SUPPORTING INFORMATION

Lipidic Protic Ionic Liquid Crystals

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SUPPORTING INFORMATION

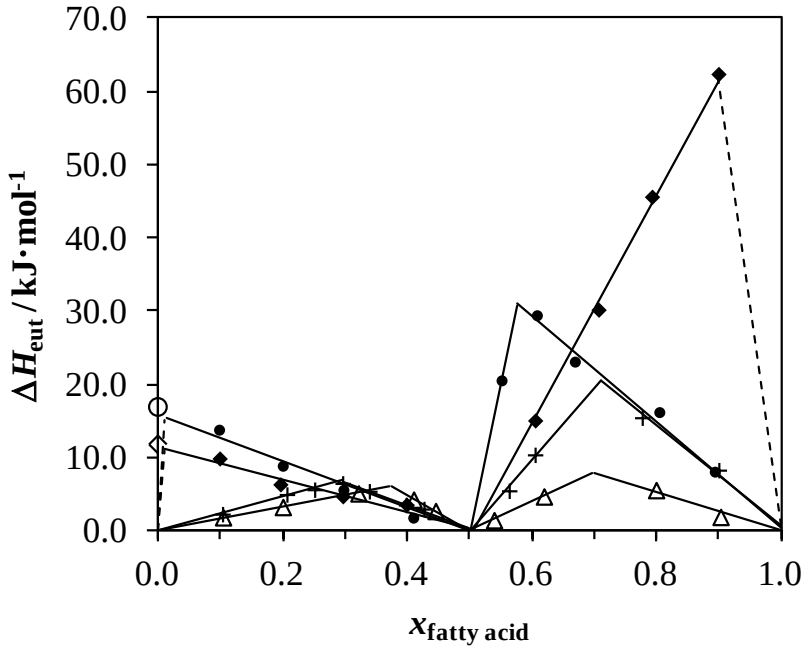

Figure S1. Tammann plots of the eutectic transitions ΔH_{eut} in the ethanolamine-rich region (x = 0.0 to 0.5 fatty acid molar fraction) and in the fatty acid-rich region (x = 0.5 to 1.0 fatty acid molar fraction) of the (+) oleic acid + monoethanolamine, (△) oleic acid + diethanolamine, (◆) stearic acid + monoethanolamine and (●) stearic acid + diethanolamine systems. Solid lines are linear fitting of the data (R^2 > 0.95 considering that y = 0.0 at the pure compounds concentration). Dashed lines are supposed plots close to pure component concentration. (○) Diethanolamine and (◇) monoethanolamine melting enthalpy for analysis purpose.

Table S1. Experimental solid-liquid equilibrium data for oleic acid + ethanolamine systems for molar fraction x, temperature T [†] and pressure p = 102.0 kPa [‡].

oleic acid (1) + monoethanolamine (2)					oleic acid (1) + diethanolamine (2)					
x_1	T_{eut} / K	T_1 / K	T_m / K	T_{LCm} / K	x_1	T_{eut} / K	T_1 / K	T_2 / K	T_m / K	T_{LCm} / K
0.0000			280.01		0.0000				300.80	
0.1008				328.15	0.1033	272.81	275.22	282.53	296.43	
0.1025	271.80	277.97	279.24		0.1993	275.25	277.38	280.74	293.00	
0.1964				373.15	0.2986					308.15
0.2058	272.65		276.31		0.3206	275.69	278.15		281.98	
0.2504	274.58		275.90		0.4089					353.15
0.2953	272.44		277.40		0.4097	274.48			279.89	
0.2999				382.15	0.4445	273.76			283.07	
0.3381	273.65		278.59		0.5000				283.60	360.95
0.3972	271.67		281.54		0.5383	262.72	271.29		283.65	
0.4001				376.45	0.6200					323.15
0.4259	272.35		284.22		0.6184	262.83	271.35		275.00	
0.5000			288.08	358.15	0.6880					304.35
0.5626	276.89	281.96	284.79		0.6940				265.37	
0.6020				324.35	0.7984	265.80		271.40	279.97	
0.6042	277.15	280.92	284.23		0.9019	267.06		270.48	285.08	
0.7000				298.05	1.0000				287.16	
0.7200			278.82							
0.7762	279.19		281.53							
0.8991	278.48	282.26	285.43							
1.0000			287.16							

[†] T_{eut} is the temperature of the eutectic transition, T_1 and T_2 are the temperatures of the other invariant transitions, T_m is the melting temperature (*liquidus* line) and T_{LCm} is the melting of the liquid crystal.

[‡] Uncertainties for molar fraction and pressure are ± 0.0005 and ± 0.5 kPa, respectively. Uncertainty for temperatures T_{eut}, T_1, T_2, T_m is ± 0.4 K and for temperature T_{LCm} is ± 1.0 K.

Table S2. Experimental solid-liquid equilibrium data for stearic acid + ethanolamine systems for mole fraction x, temperature T [†] and pressure p = 102.0 kPa [‡].

stearic acid (1) + monoethanolamine (2)				stearic acid (1) + diethanolamine (2)				
x_1	T_{eut} / K	T_m / K	T_{LCm} / K	x_1	T_{eut} / K	T_1 / K	T_m / K	T_{LCm} / K
0.0000		280.01		0.0000			300.80	
0.0230			348.45	0.0987	298.68		324.24	
0.0996	277.12	339.08		0.2009	298.05		327.38	
0.1000			375.00	0.2983	297.99	328.88	331.78	353.15
0.1971	274.93	344.16		0.3957				373.15
0.2004			388.15	0.4103	298.08	328.97	336.36	
0.2973	277.18	346.75		0.5000			339.48	380.15
0.3960			388.15	0.5521	330.43		333.28	
0.3996	276.49	350.58		0.5940				355.15
0.5000		351.65	373.15	0.6088			330.55	
0.5455	344.15	351.15		0.6698	331.16		332.98	
0.5495			365.15	0.6700				334.00
0.6061	344.06	350.65		0.8053	332.18	334.55	337.84	
0.6600		351.15		0.8944	331.90	334.65	341.53	
0.7078	340.60	350.40		1.0000			343.57	
0.7936	341.35	347.34						
0.9003		342.06						
1.0000		343.57						

[†] T_{eut} is the temperature of the eutectic transition, T_1 is the temperature of the other invariant transitions, T_m is the melting temperature (*liquidus* line) and T_{LCm} is the melting of the liquid crystal.

[‡] Uncertainties for molar fraction and pressure are ± 0.0005 and ± 0.5 kPa, respectively. Uncertainty for temperatures T_{eut}, T_1, T_2, T_m is ± 0.4 K and for temperature T_{LCm} is ± 1.0 K.

Table S3. Rheological models' parameters related to shear stress / shear rate curves fitted to flow experimental data for the monoethanolammonium oleate

T / K	σ_0 / Pa	K †	n ‡	R^2	model
293.15	217.78	4.600	1.000	0.9908	Bingham plastic
298.15	74.22	2.260×10^6	0.307	0.9706	Vocadlo
303.15	62.58	5.803×10^5	0.316	0.9586	Vocadlo
308.15	39.69	1.010×10^6	0.298	0.9556	Vocadlo
313.15	36.47	3.479×10^5	0.303	0.9795	Vocadlo
318.15	26.19	2.792×10^5	0.296	0.9296	Vocadlo
323.15	19.39	5.939×10^4	0.314	0.9314	Vocadlo
328.15	25.17	1.060×10^5	0.298	0.9585	Vocadlo
333.15	15.97	2.249×10^4	0.318	0.9517	Vocadlo
338.15	14.10	1907.900	0.364	0.9862	Vocadlo
343.15	11.10	4191.800	0.330	0.9691	Vocadlo
348.15	9.21	504.509	0.343	0.9679	Vocadlo
353.15	0.00	0.072	1.000	0.9999	Newtonian
358.15	0.00	0.052	1.000	0.9999	Newtonian
363.15	0.00	0.041	1.000	0.9999	Newtonian

† K_V for Vocadlo model, η' for Bingham plastic model and η for Newtonian model.

‡ n_V for Vocadlo model.

Table S4. Rheological models' parameters related to shear stress / shear rate curves fitted to flow experimental data for the diethanolammonium oleate

T / K	σ_0 / Pa	K †	n ‡	R^2	model
293.15	20.79	30.438	0.589	0.9634	H-B
298.15	14.34	10.822	0.873	0.9520	H-B
303.15	2.09	1.740	0.870	0.9908	H-B
308.15	0.00	1.706	0.813	0.9908	Shear thinning
313.15	0.00	0.797	0.987	0.9999	Shear thinning
318.15	0.00	0.486	0.988	0.9999	Shear thinning
323.15	0.00	0.343	0.996	0.9999	Shear thinning
328.15	0.00	0.251	1.000	0.9999	Newtonian
333.15	0.00	0.188	1.000	0.9999	Newtonian
338.15	0.00	0.144	1.000	0.9999	Newtonian
343.15	0.00	0.112	1.000	0.9999	Newtonian
348.15	0.00	0.087	1.000	0.9999	Newtonian
353.15	0.00	0.069	1.000	0.9999	Newtonian
358.15	0.00	0.055	1.000	0.9999	Newtonian
363.15	0.00	0.044	1.000	0.9999	Newtonian

† K for shear-thinning model, K_H for H-B model and η for Newtonian model.

‡ n for shear-thinning model and n_H for H-B model.