Supporting Information

The thermophysical properties of diethylene glycol dimethyl ether blended with the fatty acid methyl esters

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Table S1 Comparison of experimental values of densities and viscosities of pure components with literature values at different temperatures and p=0.1 MPa[a]

Component	T /(K)	ρ/(g·cm^{-3})		η/(mPa·s)		n_D	
		Experiment	Literature	Experiment	Literature	Experiment	Literature
Diethylene glycol dimethyl ether	293.15	0.9436	0.9435[b], 0.9434[c]	1.081	1.081[c], 1.081[d]	1.4077	1.40802[d]
	298.15	0.9386	0.9385[c]	1.000	0.989[c], 1.011[d]		
	303.15	0.9336	0.9337[b], 0.9335[c]	0.920	0.916[c], 0.942[d]	1.4035	1.40359[d]
	308.15	0.9286	0.9285[c]	0.856	0.853[c], 0.879[d]		
	313.15	0.9236	0.9237[b], 0.9235[c]	0.792	0.796[c], 0.825[d]	1.3989	1.39921[d]
	318.15	0.9186	0.9186[c]	0.745	0.745[c], 0.767[d]		
	323.15	0.9135	0.9137[b], 0.9136[c]	0.699	0.699[c], 0.718[d]	1.3942	1.39490[d]
Methyl octanoate	293.15	0.8771	0.8771[e], 0.8771[f]	1.404	1.4275[e], 1.386[g], 1.412[f]	1.4171	1.417339[h]
	298.15	0.8728	0.8728[e], 0.8725[f]	1.284	1.3127[e], 1.2834[f]		
	303.15	0.8684	0.8684[e], 0.8680[f]	1.176	1.2120[e], 1.1870[f], 1.189[g]	1.4127	1.412984[h]
	308.15	0.8640	0.8640[e], 0.8638[f]	1.086	1.1233[e], 1.0897[f]		
	313.15	0.8596	0.8596[e], 0.8594[f]	0.999	1.0444[e], 1.019[g], 1.0053[f]	1.4082	1.408543[h]
	318.15	0.8553	0.8552[e], 0.8550[f]	0.938	0.97334[e], 0.9393[f]		
	323.15	0.8509	0.8508[e], 0.8506[f]	0.871	0.90926[e], 0.8747[f],0.887[g]	1.4034	1.404054[h]
Methyl decanoate	293.15	0.8722	0.8723[e], 0.8724[f]	2.145	2.1360[e], 2.1120[f]	1.4252	1.42577[h]
	298.15	0.8681	0.8682[f], 0.86805[j]	1.931	1.915[j], 1.9067[f], 1.9335[e]		
	303.15	0.8640	0.8641[f], 0.86402[j]	1.741	1.739[j], 1.7316[f],1.7601[e]	1.4214	1.421546[h]
	308.15	0.8599	0.8599[f], 0.8600[j]	1.585	1.589[j], 1.5755[f], 1.6091[e]		
	313.15	0.8558	0.8558[f], 0.85583[j]	1.449	1.458[j], 1.4429[f], 1.4773[e]	1.4168	1.417290[h]
	318.15	0.8517	0.8517[f], 0.85171[j]	1.337	1.341[j], 1.3341[f],1.3613[e]		
	323.15	0.8476	0.8475[f], 0.84759[j]	1.236	1.240[j], 1.2307[f], 1.2589[e]	1.4126	1.412965[h]
Methyl dodecanoate	293.15	0.8692	0.8698[e], 0.8691[f]	3.165	3.1519[f], 3.1668[e]	1.4318	1.431689[h], 1.43209[k]
	298.15	0.8653	0.8658[e], 0.8649[f], 0.86527[j]	2.809	2.7895[f], 2.8237[e]		
	303.15	0.8613	0.8618[e], 0.8611[f], 0.86133[j]	2.510	2.4907[f], 2.5356[e]	1.4277	1.427545[h], 1.42401[k]
	308.15	0.8574	0.8579[e], 0.8570[f], 0.85740[j]	2.251	2.250[l], 2.2893[e], 2.2437[f]		
	313.15	0.8535	0.8539[e], 0.85347[j], 0.8533[f]	2.035	2.041[l], 2.0776[e], 2.0346[f]	1.4237	1.423352[h]
	318.15	0.8495	0.8500[e], 0.84954[j], 0.8494[f]	1.843	1.8624[f], 1.862[l], 1.8944[e]		
	323.15	0.8456	0.8461[e], 0.84560[j], 0.8452[f]	1.695	1.7347[e], 1.7023[f]	1.4191	1.419149[h]
Methyl tetradecanoate	293.15	0.8669	0.8672[m]	4.510	4.442[n], 4.509[o]	1.4371	1.436365[h], 1.43701[k]
	298.15	0.8631	0.8637[e], 0.86325[j]	3.955	3.9821[e], 3.919[j]		
	303.15	0.8593	0.8599[e], 0.8596[m], 0.85943[j]	3.486	3.496[n], 3.484[j], 3.543[e]	1.4327	1.432295[h], 1.42905[k]
	308.15	0.8555	0.8560[e], 0.8557[l], 0.85562[j]	3.096	3.101[j], 3.1651[e]		
	313.15	0.8517	0.8522[e], 0.85181[j] 0.8519[m], 0.8516[p]	2.765	2.841[n], 2.784[j], 2.447[e]	1.4291	1.428196[h]
	318.15	0.8479	0.84801[l], 0.8484[e]	2.522	2.516[j], 2.5709[e]		
	323.15	0.8441	0.8446[e], 0.8442[m], 0.8433[p]	2.282	2.252[n], 2.311[j], 2.3343[e]	1.4245	1.424070[h]

[a]Standard uncertainties u are u (p) = 0.2 kPa, u (T) = 0.01 K for density experiments, u (T) = 0.01 K for viscosity experiments, u_r (ρ) = 0.0010, u_r (η) = 0.020. [b]Ref.17. [c]Ref.18. [d]Ref.19. [e]Ref.22. [f]Ref.23. [g]Ref.24. [h]Ref.25. [j]Ref.26. [k]Ref.27. [l]Ref.28. [m]Ref.29. [n]Ref.30. [o]Ref.31. [p]Ref.32

Table S2 The adjustable parameters of the Redlich-Kister equation and standard deviations for V_m^E of binary mixtures

T/K	A_2	A_1	A_0	σ	A_2	A_1	A_0	σ
	DEGDME (1) + methyl octanoate (2)				DEGDME (1) + methyl decanoate (2)			
293.15	0.0102	0.192	1.3326	0.0029	0.2379	0.4968	2.0553	0.0060
298.15	-0.0039	0.1746	1.337	0.0024	0.1441	0.4756	1.9475	0.0062
303.15	-0.0092	0.2024	1.3444	0.0023	0.1509	0.4851	1.9684	0.0056
308.15	-0.0288	0.1786	1.3628	0.0025	0.1473	0.4852	1.9863	0.0047
313.15	-0.0155	0.1831	1.3749	0.0021	0.1511	0.4909	2.0133	0.0050
318.15	-0.0171	0.1705	1.3894	0.0029	0.1478	0.4926	2.0297	0.0047
323.15	-0.0084	0.1747	1.4049	0.0024	0.1379	0.4968	2.0553	0.0044
	DEGDME (1) + methyl dodecanoate (2)				DEGDME (1) + methyl tetradecanoate (2)			
293.15	0.4028	0.7495	2.4721	0.0057	0.595	1.0845	2.9051	0.0086
298.15	0.3266	0.7542	2.4858	0.0059	0.6168	1.0475	2.9258	0.0087
303.15	0.334	0.7534	2.4998	0.0061	0.6195	1.0496	2.9439	0.0083
308.15	0.3347	0.747	2.5219	0.0056	0.6	1.072	2.9672	0.0088
313.15	0.3416	0.7607	2.5428	0.0058	0.6009	1.0848	2.9933	0.0084
318.15	0.3289	0.7671	2.5666	0.0060	0.6204	1.0783	3.0131	0.0076
323.15	0.3121	0.7741	2.5961	0.0054	0.5841	1.1026	3.0417	0.0076

Table S3 The adjustable parameters of the Redlich-Kister equation and standard deviations for $\Delta\eta$ of binary mixtures

T/K	A_3	A_2	A_1	A_0	σ	A_3	A_2	A_1	A_0	σ
	DEGDME (1) + methyl octanoate (2)					DEGDME (1) + methyl decanoate (2)				
293.15	-0.0922	0.123	0.2913	-1.4411	0.0002	-0.0037	0.0654	-0.0083	-0.3199	0.0011
298.15	-0.0134	-0.0071	-0.0112	-0.0837	0.0002	-0.0736	0.0365	0.0276	-0.267	0.0006
303.15	-0.0194	-0.0068	-0.0028	-0.0759	0.0003	-0.0173	-	0.0074	-0.2208	0.0001
308.15	-0.0092	-0.0047	-0.0049	-0.0693	0.0003	-0.0873	-0.0084	0.0262	-0.1945	0.0005
313.15	-0.02	0.0117	0.0013	-0.0632	0.0003	-0.0865	-0.0277	0.0317	-0.1583	0.0008
318.15	0.0025	0.0179	-0.0058	-0.0557	0.0003	-0.0205	-0.0043	0.0152	-0.1354	0.0002
323.15	-0.0027	0.0139	-0.0013	-0.0418	0.0002	-0.0572	0.0272	0.0112	-0.1148	0.0007
	DEGDME (1) + methyl dodecanoate (2)					DEGDME (1) + methyl tetradecanoate (2)				
293.15	0.1038	-0.0377	0.0609	-0.7736	0.0037	-0.0922	0.123	0.2913	-1.4411	0.0053
298.15	0.1096	-0.0175	0.0002	-0.6267	0.0019	0.017	0.0523	0.205	-1.1502	0.0024
303.15	0.0496	-0.061	0.0306	-0.5195	0.0013	-0.0706	0.0855	0.1983	-0.9265	0.0029
308.15	0.0129	-0.0353	0.0129	-0.4293	0.0004	-0.1447	0.0729	0.1736	-0.7519	0.0023
313.15	-0.0188	-0.0494	0.02	-0.3549	0.0004	0.0118	0.0798	0.0865	-0.5976	0.0021
318.15	-0.0333	-0.0789	-0.0056	-0.3017	0.0010	-0.0556	0.0733	0.1261	-0.5168	0.0022
323.15	-0.0224	-0.0719	0.0010	-0.2731	0.0016	-0.0589	0.0642	0.1052	-0.4074	0.0018

Table S4 Measured refractive Indices (n_D) for the binary mixtures from 293.15 to 323.15 K and P=0.1 MPa[a].

	n_D					n_D			
x_1	293.15 K	303.15K	313.15K	323.15K	x_1	293.15 K	303.15K	313.15K	323.15K
	DEGDME (1) + methyl octanoate (2)					DEGDME (1) + methyl decanoate (2)			
0	1.4171	1.4127	1.4082	1.4034	0	1.4252	1.4214	1.4168	1.4125
0.1004	1.4163	1.4117	1.4071	1.4023	0.1003	1.4239	1.4198	1.4151	1.4108
0.1993	1.4153	1.4107	1.4061	1.4013	0.2003	1.4224	1.4183	1.4135	1.4091
0.3005	1.4143	1.4097	1.4051	1.4003	0.2999	1.4208	1.4167	1.4119	1.4074
0.4007	1.4133	1.4087	1.4041	1.3993	0.4005	1.4191	1.4150	1.4102	1.4057
0.5007	1.4123	1.4077	1.4031	1.3983	0.5002	1.4174	1.4132	1.4084	1.4039
0.6001	1.4113	1.4068	1.4022	1.3973	0.6000	1.4156	1.4113	1.4065	1.4020
0.7001	1.4104	1.4059	1.4013	1.3964	0.7003	1.4138	1.4094	1.4045	1.4000
0.8007	1.4095	1.4051	1.4004	1.3956	0.8001	1.4119	1.4075	1.4026	1.3980
0.9006	1.4086	1.4043	1.3996	1.3949	0.8999	1.4098	1.4056	1.4007	1.3961
1	1.4077	1.4035	1.3988	1.3942	1	1.4077	1.4036	1.3988	1.3942
	DEGDME (1) + methyl dodecanoate (2)					DEGDME (1) + methyl tetradecanoate (2)			
0	1.4318	1.4277	1.4237	1.4191	0	1.4371	1.4327	1.4292	1.4245
0.1008	1.4301	1.4259	1.4218	1.4172	0.1007	1.4351	1.4309	1.4271	1.4225
0.2002	1.4283	1.4241	1.4199	1.4152	0.1997	1.4331	1.4289	1.425	1.4204
0.3001	1.4264	1.4221	1.4179	1.4132	0.3003	1.4309	1.4266	1.4226	1.4181
0.3999	1.4243	1.4200	1.4157	1.4110	0.4002	1.4285	1.4242	1.4202	1.4156
0.5003	1.4221	1.4177	1.4134	1.4087	0.5007	1.4259	1.4215	1.4174	1.4129
0.5995	1.4196	1.4153	1.4109	1.4062	0.6000	1.4230	1.4186	1.4144	1.4099
0.6997	1.4170	1.4127	1.4082	1.4035	0.7001	1.4198	1.4154	1.4111	1.4065
0.7998	1.4142	1.4099	1.4053	1.4006	0.8005	1.4162	1.4119	1.4074	1.4028
0.9244	1.4102	1.4060	1.4012	1.3965	0.9002	1.4123	1.4081	1.4034	1.3985
1	1.4077	1.4036	1.3988	1.3942	1	1.4077	1.4036	1.3988	1.3942