Supporting Information: Understanding Solute-Hydrotrope Aggregation in Aqueous Solutions: A Molecular Dynamics Approach

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Tables

Table S1: Number of molecules (N_i) and simulation times during the production phase (t) for each simulation at different hydrotrope molar fractions free of solute ($x_{\text{hydrotrope}}$).

Binary systems: hydrotrope + water				
$x_{\text{hydrotrope}}$	$N_{\text{hydrotrope}}$	N_{water}	N_{solute}	t / ns
0	0	10000	-	20
0.1	1000	9000	-	20
0.2	2000	8000	-	20
0.4	4000	6000	-	20
0.6	6000	4000	-	20
0.8	8000	2000	-	20
0.9	9000	1000	-	20
1	10000	0	-	20
Ternary systems: hydrotrope + water + solute				
$x_{\text{hydrotrope}}$	$N_{\text{hydrotrope}}$	N_{water}	N_{solute}	t / ns
[a] 0.2	2500	10000	5	100
0.4	5000	7500	5	50
0.6	7500	5000	5	50
[a] 0.8	10000	2500	5	150
1	12500	0	5	50

[a] The system required more time for better sampling to analyze the solute-solvent interactions for KBI analysis.

Table S2: Absolute Average Relative Deviation (AARD %)[a] for the pure density of the hydrotrope between 280 and 320 K using MD with the GAFF2/RESP2$_{0.5}$ force field (FF), with and without the LJ scaling factor ($f_{\sigma_{OH}} = 0.98$).

Hydrotrope	FF without LJ fit	FF with the scaling factor
1,2-ethanediol	3.6%	0.4%
1,2-propanediol	1.3%	0.8%
1,2-butanediol	2.6%	0.2%
1,2-pentanediol	0.5%	1.5%
1,2-hexanediol	0.3%	1.4%

[a] AARD% $= \frac{100}{n} \sum^{n} \left| \frac{\rho_{\mathrm{MD}} - \rho_{\mathrm{exp}}}{\rho_{\mathrm{exp}}} \right|$ where n is the total number of experimental points, ρ is the density, and the superscripts exp and MD are the experimental and calculated from MD values, respectively

Figures

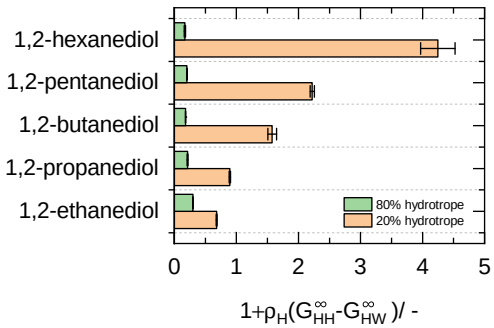

Figure S1: The term, $1 + \rho_H \left(G^{\infty}_{\mathrm{HH}} - G^{\infty}_{\mathrm{HW}}\right)$, in Eq. 3, in various hydrotrope + water mixtures at 303.2 K.

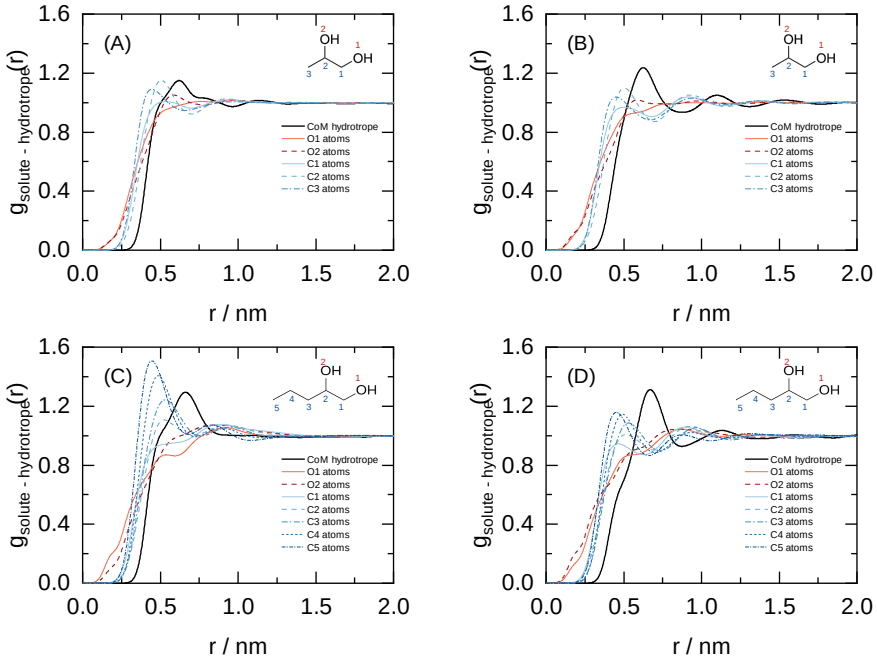

Figure S2: Radial distribution function between the center of mass of syringic acid and the center of mass (CoM) of the hydrotrope or specific atoms for various concentrations of hydrotropes: (A) 20% 1,2-propanediol, (B) 80% 1,2-propanediol, (C) 20% 1,2-pentanediol a (D) 80% 1,2-pentanediol.