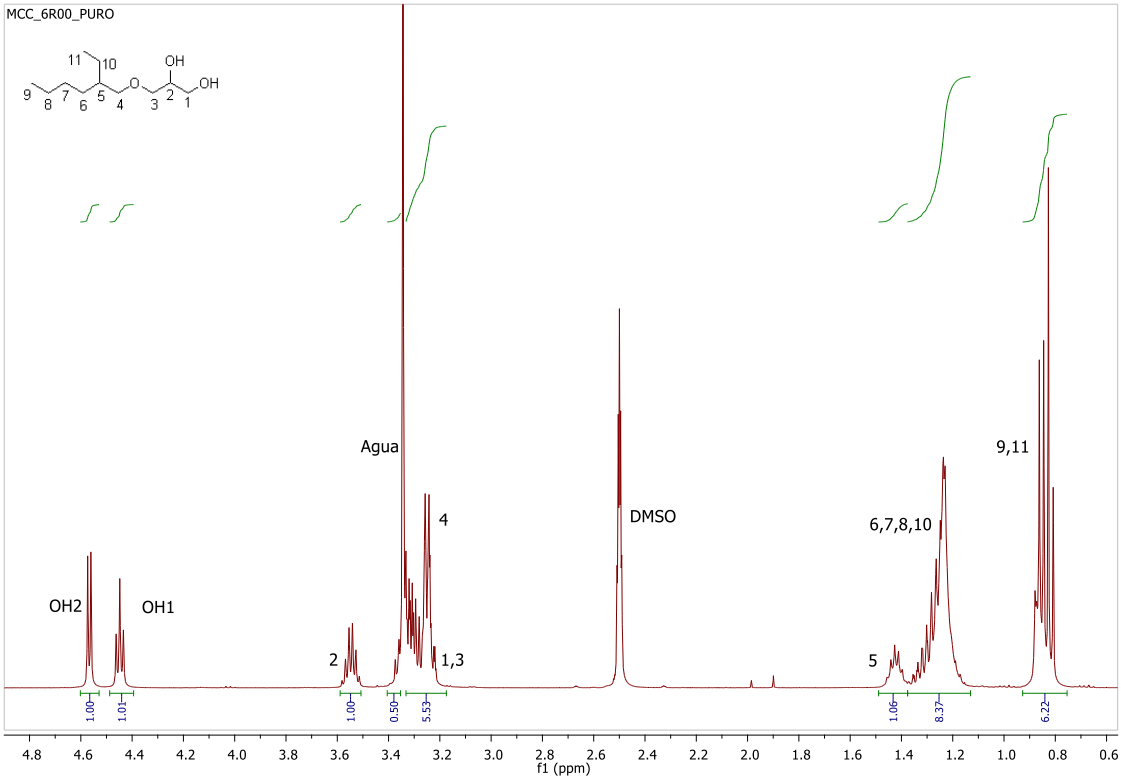


Figure S-22. [1]H-RMN of 3-(2-ethylhexyloxy)propan-1,2-diol [6(2).0.0].

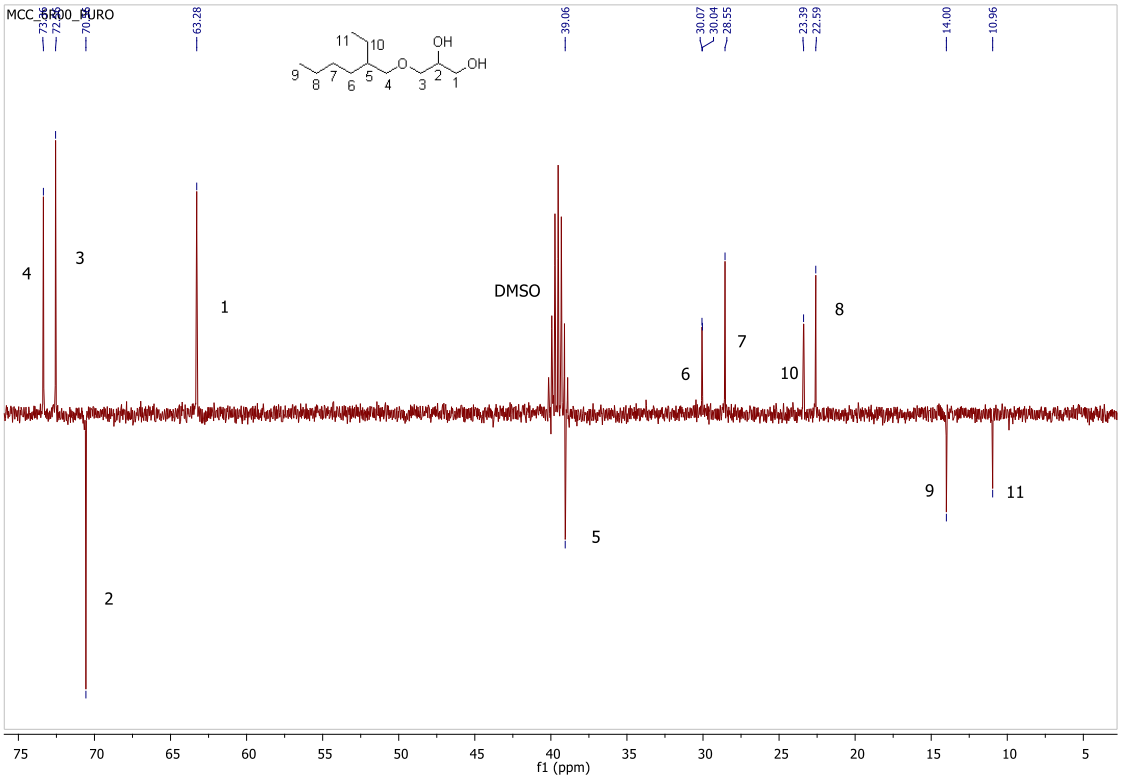


Figure S-23. [13]C-RMN (APT) of 3-(2-ethylhexyloxy)propan-1,2-diol [6(2).0.0].

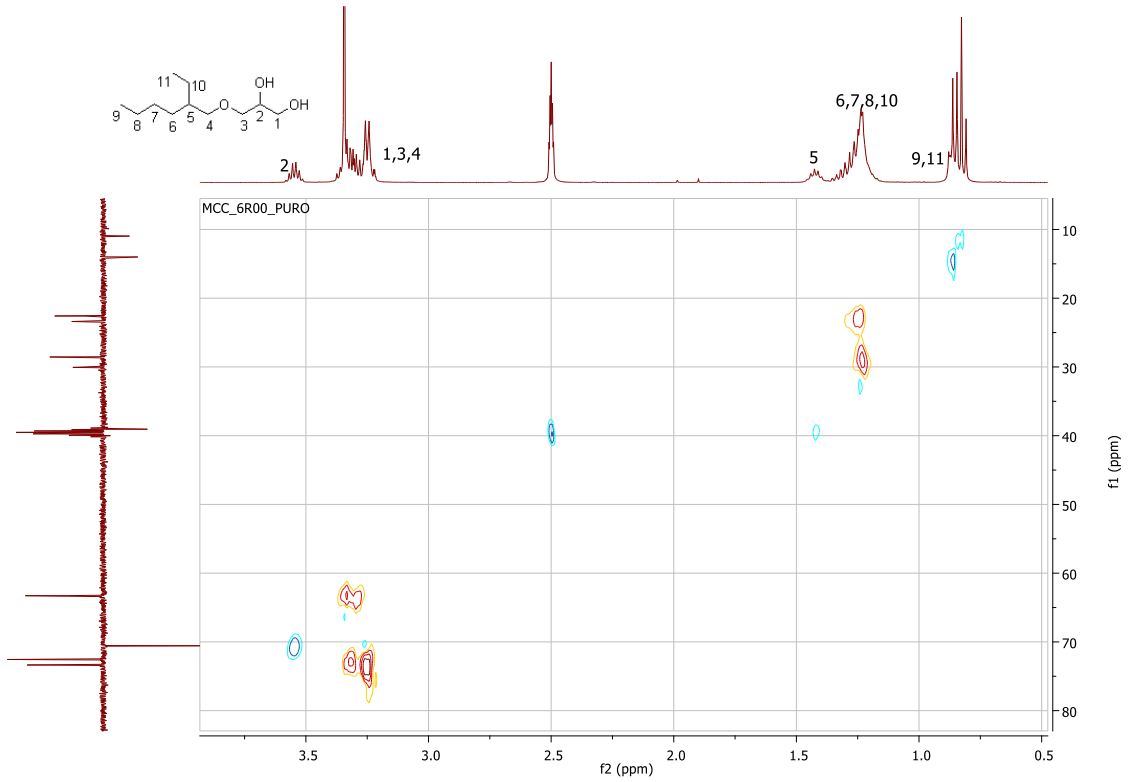
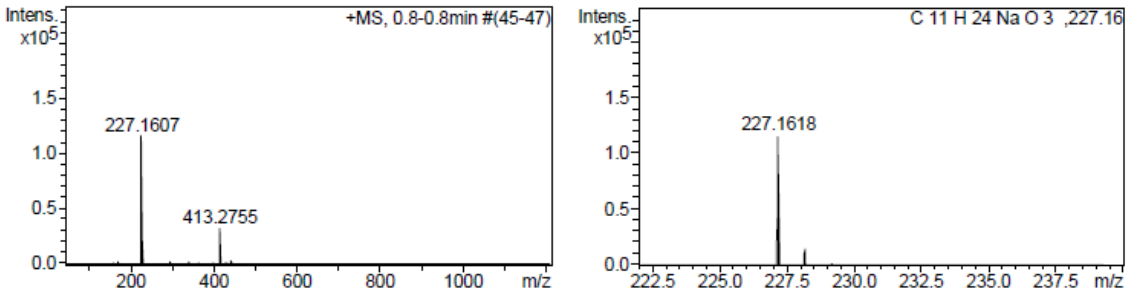


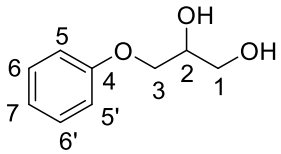
Figure S-24. HSQC of 3-(2-ethylhexyloxy)propan-1,2-diol [6(2).0.0].



m/z	z	I	FWHM
171.0997		1589	0.0260
226.9523		3414	0.0322
227.1607		116094	0.0363

m/z	z	I	FWHM
227.1618		116094	0.0363
228.1651		14265	0.0363
229.1685		1517	0.0363

Figure S-25. HRMS of 3-(2-ethylhexyloxy)propan-1,2-diol [6(2).0.0].



3-Phenoxypropan-1,2-diol, [Ph.0.0], White solid, CAS 538-43-2: **^{1}H NMR** (400 MHz, [d_6]DMSO, 25 ºC): δ 7.24-7.30 (m, 2H, $H_{6,6'}$), 6.89-6.94 (m, 3H, $H_{5,5'}$, H_7), 4.95 (d, 1H, J = 5.1 Hz, OH_2), 4.67 (t, 1H, J = 5.7 Hz, OH_1), 3.98 (dd, 1H, J_{gem} = 9.7 Hz, J = 5.1 Hz, H_{3a}), 3.84 (dd, 1H, J_{gem} = 9.7 Hz, J = 5.1 Hz, H_{3b}), 3.79 (sext, 1H, J = 5.1 Hz, H_2), 3.44 (t, 2H, J = 5.5 Hz, H_1). **^{13}C NMR** (100 MHz, [d_6]DMSO, 25 ºC): δ 158.7 (C, C_4), 129.5 (CH, $C_{6,6'}$), 120.4 (CH, C_7), 114.5 (CH, $C_{5,5'}$), 70.0 (CH, C_2), 69.4 (CH_2, C_3), 62.7 (CH_2, C_1). **HRMS** (ESI^+): *m/z* calc. = 191.0679, *m/z* found = 191.0674 ($M+Na^+$).

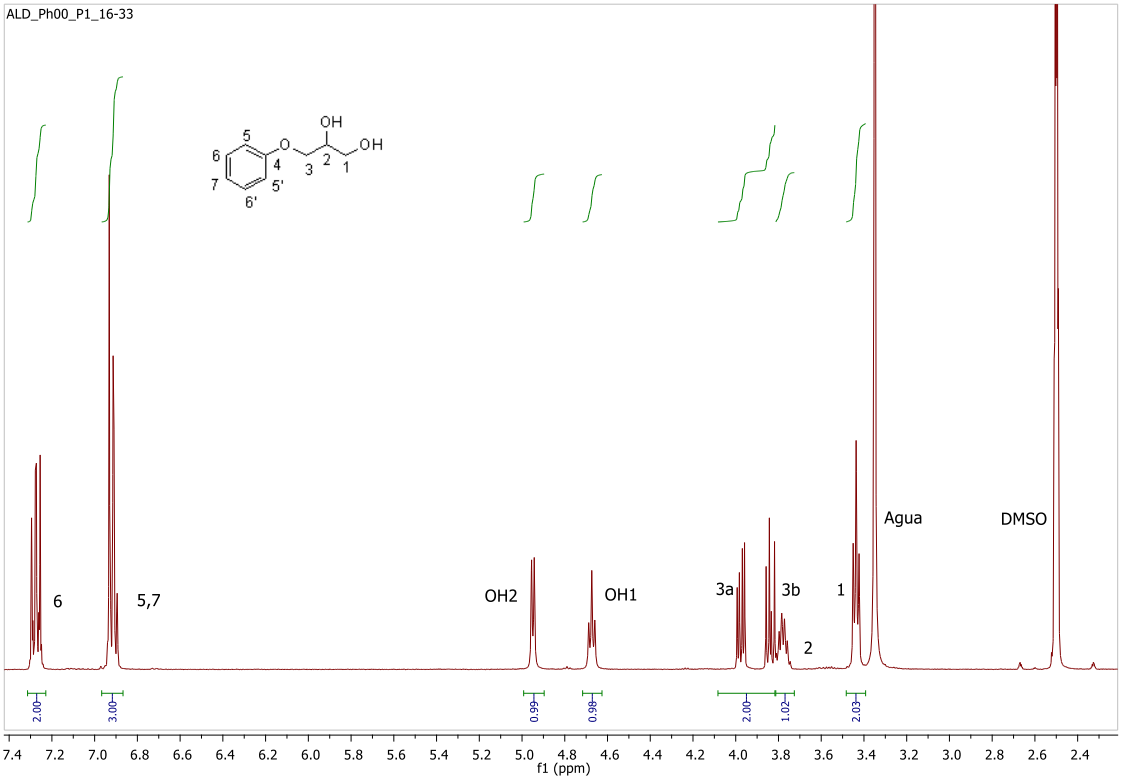


Figure S-26. ^{1}H-RMN of 3-phenoxypropan-1,2-diol, [Ph.0.0].

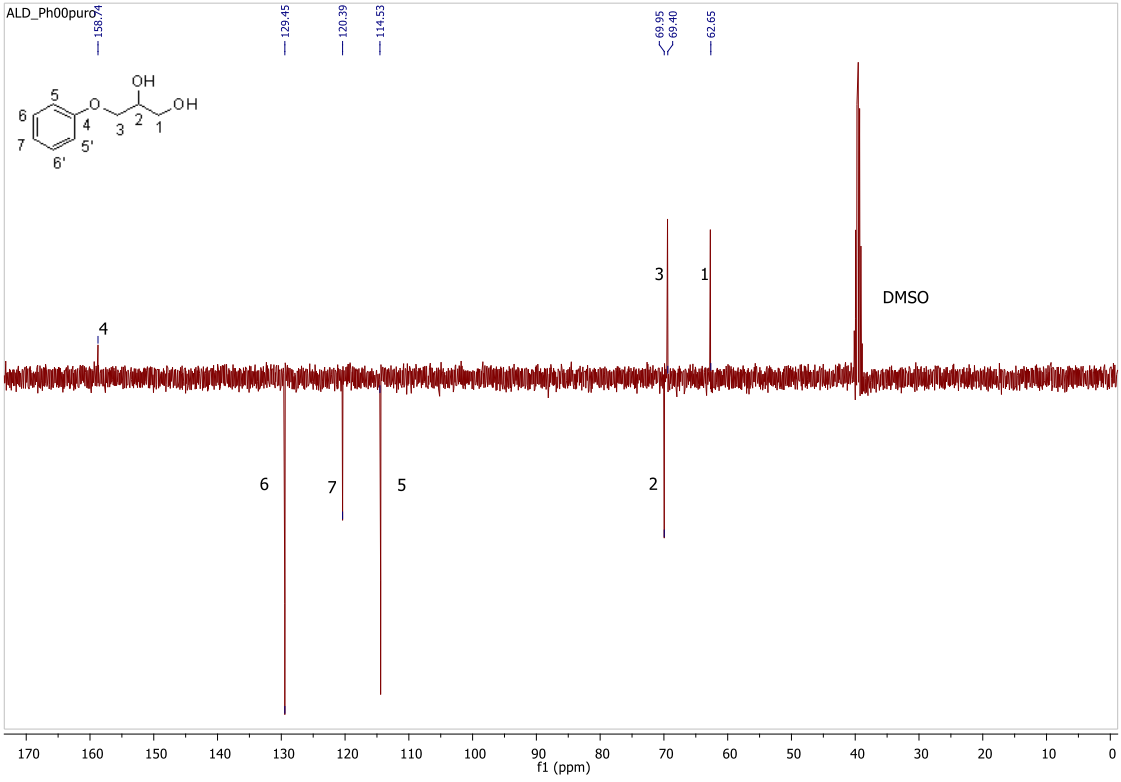


Figure S-27. ^{13}C-RMN (APT) of 3-phenoxypropan-1,2-diol, [Ph.0.0].

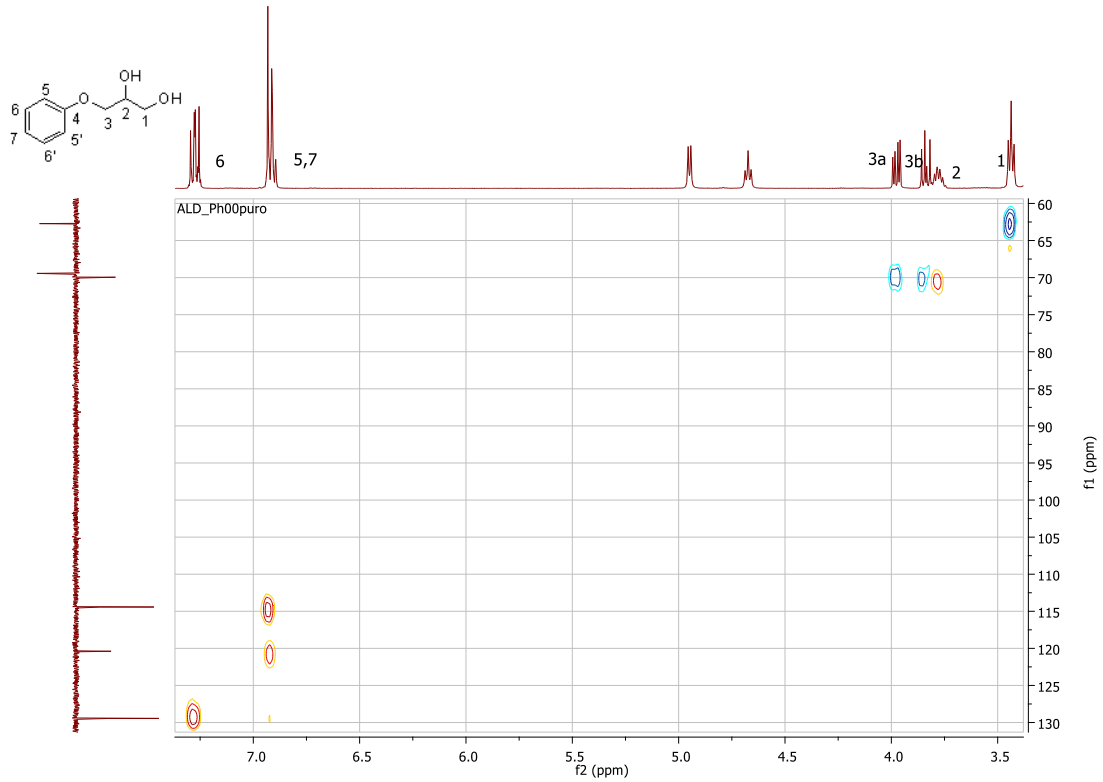
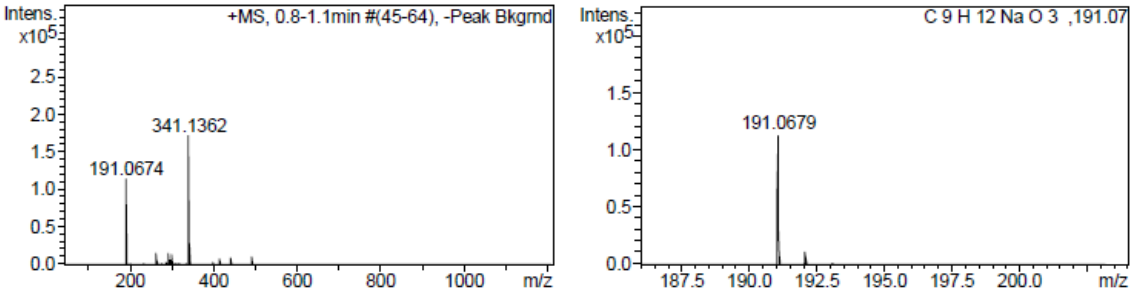


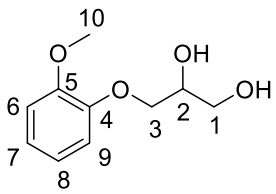
Figure S-28. HSQC of 3-phenoxypropan-1,2-diol, [Ph.0.0].



m/z	z	I	FWHM
191.0674		114151	0.0307
192.0710		8612	0.0260
263.0882		15625	0.0354

m/z	z	I	FWHM
191.0679		114151	0.0307
192.0712		11400	0.0307
193.0721		1213	0.0307

Figure S-29. HRMS of 3-phenoxypropan-1,2-diol, [Ph.0.0].



3-(2-Methoxyphenoxy)propan-1,2-diol, Guaiphenesin, [G.0.0], White solid, CAS 93-14-1: **^{1}H NMR** (400 MHz, [d_6]DMSO, 25 ºC): δ 6.91-6.98 (m, 2H, H_6, H_9), 6.83-6.91 (m, 2H, H_7, H_8), 4.90 (d, 1H, J = 5.0 Hz, OH_2), 4.63 (t, 1H, J = 5.7 Hz, OH_1), 3.94 (dd, 1H, J_{gem} = 9.6 Hz, J = 4.3 Hz, H_{3a}), 3.83 (dd, 1H, J_{gem} = 9.6 Hz, J = 6.0 Hz, H_{3b}), 3.76-3.82 (m, 1H, H_2), 3.75 (s, 3H, H_{10}), 3.39-3.49 (m, 2H, H_1). **^{13}C NMR** (100 MHz, [d_6]DMSO, 25 ºC): δ 149.1 (C, C_5), 148.3 (C, C_4), 120.8 (CH, C_7), 120.7 (CH, C_8), 113.3 (CH, C_9), 112.3 (CH, C_6), 70.3 (CH_2, C_3), 70.0 (CH, C_2), 62.9 (CH_2, C_1), 55,5 (CH_3, C_{10}). **HRMS** (ESI$^+$): *m/z* calc. = 221.0784, *m/z* found = 221.0786 (M+Na$^+$).

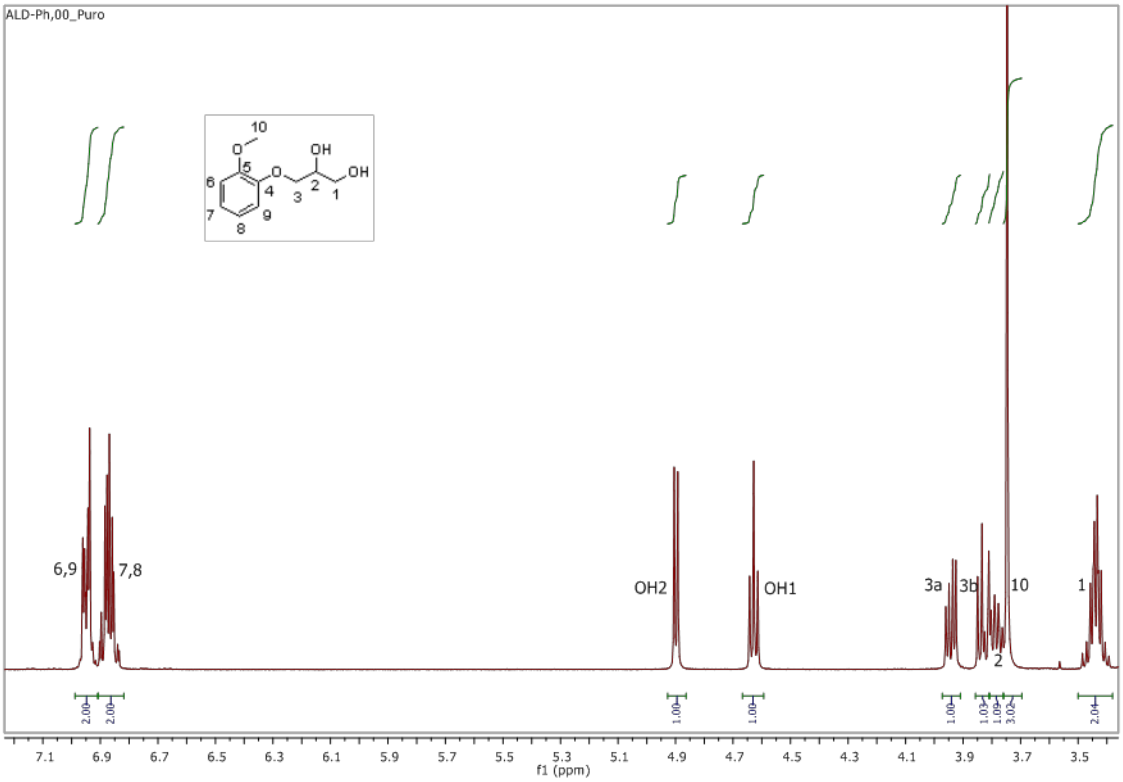


Figure S-30. ^{1}H-RMN of 3-(2-methoxyphenoxy)-propan-1,2-diol, [G.0.0].

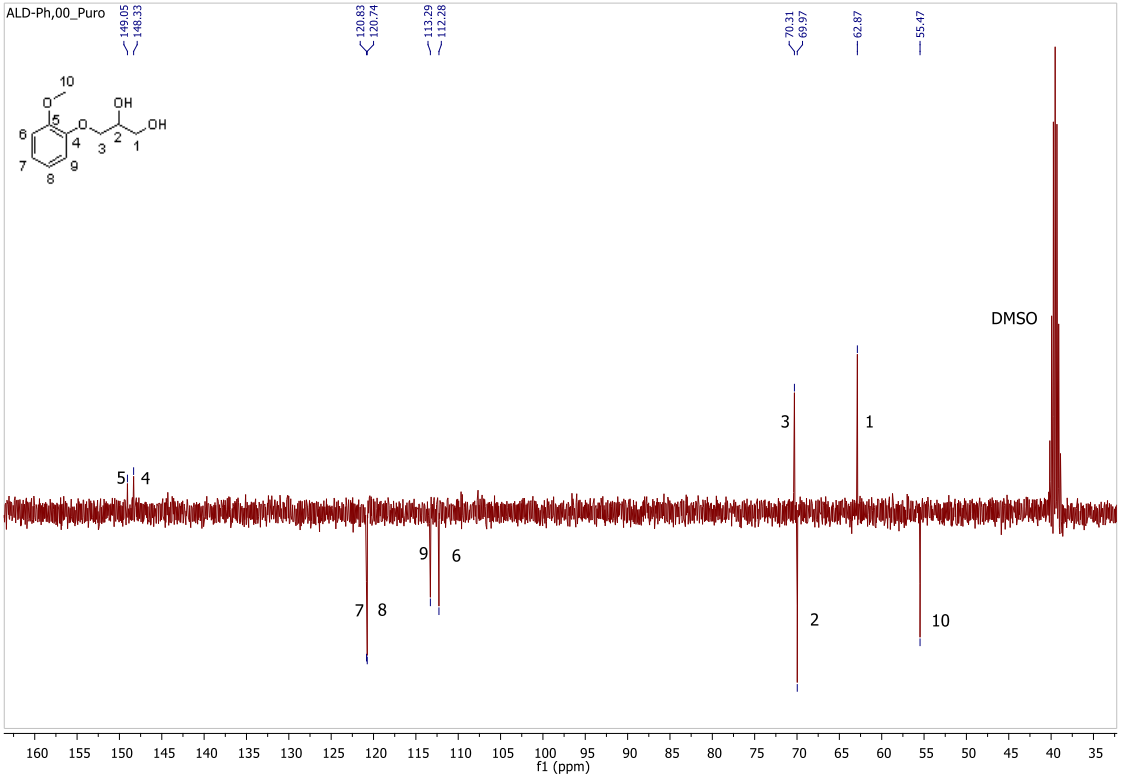


Figure S-31. ^{13}C-RMN (APT) of 3-(2-methoxyphenoxy)propan-1,2-diol, [G.0.0].

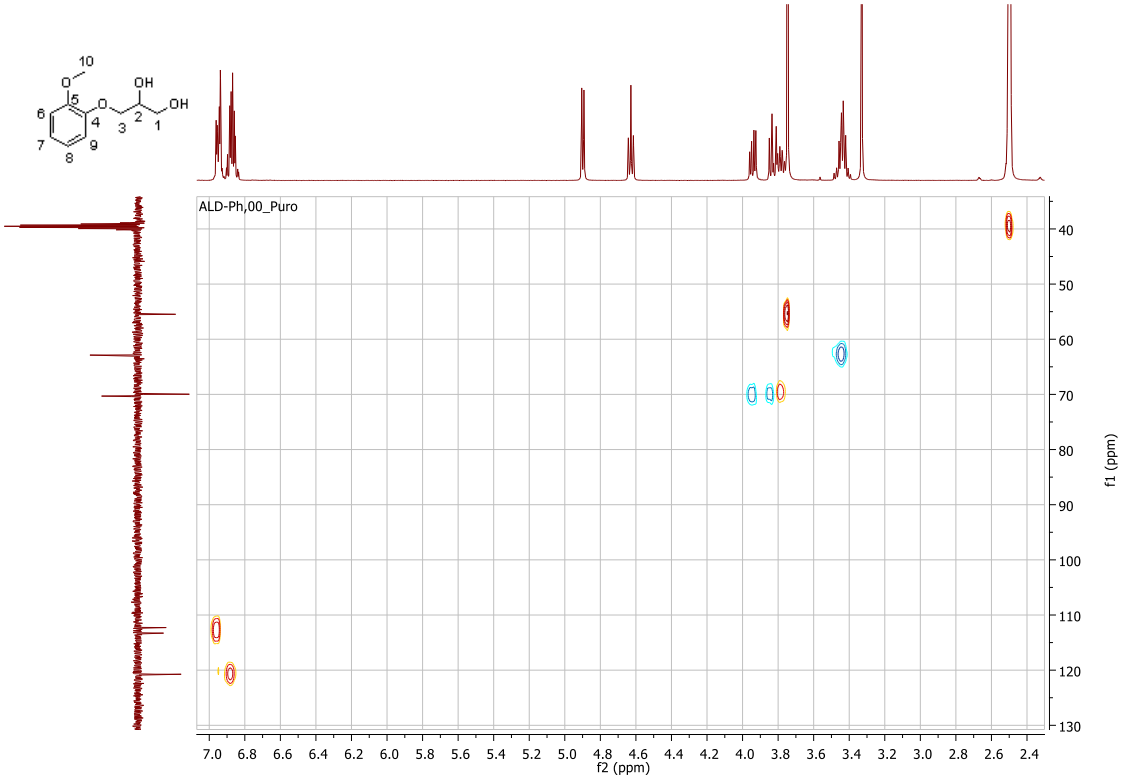


Figure S-32. HSQC of 3-(2-methoxyphenoxy)propan-1,2-diol, [G.0.0].

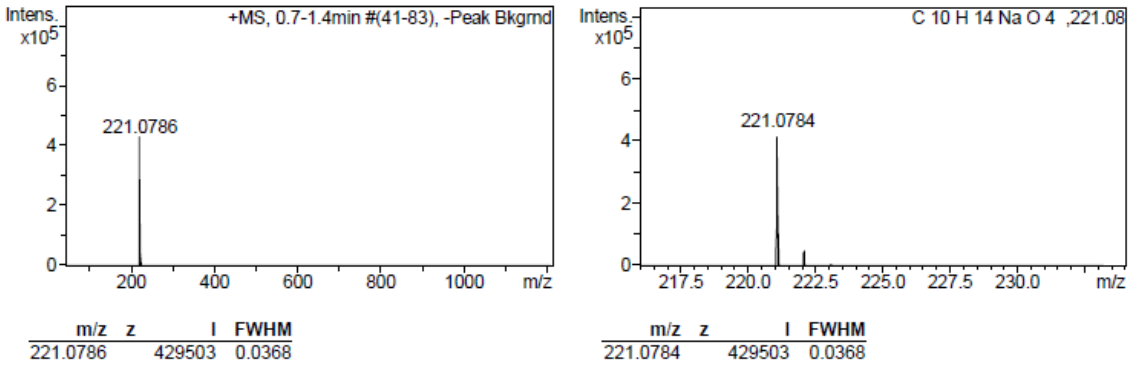
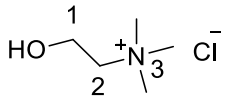


Figure S-33. HRMS of 3-(2-methoxyphenoxy)propan-1,2-diol, [G.0.0].

2.2 Used ammonium salts description



Choline Chloride, [ChCl], White hygroscopic solid, CAS 67-48-1: **^{1}H NMR** (400 MHz, [d_6]DMSO, 25 ºC): δ 5.66 (t, 1H, *J* = 5.6 Hz, OH_1), 3.78-3.84 (m, 2H, H_1), 3.44 (dd, 2H, *J* = 6.0 Hz, 4.2 Hz, H_2), 3.15 (s, 9H, H_3). **^{13}C NMR** (100 MHz, [d_6]DMSO, 25 ºC): δ 66.9 (CH_2, C_2), 55.0 (CH_2, C_1), 53.0 (CH_3, C_3). **HRMS** (ESI^+): *m/z* calc. = 104.1070, *m/z* found = 104.1080 (M^+). m/z: 139.08 [M^+Cl^-]. m. p. = 302 ºC.

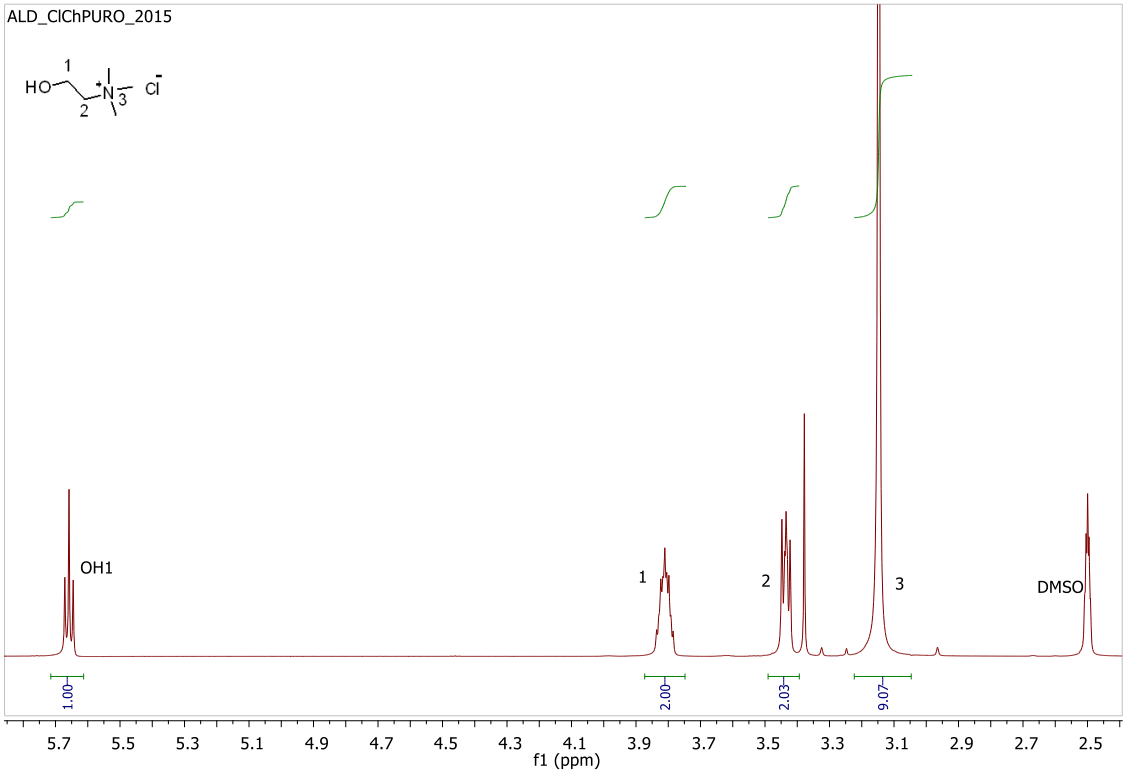


Figure S-34. [1]H-RMN of ammonium salt choline chloride [ChCl].

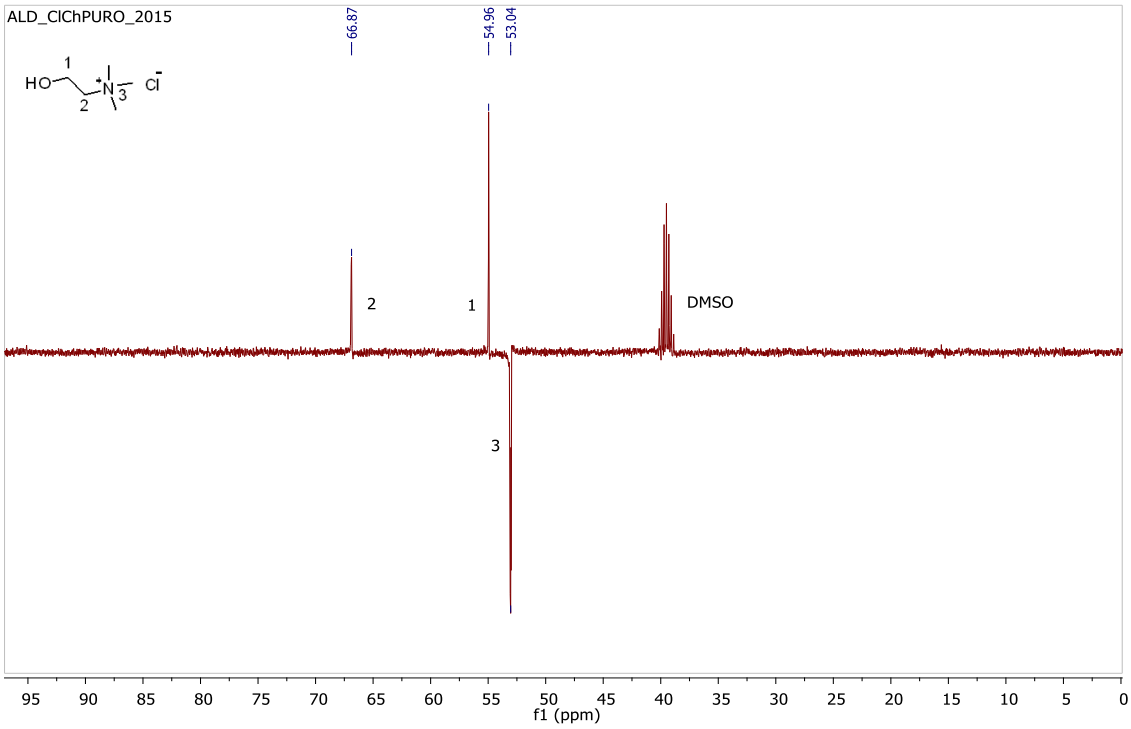


Figure S-35. [13]C-RMN (APT) of salt choline chloride [ChCl].

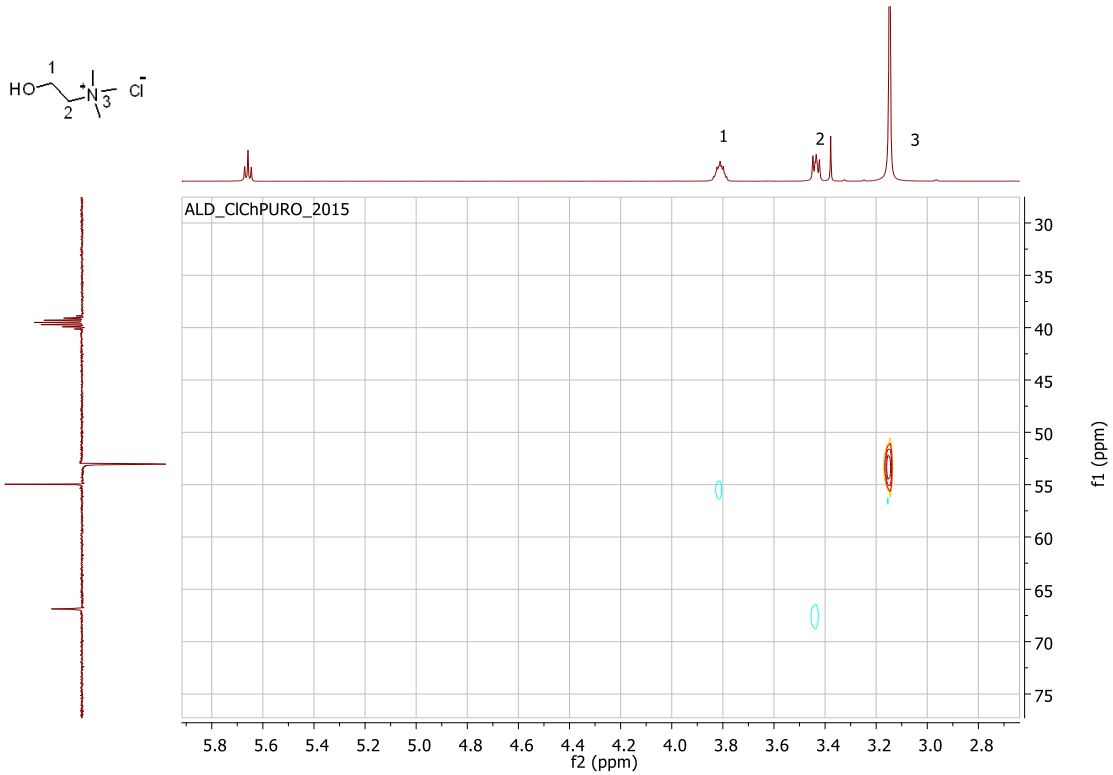


Figure S-36. HSQC of salt choline chloride [ChCl].

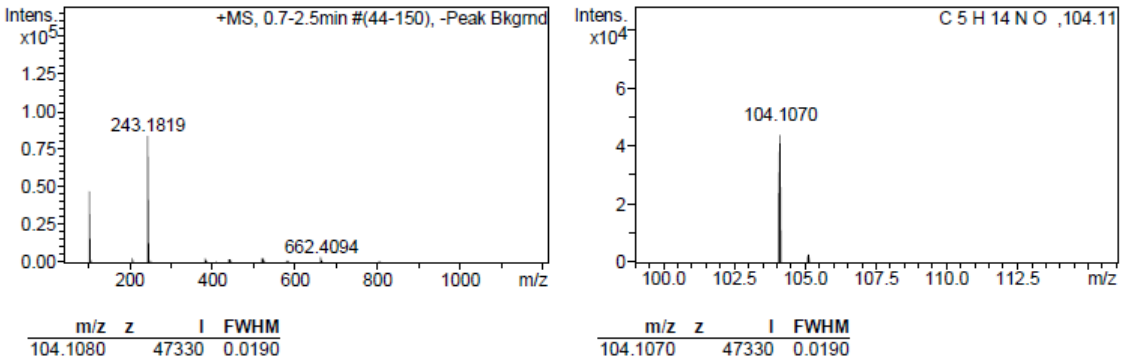
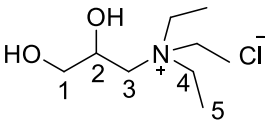


Figure S-37. HRMS of salt choline chloride [ChCl]. 243.1819 peak comes from the used matrix.



***N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride, [N00Cl],** White solid, CAS 35648-99-8: **^{1}H NMR** (400 MHz, D_2O, 25 ºC): δ 4.18-4.26 (m, 1H, H_2), 3.63 (dd, 1H, J_{gem} = 11.6 Hz, J = 5.5 Hz, H_{1a}), 3.56 (dd, 1H, J_{gem} = 11.6 Hz, J = 6.0 Hz, H_{1b}), 3.27-3.52 (m, 8H, H_3, H_4), 1,31 (t, 9H, J = 7.2 Hz, H_5). ^{1}H NMR (400 MHz, [d_6]DMSO, 25 ºC): δ 5.56 (d, 1H, J = 5.7 Hz, OH_2), 5.19 (t, 1H, J = 5.2 Hz, OH_1), 3.92-4.01 (m, 1H, H_2), 3.16-3.48 (m, 10H, H_1, H_3, H_4), 1.19 (t, 9H, J = 7.1 Hz, H_5). **^{13}C NMR** (100 MHz, [d_6]DMSO, 25 ºC): δ 65.6 (CH, C_2), 63.7 (CH_2, C_1), 59.5 (CH_2, C_3), 52.9 (CH_2, C_4), 7.2 (CH_3, C_5). **HRMS** (ESI^+): *m/z* calc. = 176.1645, *m/z* found = 176.1639 (M^+). m/z: 211.41 [M^+Cl^-]. m. p. = 102-160 ºC.

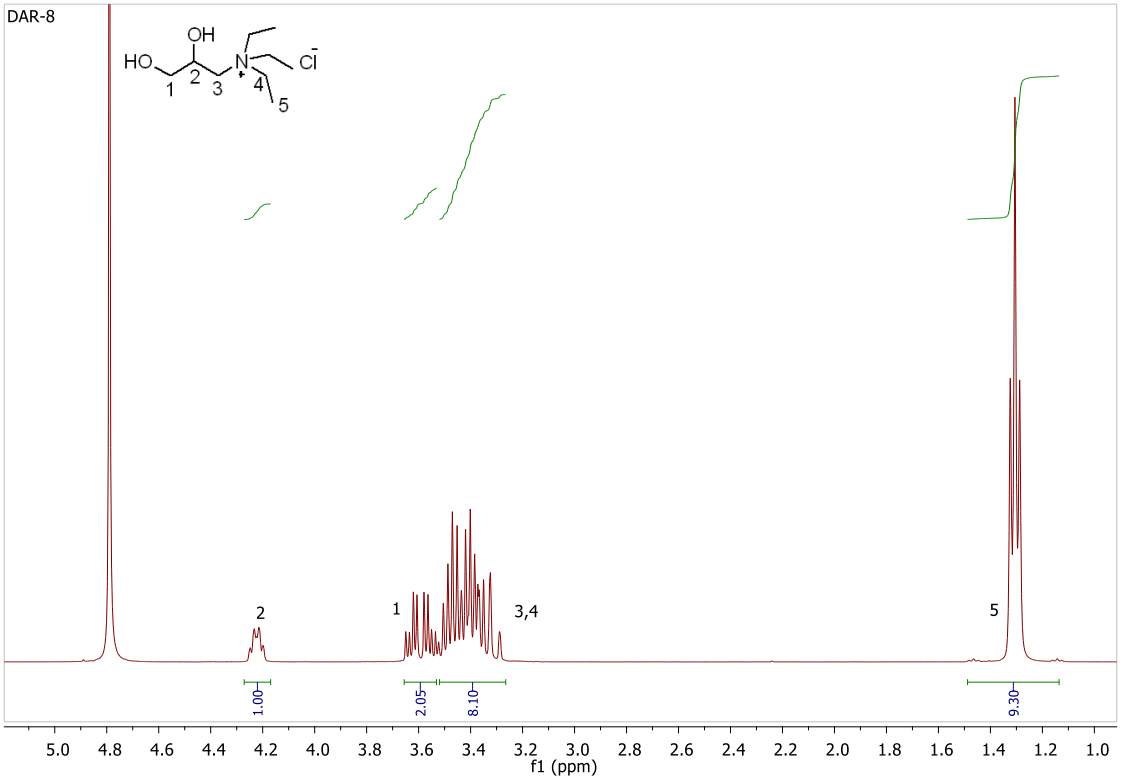


Figure S-38. ^{1}H-RMN (D_2O) of salt *N*,*N*,*N*-triethyl-2,3-dihydroxipropan-1-aminium chloride [N.0.0.Cl].

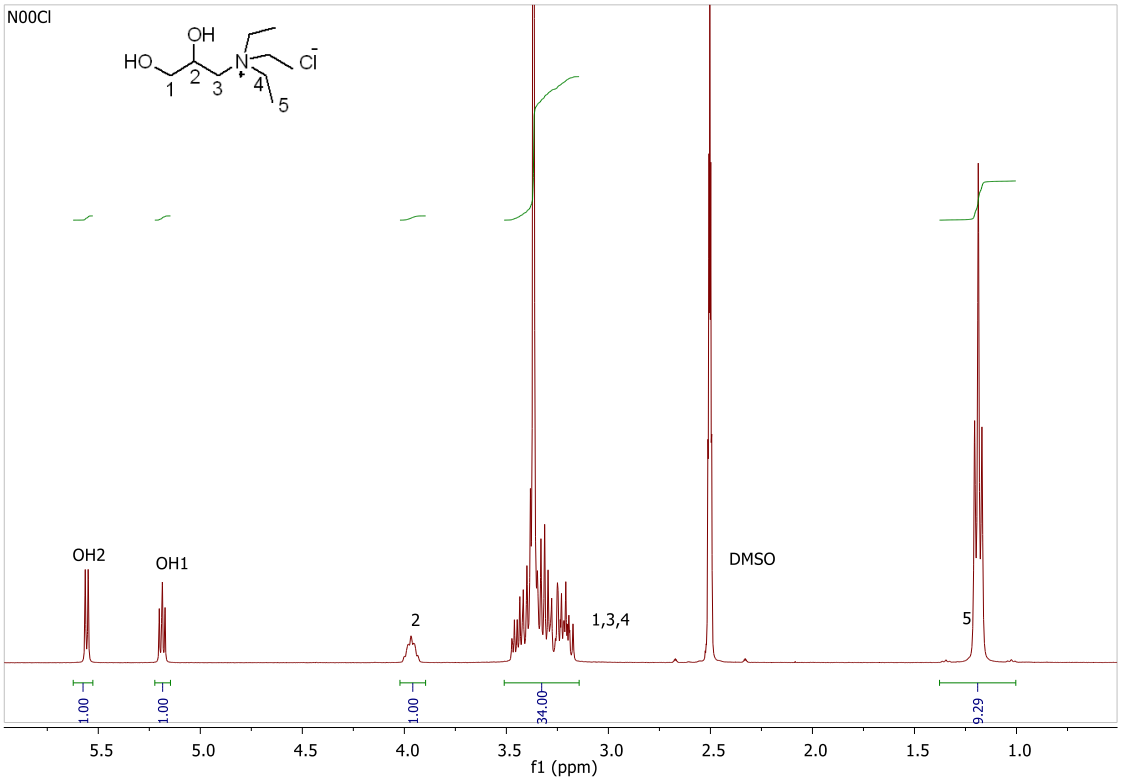


Figure S-39. ^{1}H-RMN ([d_6]DMSO) of salt *N*,*N*,*N*-triethyl-2,3-dihydroxipropan-1-aminium chloride.

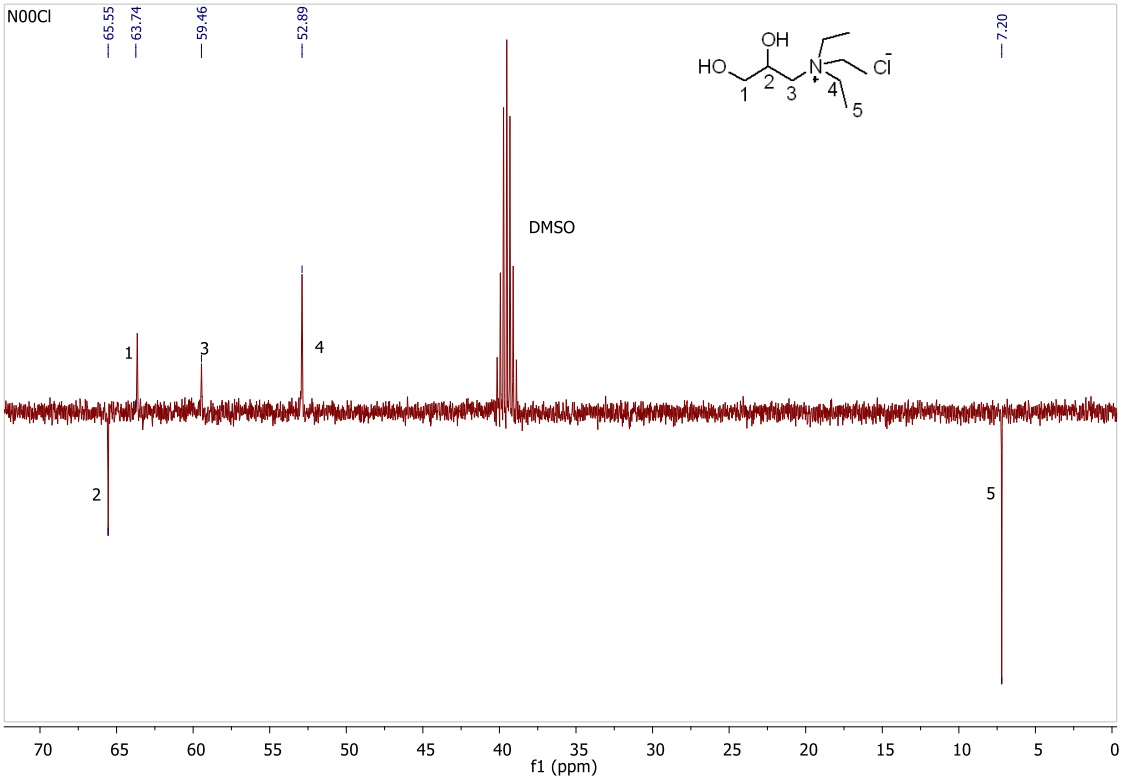


Figure S-40. ^{13}C-RMN (APT) of salt *N*,*N*,*N*-triethyl-2,3-dihydroxipropan-1-aminium chloride [N.0.0.Cl].

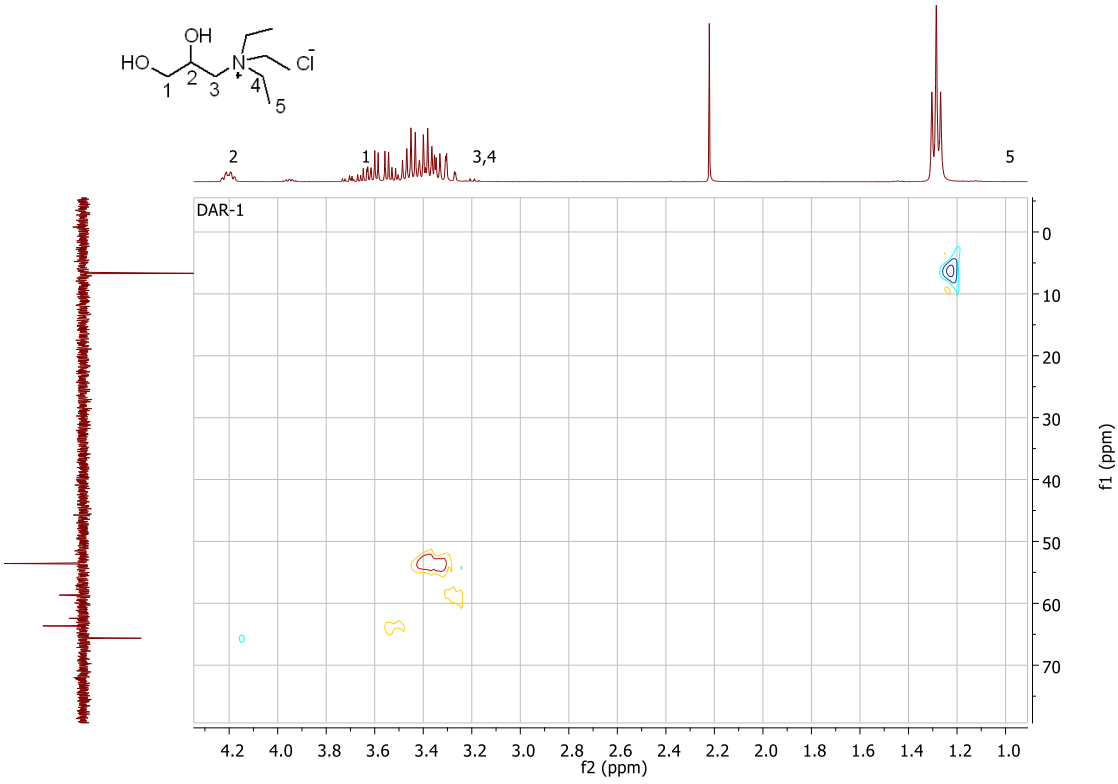


Figure S-41. HSQC of salt *N*,*N*,*N*-triethyl-2,3-dihydroxipropan-1-aminium chloride [N.0.0.Cl].

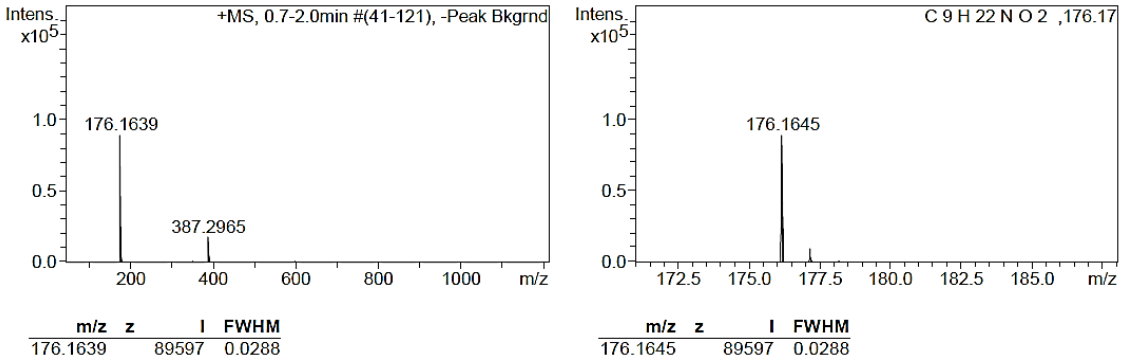
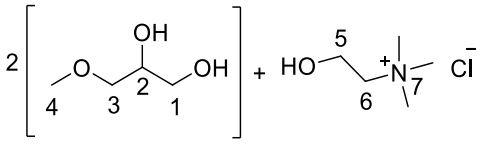


Figure S-42. HRMS of salt *N*,*N*,*N*-triethyl-2,3-dihydroxipropan-1-aminium chloride [N.0.0.Cl].

2.3 DESs description

In order to show the NMR description of DESs synthetized and measured, we include here two examples, one choline chloride DES and one *N*,*N*,*N*-triethyl-2,3-dihydroxipropan-1-aminium chloride DES (both in molar proportion 2:1).



DES [1.0.0]-ChCl (2:1): ^{1}H NMR (400 MHz, [d_6]DMSO, 25 ºC): δ 5.55 (t, 1H, *J* = 5.1 Hz, OH_5), 4.70 (d, 2H, *J* = 5.1 Hz, OH_2), 4.57 (t, 2H, *J* = 5.7 Hz, OH_1), 3.78-3.85 (m, 2H, H_5), 3.55 (sx, 2H, *J* = 5.2 Hz, H_2), 3.41-3.44 (m, 2H, H_6), 3.23 (s, 6H, H_4), 3.18-3.34 (m, 8H, H_1, H_3), 3.13 (s, 9H, H_7). **^{13}C NMR** (100 MHz, [d_6]DMSO, 25 ºC): δ 74,2 (CH_2, C_3), 70,5 (CH, C_2), 70,0 (CH_2, C_6), 63,2 (CH_2, C_1), 58,4 (CH_3, C_4), 55,1 (CH_2, C_5), 53,2 (CH_3, C_7).

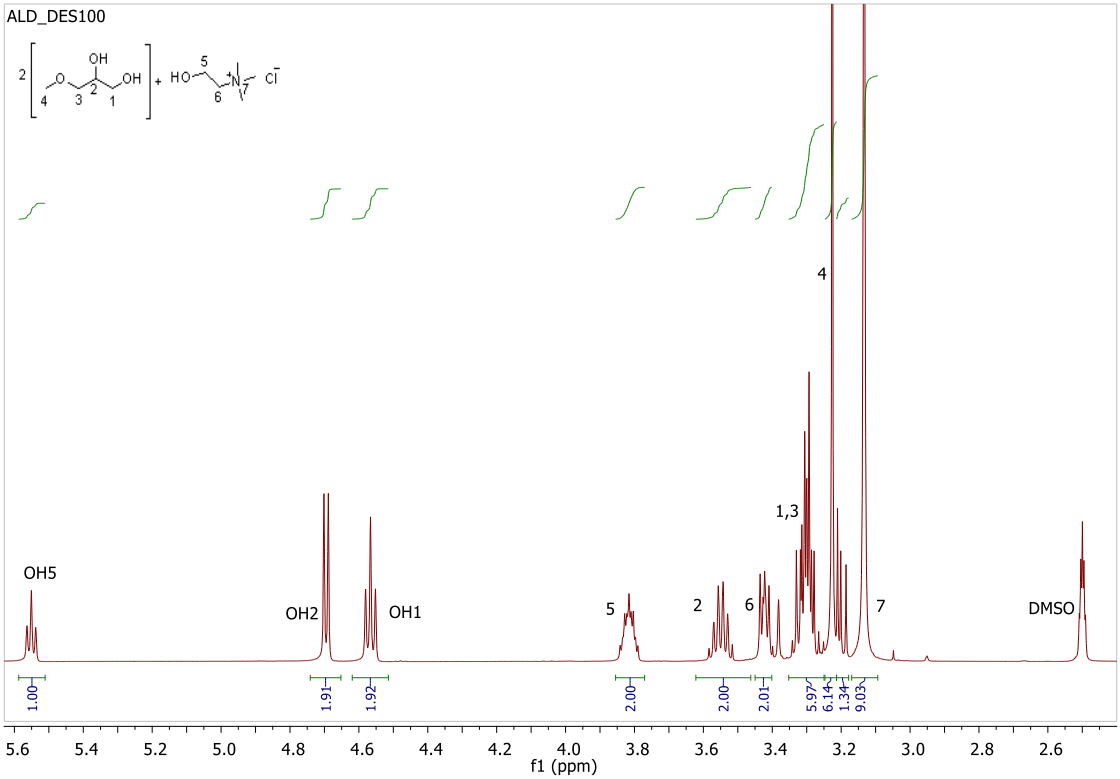


Figure S-43. ^{1}H-RMN of DES [1.0.0]-ChCl.

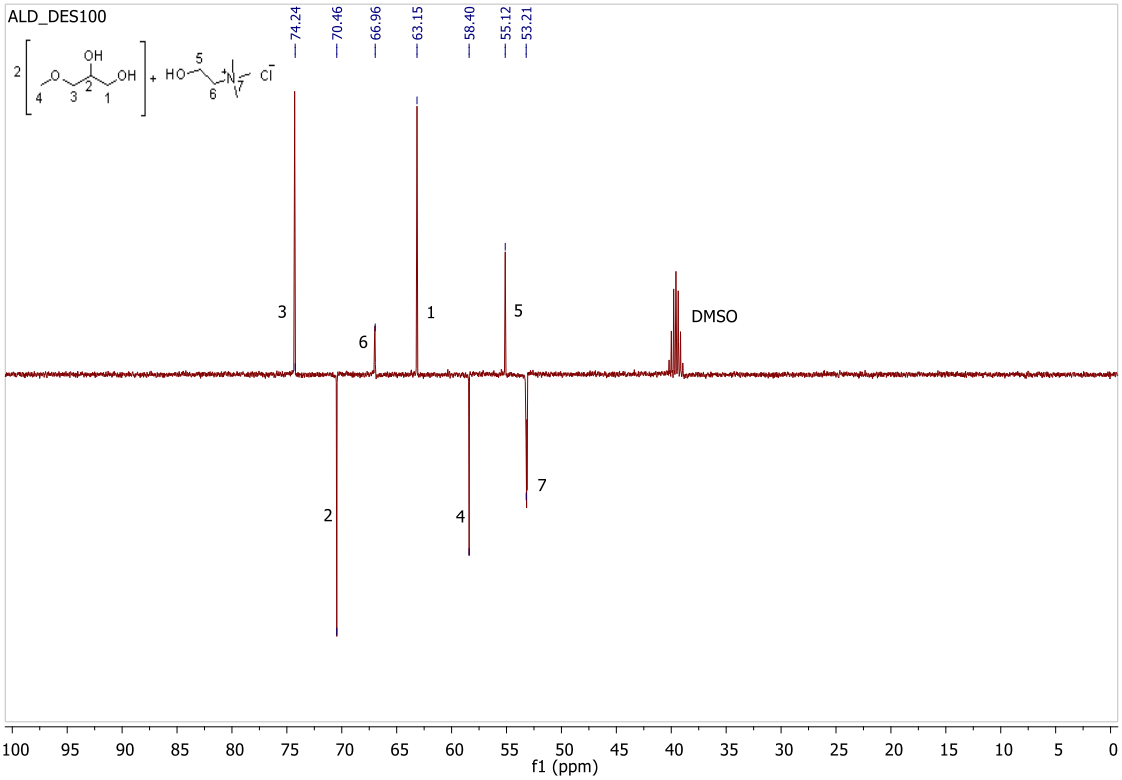


Figure S-44. ^{13}C-RMN (APT) of DES [1.0.0]-ChCl.

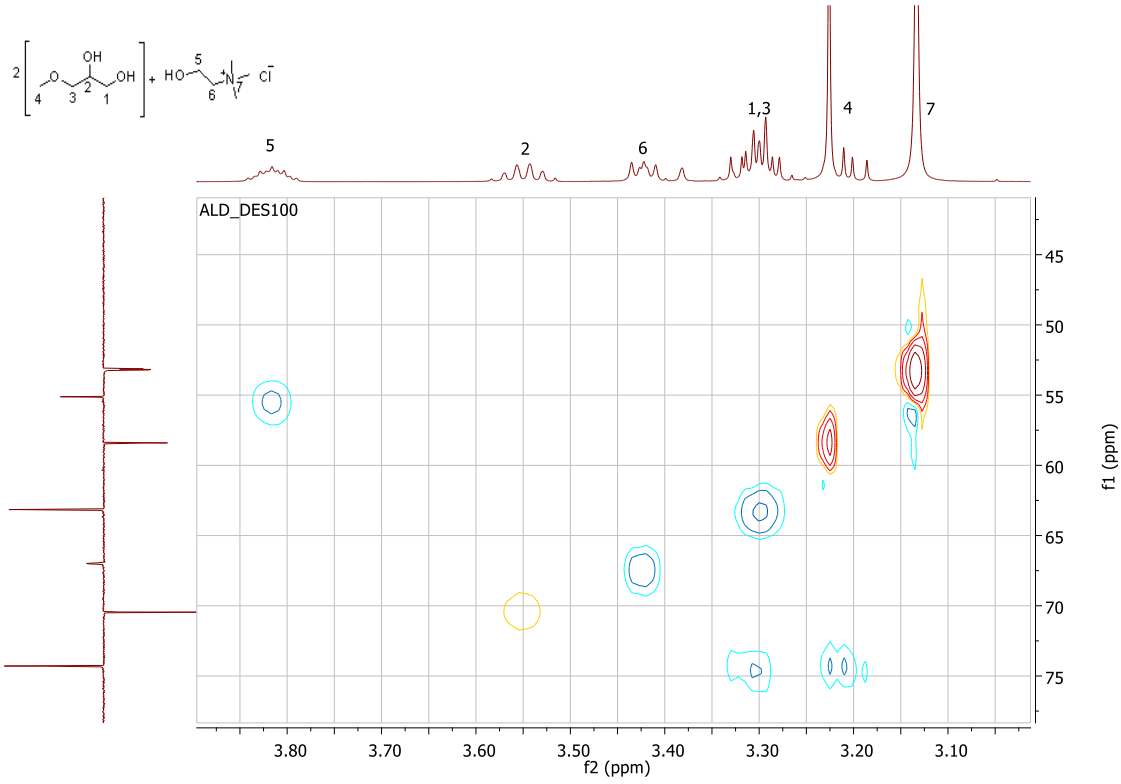
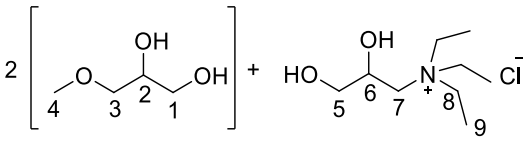


Figure S-45. HSQC of DES [1.0.0]-ChCl.



DES [1.0.0]-N00Cl (2:1): ^{1}H NMR (400 MHz, [d_6]DMSO, 25 ºC): δ 5.65 (d, 1H, *J* = 5.8 Hz, OH_6), 5.24 (t, 1H, *J* = 5.3 Hz, OH_5), 4.70 (d, 2H, *J* = 4.9 Hz, OH_2), 4.57 (t, 2H, *J* = 5.6 Hz, OH_1), 3.92-4.01 (m, 1H, H_6), 3.55 (sx, 2H, *J* = 5.1 Hz, H_2), 3.22 (s, 6H, H_4), 3.15-3.47 (m, 18H, H_1, H_3, H_5, H_7, H_8), 1.18 (t, 9H, *J* = 7.1 Hz, H_9). **^{13}C NMR** (100 MHz, [d_6]DMSO, 25 ºC): δ 74.3 (CH_2, C_3), 70.4 (CH, C_2), 65.5 (CH, C_6), 63.7 (CH_2, C_5), 63.0 (CH_2, C_1), 59.5 (CH_2, C_7), 58.4 (CH_3, C_4), 52.9 (CH_2, C_8), 7.3 (CH_3, C_9).

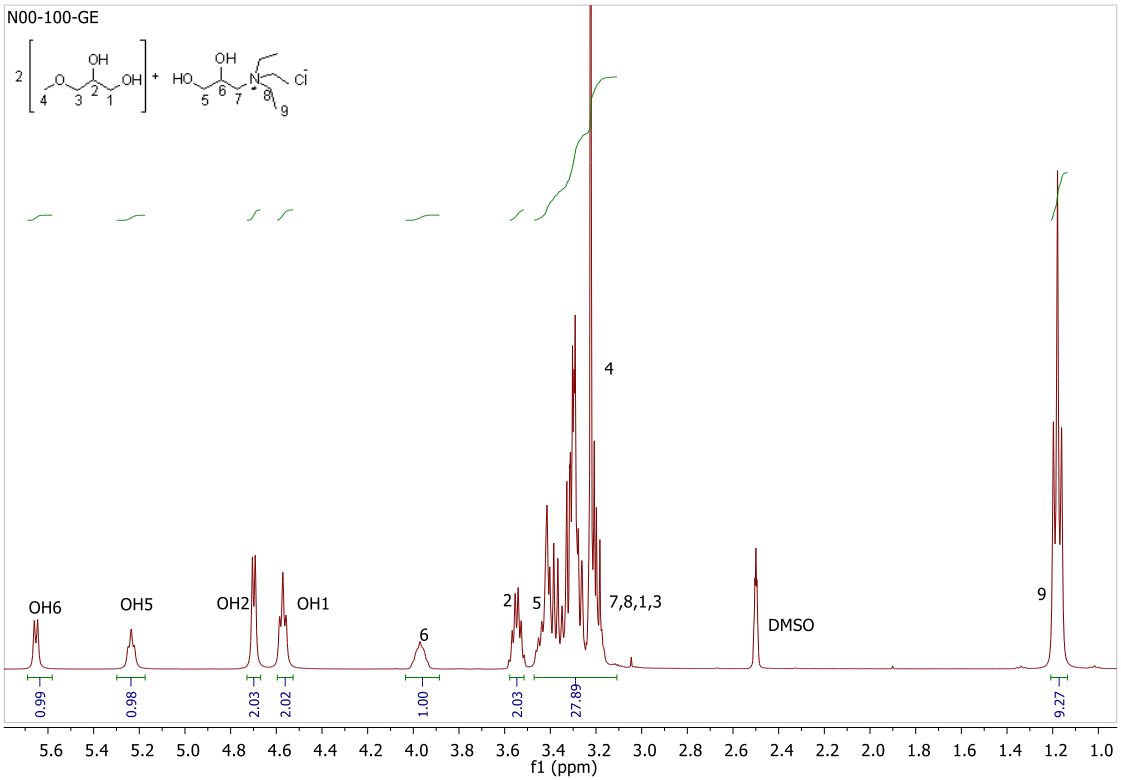


Figure S-46. ^{1}H-RMN of DES [1.0.0]-[N.0.0.Cl].

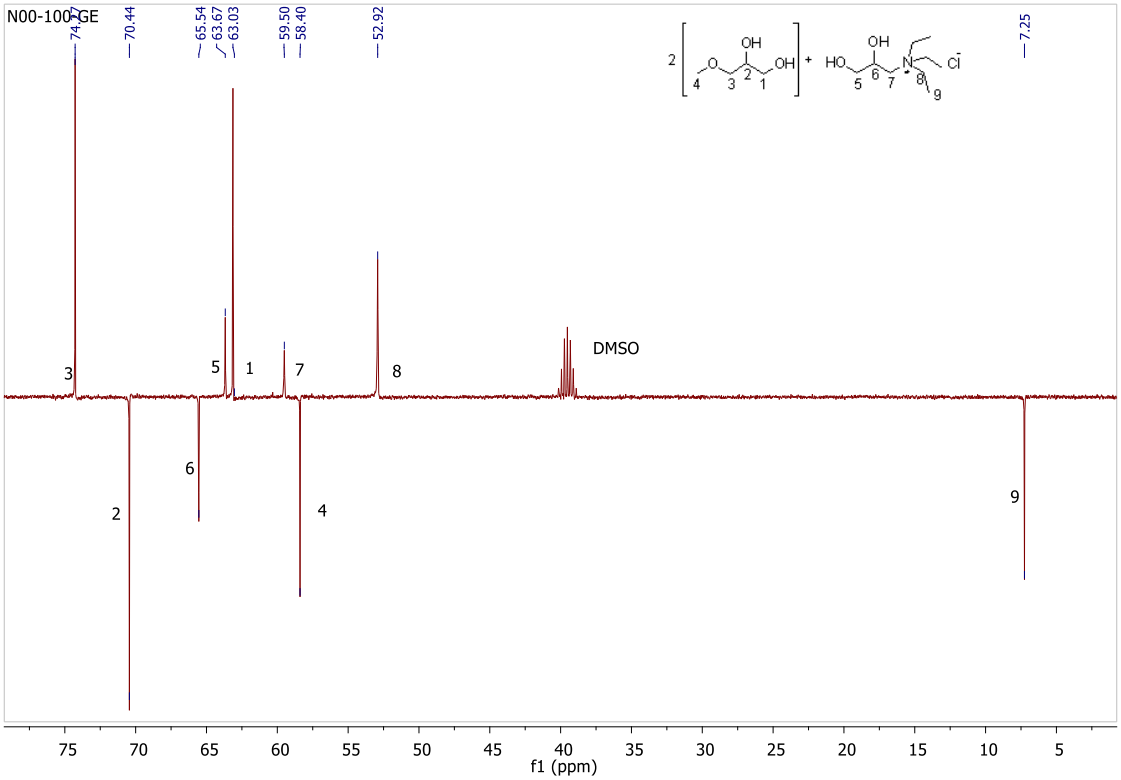


Figure S-47. ^{13}C-RMN (APT) of DES [1.0.0]-[N.0.0.Cl].

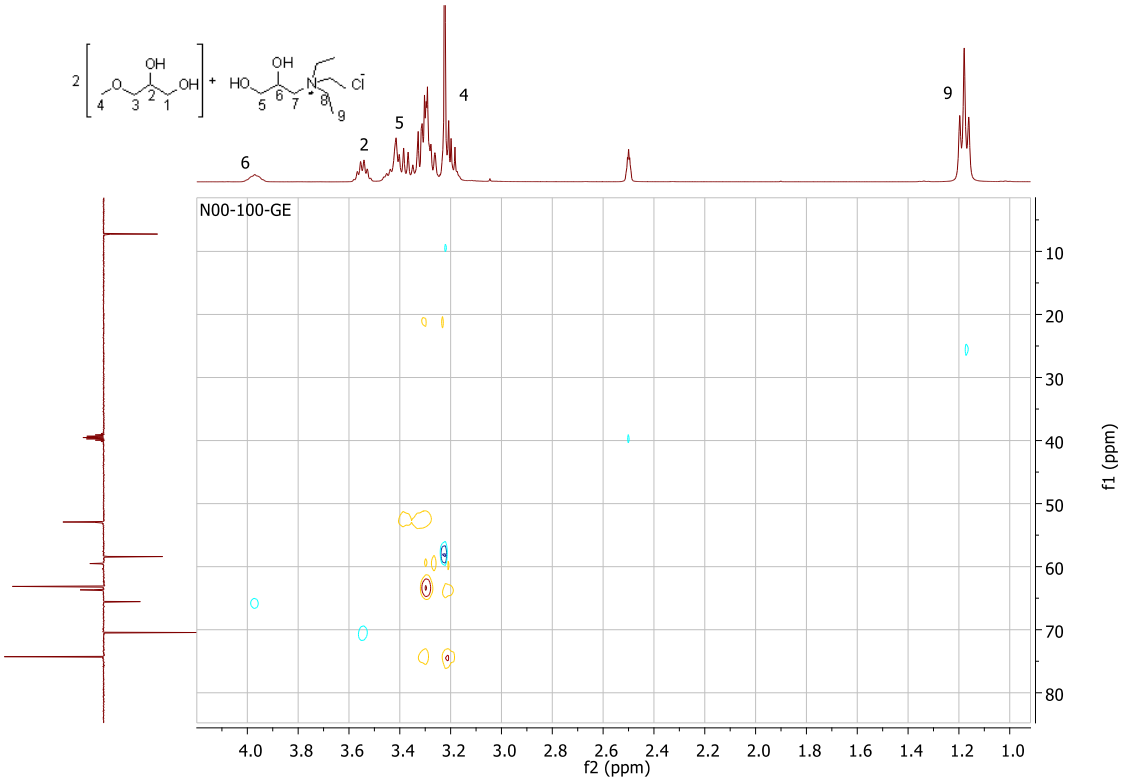


Figure S-48. HSQC of DES [1.0.0]-[N.0.0.Cl].

3. Study of the DES formation

In this article fourteen new mixtures of glyceryl ethers and ammonium salts were prepared:

- Seven glycerol monoethers, seven glycerol diethers and one glycerol triether were proved.
- Two ammonium salts (ChCl and [N.0.0.Cl]).
- Four different molar ratios HBD-HBA 2.5:1, 2:1, 1.5:1 and 1:1.
- Stirring at 70°C for 10 h
- Cooling down to room temperature for 1 day
- In the correct molar proportion, a homogeneous colourless liquid was obtained, being its composition assured by NMR.
- Cooling down at -21°C for 1 day

4. Density and Sound propagation speed measurement

4.1 Density

Table S1. Densities of all measured glycerol monoethers [R.0.0] (in g·cm^{-3})

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
298.15	1.110878	1.056733	1.001079	1.016539	1.358090
303.15	1.106862	1.052699	0.997184	1.012425	1.352421
313.15	1.098833	1.044562	0.989348	1.004145	1.340967
323.15	1.090763	1.036283	0.981439	0.995778	1.329376
333.15	1.082576	1.027435	0.973457	0.987326	1.317660

Table S2. Densities of all measured DES of Choline Chloride (in g·cm^{-3})

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	1.122026	-*	-*	-*	1.285208	1.163109	1.195
303.15	1.118924	-	-	-	1.281237	1.159641	1.191
313.15	1.112754	-	-	-	1.273103	1.153059	1.184
323.15	1.106515	-	-	-	1.264883	1.146182	1.176950
333.15	1.100318	1.066239	-	-	1.256726	1.138513	1.169990
338.15	1.097242	1.063756	-	1.037860	1.252682	1.135205	1.166488
343.15	1.094139	1.060990	-	1.034760	1.248612	1.131725	1.162945

*Some of the mixtures are not stable at all temperatures. For this reason, some values under the critical stability temperature were not able to be measured.

Table S3. Densities of all measured DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride (in g·cm^{-3})

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	1.124870	1.094577	1.053742	1.068705	1.263325	1.163213	1.197
303.15	1.121620	1.091611	1.050432	1.065444	1.259360	1.159831	1.193
313.15	1.115364	1.085204	1.043910	1.058938	1.251364	1.152801	1.186
323.15	1.109410	1.078763	1.037536	1.052399	1.242754	1.146389	1.179
333.15	1.103412	1.072333	1.031159	1.045866	1.233814	1.139591	1.172

4.2 Sound propagation speed

Table S4. Sound propagation speed of all measured glycerol monoethers [R.0.0] (in m·s^{-1})

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
298.15	1549.0	1449.3	1397.8	1379.9	1206.6
303.15	1534.8	1433.9	1382.7	1364.3	1192.5
313.15	1506.4	1403.8	1353.0	1333.5	1164.8
323.15	1477.7	1372.5	1323.7	1303.1	1137.2
333.15	1448.8	1340.1	1294.9	1273.1	1109.4

Table S5. Sound propagation speed of all measured DES of Choline Chloride (in m·s^{-1})

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	1789.8	-*	-*	-*	1483.3	1824.8	-
303.15	1775.5	-	-	-	1469.8	1804.3	-
313.15	1747.4	-	-	-	1443.6	1770.2	-
323.15	1714.6	-	-	-	1416.5	1735.9	1764.2
333.15	1685.5	1583.0	-	-	1390.5	1703.6	1730.5
338.15	1670.6	1569.5	-	-	1376.9	1685.14	1714.5
343.15	1655.7	1556.1	-	-	1363.9	1667.93	1699.1

*Some of the mixtures are not stable at all temperatures. For this reason, some values under the critical stability temperature were not able to be measured.

Table S6. Sound propagation speed of all measured DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride (in m·s^{-1})

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	1775.9	1679.7	1579.3	1600.0	1493.8	1869.3	-
303.15	1760.2	1663.0	1563.3	1582.9	1478.3	1827.9	-
313.15	1730.3	1632.2	1532.3	1550.8	1448.6	1772.9	-
323.15	1701.9	1602.9	1503.2	1520.6	1420.6	1731.1	-
333.15	1673.8	1574.4	1475.3	1492.0	1388.6	1695.7	-

5. Molar volume

Table S7. Molar volume of all measured glycerol monoethers [R.0.0] (in $cm^3 \cdot mol^{-1}$)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
298.15	95.53	113.70	148.04	131.99	128.21
303.15	95.87	114.14	148.62	132.52	128.75
313.15	96.58	115.02	149.80	133.62	129.85
323.15	97.29	115.94	151.00	134.74	130.98
333.15	98.03	116.94	152.24	135.89	132.14

Table S8. Molar volume of all measured DES of Choline Chloride (in $cm^3 \cdot mol^{-1}$)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	104.53	-	-	-	126.53	136.42	149.54
303.15	104.82	-	-	-	126.92	136.83	150.05
313.15	105.41	-	-	-	127.74	137.61	150.95
323.15	106.00	-	-	-	128.57	138.43	151.81
333.15	106.60	118.77	-	-	129.40	139.37	152.71
338.15	106.90	119.05	-	131.03	129.82	139.77	153.17
343.15	107.20	119.36	-	131.42	130.24	140.20	153.64

Table S9. Molar volume of all measured DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride (in $cm^3 \cdot mol^{-1}$)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	125.63	137.64	160.68	149.70	147.75	157.06	169.32
303.15	126.00	138.02	161.19	150.16	148.22	157.52	169.93
313.15	126.70	138.83	162.20	151.09	149.17	158.48	170.86
323.15	127.38	139.66	163.19	152.02	150.20	159.37	171.91
333.15	128.08	140.50	164.20	152.97	151.29	160.32	172.87

6. Solvents polarity

Table S10. Dielectric permittivity of all measured glycerol monoethers [R.0.0]

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
293.15	22.95	17.96	12.61	16.83	-
298.15	22.82	17.86	12.44	16.75	24.50
303.15	22.69	17.76	12.28	16.69	-
313.15	22.45	17.60	12.00	16.54	-
323.15	22.20	17.43	11.72	16.39	-
333.15	21.95	17.24	11.41	16.26	-

Table S11. Calculated dipolar moment of all studied glycerol monoethers [R.0.0] (in Debyes)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
298.15	3.49	3.35	3.13	3.51	4.37

7. Refractive index measurement

Table S12. Refractive index of all measured glycerol monoethers [R.0.0]

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
298.15	1.4408	1.4398	1.4410	1.4365	1.3871
303.15	1.4393	1.4374	1.4395	1.4349	1.3849
313.15	1.4359	1.4335	1.4360	1.4313	1.3820
323.15	1.4323	1.4294	1.4325	1.4278	1.3787
333.15	1.4288	1.4252	1.4290	1.4242	1.3757
343.15	1.4254	1.4217	1.4256	1.4206	1.3725

Table S13. Standard deviation in the Refractive index of all measured glycerol monoethers [R.0.0]

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
298.15	0.0002	0.0002	0.0000	0.0001	0.0001
303.15	0.0000	0.0001	0.0001	0.0001	0.0001
313.15	0.0001	0.0002	0.0000	0.0001	0.0001
323.15	0.0001	0.0001	0.0000	0.0001	0.0001
333.15	0.0001	0.0000	0.0000	0.0000	0.0000
343.15	0.0000	0.0001	0.0000	0.0000	0.0002

Table S14. Refractive index of all measured DES of Choline Chloride

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	1.4704	-	-	-	1.4275	1.5336	1.5379
303.15	1.4687	-	-	-	1.4260	1.5321	1.5366
313.15	1.4653	-	-	-	1.4234	1.5290	1.5335
323.15	1.4619	1.4600	-	1.4500	1.4207	1.5257	1.5300
333.15	1.4590	1.4571	-	1.4469	1.4181	1.5226	1.5271
338.15	1.4572	1.4554	-	1.4454	1.4168	1.5212	1.5258
343.15	1.4558	1.4540	1.4523	1.4441	1.4154	1.5194	1.5242
348.15	1.4537	1.4524	1.4507	1.4427	1.4144	1.5177	1.5224

Table S15. Standard deviation in the Refractive index of all measured DES of Choline Chloride

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	0.0001	-	-	-	0.0001	0.0001	0.0001
303.15	0.0001	-	-	-	0.0000	0.0000	0.0001
313.15	0.0001	-	-	-	0.0001	0.0001	0.0001
323.15	0.0001	0.0001	-	0.0000	0.0002	0.0001	0.0001
333.15	0.0000	0.0001	-	0.0001	0.0001	0.0001	0.0001
338.15	0.0001	0.0001	-	0.0001	0.0000	0.0001	0.0000
343.15	0.0001	0.0002	0.0002	0.0001	0.0001	0.0001	0.0000
348.15	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000

Table S16. Refractive index of all measured DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	1.4774	1.4734	1.4697	1.4693	1.4400	1.5311	1.5355
303.15	1.4762	1.4720	1.4681	1.4679	1.4387	1.5296	1.5340
313.15	1.4736	1.4693	1.4655	1.4654	1.4362	1.5265	1.5316
323.15	1.4708	1.4667	1.4629	1.4627	1.4335	1.5238	1.5287
333.15	1.4680	1.4638	1.4603	1.4601	1.4310	1.5210	1.5258
338.15	1.4668	1.4626	1.4590	1.4588	1.4297	1.5195	1.5246
343.15	1.4655	1.4612	1.4576	1.4574	1.4283	1.5181	1.5234

Table S17. Standard deviation in the Refractive index of all measured DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0000
303.15	0.0005	0.0000	0.0001	0.0000	0.0001	0.0001	0.0001
313.15	0.0003	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
323.15	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
333.15	0.0001	0.0001	0.0001	0.0000	0.0000	0.0002	0.0001
338.15	0.0003	0.0001	0.0001	0.0001	0.0003	0.0002	0.0001
343.15	0.0001	0.0002	0.0000	0.0001	0.0002	0.0000	0.0001

7.2 Molar Refraction

Table S18. Molar refraction of all measured glycerol monoethers [R.0.0] (in $cm^3 \cdot mol^{-1}$)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
298.15	25.2179	29.9537	39.0932	34.5445	30.1888
303.15	25.2329	29.9258	39.1272	34.5718	30.1622
313.15	25.2460	29.9265	39.1663	34.6075	30.2181
323.15	25.2496	29.9166	39.2056	34.6509	30.2469
333.15	25.2607	29.9141	39.2478	34.6902	30.3001

Table S19. Molar refraction of all measured DES of Choline Chloride (in $cm^3 \cdot mol^{-1}$)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	29.1865	-	-	-	32.5204	42.3786	46.7665
303.15	29.1784	-	-	-	32.5211	42.4056	46.8306
313.15	29.1554	-	-	-	32.5541	42.4421	46.8868
323.15	29.1354	-	-	-	32.5826	42.4693	46.8957
333.15	29.1409	32.3515	-	-	32.6163	42.5462	46.9537
338.15	29.1255	32.3250	-	34.9005	32.6323	42.5743	46.9999
343.15	29.1291	32.3252	-	34.9164	32.6421	42.5813	47.0229

Table S20. Molar refraction of all measured DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride (in $cm^3 \cdot mol^{-1}$)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	35.5240	38.6383	44.8095	41.7119	38.9404	48.6014	52.7569
303.15	35.5482	38.6473	44.8192	41.7350	38.9626	48.6306	52.8195
313.15	35.5825	38.6823	44.8839	41.8011	39.0171	48.6848	52.9074
323.15	35.5920	38.7304	44.9370	41.8456	39.0755	48.7467	52.9899
333.15	35.6027	38.7567	44.9960	41.9057	39.1606	48.8202	53.0435

8. Viscosity measurement

Table S21. Kinematic viscosity of all measured glycerol monoethers [R.0.0] (in centistokes)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
298.15	35.712	36.970	42.206	44.075	49.903
303.15	26.966	27.953	32.283	33.153	35.381
313.15	16.380	17.025	19.856	19.536	20.651
323.15	10.467	11.096	12.968	12.393	12.947
333.15	6.992	7.613	8.902	8.226	8.640
343.15	4.923	5.467	6.384	5.855	6.022

Table S22. Standard deviation in the Kinematic viscosity of all measured glycerol monoethers (in cSt)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
298.15	0.017	0.008	0.004	0.006	0.018
303.15	0.009	0.008	0.011	0.010	0.015
313.15	0.004	0.005	0.010	0.006	0.007
323.15	0.008	0.013	0.007	0.006	0.001
333.15	0.004	0.010	0.002	0.006	0.010
343.15	0.006	0.005	0.007	0.006	0.011

Table S23. Kinematic viscosity of all measured DES of Choline Chloride (in cSt)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	117.303	-	-	-	124.007	1558.690	-
303.15	89.449	-	-	-	93.642	961.657	1882.613
313.15	53.887	-	-	-	57.135	399.730	758.513
323.15	34.962	-	-	-	37.638	189.617	358.749
333.15	23.848	28.200	-	-	25.776	100.547	169.018
338.15	20.053	23.403	-	26.720	21.443	75.819	120.807
343.15	17.076	19.790	-	22.596	18.358	58.840	88.636

Table S24. Standard deviation in the Kinematic viscosity of all measured DES of Choline Chloride (in cSt)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	0.082	-	-	-	0.061	0.455	-
303.15	0.111	-	-	-	0.091	0.202	0.253
313.15	0.055	-	-	-	0.025	0.205	0.232
323.15	0.015	-	-	-	0.055	0.253	0.113
333.15	0.010	0.086	-	-	0.008	0.096	0.115
338.15	0.008	0.038	-	0.125	0.001	0.037	0.049
343.15	0.005	0.029	-	0.125	0.005	0.050	0.043

Table S25. Kinematic viscosity of all measured DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride (in cSt)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	402.364	410.811	420.718	516.054	437.391	8057.170	-
303.15	275.138	280.414	292.136	352.877	297.623	4299.935	8745.140
313.15	141.257	146.271	155.476	178.889	151.293	1345.333	2682.680
323.15	79.779	82.571	88.324	99.260	84.649	510.263	997.417
333.15	48.927	50.540	53.725	59.714	51.391	226.530	390.630
338.15	39.577	40.853	43.173	47.549	41.280	158.767	263.633
343.15	31.971	33.175	35.807	38.408	33.756	115.193	184.080

Table S26. Standard deviation in the Kinematic viscosity of measured DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride (in cSt)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	0.132	0.028	0.119	0.055	0.035	-	-
303.15	0.083	0.069	0.028	0.035	0.110	0.106	5.346
313.15	0.069	0.057	0.077	0.082	0.014	0.363	0.467
323.15	0.070	0.009	0.033	0.043	0.025	0.204	0.381
333.15	0.039	0.034	0.068	0.015	0.042	0.416	0.128
338.15	0.040	0.049	0.065	0.014	0.172	0.178	0.156
343.15	0.023	0.025	0.029	0.008	0.049	0.111	0.089

Table S27. Dynamic viscosity of all measured glycerol monoethers [R.0.0] (in centiPoises)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
298.15	39.672	39.068	42.252	44.804	67.772
303.15	29.848	29.426	32.193	33.565	47.850
313.15	17.998	17.784	19.644	19.617	27.692
323.15	11.417	11.498	12.727	12.341	17.211
333.15	7.569	7.822	8.666	8.121	11.385

Table S28. Standard deviation in the Dynamic viscosity of measured glycerol monoethers [R.0.0] (in cP)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
298.15	0.019	0.009	0.004	0.006	0.025
303.15	0.010	0.008	0.011	0.010	0.021
313.15	0.004	0.005	0.010	0.006	0.009
323.15	0.009	0.014	0.007	0.006	0.001
333.15	0.004	0.011	0.001	0.006	0.014

Table S29. Dynamic viscosity of all measured DES of Choline Chloride (in cP)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	131.617	-	-	-	159.375	1812.926	-
303.15	100.087	-	-	-	119.977	1115.176	2241.628
313.15	59.963	-	-	-	72.739	460.912	897.776
323.15	38.686	-	-	-	47.607	217.335	422.229
333.15	26.241	30.068	-	-	32.394	114.474	197.750
338.15	22.003	24.895	-	27.732	26.862	86.070	140.920
343.15	18.684	20.997	-	23.381	22.922	66.591	103.079

Table S30. Standard deviation in the Dynamic viscosity of all measured DES of Choline Chloride (in cP)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	0.092	-	-	-	0.078	0.529	-
303.15	0.124	-	-	-	0.117	0.235	0.302
313.15	0.062	-	-	-	0.032	0.237	0.274
323.15	0.016	-	-	-	0.069	0.290	0.133
333.15	0.011	0.091	-	-	0.011	0.110	0.135
338.15	0.009	0.040	-	0.130	0.002	0.042	0.057
343.15	0.006	0.031	-	0.129	0.006	0.056	0.050

Table S31. Dynamic viscosity of all measured DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride (in cP)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	452.607	449.664	443.328	551.509	552.567	9372.205	-
303.15	308.600	306.103	306.869	375.971	374.815	4987.198	10429.454
313.15	157.553	158.734	162.303	189.433	189.323	1550.902	3182.061
323.15	88.508	89.075	91.640	104.461	105.197	584.960	1175.855
333.15	53.987	54.196	55.399	62.452	63.407	258.152	457.936

Table S32. Standard deviation in the Dynamic viscosity of all measured DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride (in cP)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	0.149	0.027	0.151	0.059	0.044	-	-
303.15	0.093	0.076	0.030	0.037	0.139	0.123	6.375
313.15	0.077	0.062	0.081	0.087	0.017	0.418	0.554
323.15	0.078	0.010	0.034	0.045	0.031	0.234	0.449
333.15	0.044	0.037	0.070	0.016	0.052	0.474	0.150

9. Ionic conductivity measurement

Table S33. Ionic conductivity of all measured DES of Choline Chloride (in $\mu S \cdot cm^{-1}$)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	1339.3	-	-	-	1214.7	117.5	38.4
303.15	1804.3	-	-	-	1601.7	199.2	65.5
313.15	3330.0	-	-	-	2910.0	449.0	162.3
323.15	5150.0	3726.7	-	2816.7	4230.0	882.7	353.0
333.15	7380.0	5410.0	-	4240.0	5810.0	1611.3	724.0
338.15	8573.3	6330.0	-	4973.3	6736.7	2220.0	958.0
343.15	10250.0	7443.3	4360.0	6090.0	7843.3	2883.3	1237.0
348.15	-	8720.5	5123.4	7205.6	9183.5	3544.8	1653.0

Table S34. Standard deviation in the Ionic conductivity of all measured DES of Choline Chloride (in $\mu S \cdot cm^{-1}$)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	1.2	-	-	-	1.5	0.1	0.1
303.15	1.5	-	-	-	2.1	0.5	0.2
313.15	0.0	-	-	-	0.0	0.0	0.2
323.15	17.3	5.8	-	5.8	0.0	0.6	0.0
333.15	0.0	10.0	-	10.0	0.0	1.5	2.6
338.15	11.5	5.8	-	15.3	15.3	10.0	1.0
343.15	10.0	15.3	0.0	10.0	5.8	5.8	1.0
348.15	-	9.2	10.0	10.3	3.5	2.6	0.7

Table S35. Ionic conductivity of all measured DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride (in $\mu S \cdot cm^{-1}$)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	361.0	266.0	196.0	180.9	266.7	18.9	7.2
303.15	515.7	375.7	269.7	253.7	386.3	35.0	11.5
313.15	999.7	687.7	475.3	469.0	735.0	119.1	39.4
323.15	1821.7	1162.7	792.3	801.7	1264.3	290.3	104.3
333.15	3045.0	1908.3	1182.0	1289.7	2273.3	593.7	240.0
338.15	3803.3	2453.3	1474.0	1602.0	2816.7	812.3	349.7
343.15	4783.3	3230.0	1811.3	1983.0	3520.0	1178.0	497.0

Table S36. Standard deviation in the Ionic conductivity of all measured DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride (in $\mu S \cdot cm^{-1}$)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]	[Ph.0.0]	[G.0.0]
298.15	0.0	0.0	0.6	0.1	0.6	0.0	0.1
303.15	1.5	0.6	0.6	0.6	0.6	0.1	0.0
313.15	1.2	1.2	0.6	0.0	2.0	0.2	0.2
323.15	1.2	2.5	1.2	0.6	4.2	0.6	0.3
333.15	13.2	2.5	1.0	0.6	5.8	1.2	1.0
338.15	18.2	5.8	1.0	2.0	5.8	1.5	0.6
343.15	20.8	0.0	1.2	1.0	5.8	1.0	0.0

10. Surface tension measurement

Table S37. Surface tension of all measured glycerol monoethers [R.0.0] (in $mN \cdot m^{-1}$)

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
298.15	38.71	32.74	28.91	27.86	27.57
303.15	38.33	32.40	28.62	27.54	27.26
313.15	37.55	31.73	28.07	26.87	26.67
323.15	36.80	31.06	27.47	26.13	26.04

Table S38. Standard deviation in the Surface tension of all glycerol monoethers [R.0.0] (in mN·m^{-1})

Temperature (K)	[1.0.0]	[2.0.0]	[4.0.0]	[3i.0.0]	[3F.0.0]
298.15	0.03	0.01	0.03	0.02	0.03
303.15	0.01	0.00	0.01	0.02	0.00
313.15	0.01	0.04	0.02	0.03	0.04
323.15	0.03	0.03	0.01	0.01	0.04

Table S39. Surface tension of all measured DES of Choline Chloride (in mN·m^{-1})

Temperature (K)	[1.0.0]	[3F.0.0]	[Ph.0.0]
298.15	41.70	31.24	44.30
303.15	41.50	31.02	43.98
313.15	41.16	30.64	43.31
323.15	40.79	30.20	42.73

Table S40. Standard deviation in the Surface tension of all DES of Choline Chloride (in mN·m^{-1})

Temperature (K)	[1.0.0]	[3F.0.0]	[Ph.0.0]
298.15	0.16	0.04	0.03
303.15	0.08	0.03	0.11
313.15	0.11	0.02	0.03
323.15	0.07	0.01	0.02

Table S41. Surface tension of all measured DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride (in mN·m^{-1})

Temperature (K)	[1.0.0]	[3F.0.0]	[Ph.0.0]
298.15	44.73	33.19	49.44
303.15	44.17	32.71	48.45
313.15	42.98	31.79	46.16
323.15	41.85	30.99	44.46

Table S42. Standard deviation in the Surface tension of all DES of *N,N,N*-triethyl-2,3-dihydroxypropan-1-aminium chloride (in mN·m^{-1})

Temperature (K)	[1.0.0]	[3F.0.0]	[Ph.0.0]
298.15	0.04	0.02	0.02
303.15	0.05	0.03	0.05
313.15	0.04	0.03	0.03
323.15	0.02	0.02	0.13