

The Behavior of Cyclohexane as a Sparingly Soluble Solute in Polyethylene Glycol

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Table S1. Densities in $10^{-3} \text{ kg}\cdot\text{m}^{-3}$ for Solutions of Cyclohexane in PEG200 at Ambient Pressure (0.1 MPa).^a

x_{CH}	T/K				
	298.15	308.15	318.15	328.15	338.15
0 ^b	1.1209	1.1129	1.1049	1.0969	1.0890
0	1.1196	1.1117	1.1037	1.0958	1.0878
0.0227	1.1155	1.1076	1.0996	1.0917	1.0837
0.0303	1.1115	1.1036	1.0956	1.0876	1.0796
0.0495	1.1048	1.0968	1.0888	1.0808	1.0728
0.0519	1.1042	1.0962	1.0881	1.0801	1.0721
0.0528	1.1040	1.0960	1.0880	1.0800	1.0720

^a Estimated standard uncertainties are $1 \times 10^{-6} \text{ kg}\cdot\text{m}^{-3}$ for density, 0.02 K for temperature, T , 0.002 for cyclohexane mole fraction x_{CH} .

^b Taken from Kealy et al. [1].

Table S2. Viscosities in $\text{mPa}\cdot\text{s}$ for Solutions of Cyclohexane in PEG200 at Ambient Pressure (0.1 MPa).^a

x_{CH}	T/K				
	298.15	308.15	318.15	328.15	338.15
0 ^b	52.34	32.41	21.49	14.72	10.61
0	51.71	32.19	21.41	15.00	11.01
0.0227	48.80	30.51	20.37	14.34	10.54
0.0303	46.83	29.38	19.69	13.88	10.24
0.0495	43.81	27.56	18.52	13.12	9.70
0.0519	43.53	27.41	18.44	13.08	9.67
0.0528	43.53	27.47	18.49	13.11	9.70

^a Estimated standard uncertainties are 0.02 K for temperature, T , 0.002 for cyclohexane mole fraction x_{CH} . Relative standard uncertainty for viscosity is 0.02 (or 2%).

^b Taken from Kealy et al. [1].

Table S3. Self-Diffusion Coefficients of PEG200 in $10^{-10} \text{ m}^2\cdot\text{s}^{-1}$ for Solutions of Cyclohexane in PEG200 at Ambient Pressure (0.1 MPa).^a

χ_{CH}	T/K				
	300.4	308.7	319.7	330.5	341.1
0 ^b	0.28	0.47	0.74	1.06	1.57
0	0.27	0.48	0.76	1.10	1.64
0.0227	0.29	0.48	0.77	1.06	1.51
0.0303	0.31	0.51	0.78	1.20	1.53
0.0495	0.32	0.56	0.85	1.18	1.66
0.0519	0.33	0.57	0.86	1.22	1.63
0.0528	0.33	0.54	0.83	1.21	1.68

^a Estimated standard uncertainties are $0.5 \times 10^{-10} \text{ m}^2\cdot\text{s}^{-1}$ for the self-diffusion coefficient, 1.0 K for temperature, T , 0.002 for cyclohexane mole fraction χ_{CH} .

^b Taken from Kealy et al. [1].

Table S4. Self-Diffusion Coefficients of Cyclohexane in $10^{-10} \text{ m}^2\cdot\text{s}^{-1}$ for Solutions of Cyclohexane in PEG200 at Ambient Pressure (0.1 MPa).^a

χ_{CH}	T/K				
	300.4	308.7	319.7	330.5	341.1
0.0227	0.46	0.82	1.27	1.85	2.67
0.0303	0.46	0.86	1.34	1.97	2.67
0.0495	0.50	0.94	1.41	2.07	2.83
0.0519	0.51	0.96	1.38	2.12	2.75
0.0528	0.50	0.92	1.45	2.04	2.84

^a Estimated standard uncertainties are $0.5 \times 10^{-10} \text{ m}^2\cdot\text{s}^{-1}$ for the self-diffusion coefficient, 1.0 K for temperature, T , 0.002 for cyclohexane mole fraction χ_{CH} .

Table S5. Excess Molar Volumes, V^E , in $10^{-6} \text{ m}^3 \cdot \text{mol}^{-1}$ as Well as Slope ($A^E/10^{-6} \text{ m}^3 \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$) and Intercept/ $10^{-6} \text{ m}^3 \cdot \text{mol}^{-1}$ of the Linear Temperature Dependence of V^E for Solutions of Cyclohexane in PEG200 at Ambient Pressure (0.1 MPa).^a

x_{CH}	T/K					A^E	Intercept
	298.15	308.15	318.15	328.15	338.15		
0.0227	-0.22	-0.19	-0.17	-0.15	-0.12	0.00237	-0.93
0.0303	-0.39	-0.34	-0.30	-0.23	-0.19	0.00508	-1.91
0.0495	-1.61	-1.49	-1.40	-1.28	-1.18	0.01053	-4.74
0.0519	-2.42	-2.30	-2.17	-2.05	-1.93	0.01236	-6.11
0.0528	-3.16	-3.02	-2.90	-2.76	-2.63	0.01322	-7.10

^a Estimated standard uncertainties are $0.5 \times 10^{-6} \text{ m}^3 \cdot \text{mol}^{-1}$ for excess molar volume, $2 \times 10^{-10} \text{ m}^3 \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$ for A^E , $6 \times 10^{-8} \text{ m}^3 \cdot \text{mol}^{-1}$ for intercept, 0.02 K for temperature, T , and 0.002 for cyclohexane mole fraction x_{CH} .

Table S6: V^E Universal Fit
Parameters According to Eq 5.

i	$a_{m,i}$	$a_{b,i}$
1	21.4	25.6
2	2.35	-2780
3	0.0579	-

Table S7. Hydrodynamic Radii in nm of Cyclohexane in PEG200.^a

x_{CH}	298.15	308.15	318.15	328.15	338.15
0.0230	0.13	0.14	0.14	0.15	0.15
0.0303	0.12	0.13	0.14	0.15	0.15
0.0490	0.12	0.13	0.14	0.15	0.15
0.0514	0.12	0.13	0.14	0.15	0.15
0.0523	0.12	0.13	0.14	0.15	0.15

^a Estimated standard uncertainties are 0.04 nm, 1 K for temperature, T , and 0.002 for cyclohexane mole fraction x_{CH} .

Table S8. ^1H NMR Relaxation Measurement Results
for Cyclohexane in PEG200 at 300.2 K.^a

x_{CH}	T_1/s	T_2/s	T_1/T_2
0.0151	1.291	0.264	4.90
0.0294	1.345	0.277	4.85
0.0308	1.371	0.269	5.10
0.0325	1.346	0.272	4.95
0.0378	1.369	0.274	4.99
average	1.344	0.271	4.96
stdev	0.032	0.005	0.10

^a Estimated standard uncertainties are 1 K for temperature, T , and 0.002 for cyclohexane mole fraction x_{CH} . Estimated relative standard uncertainty for the relaxation measurements is 0.03.

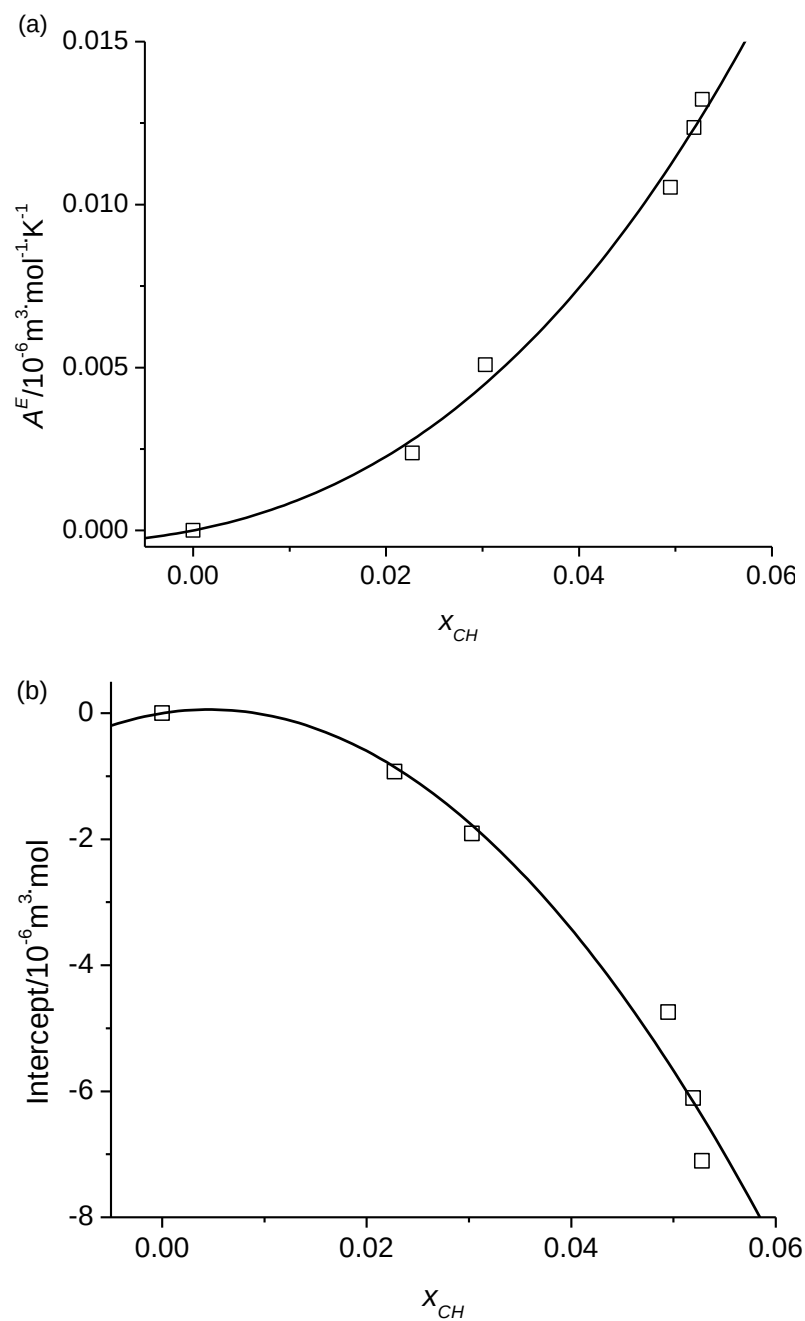


Figure S1: (a) Slopes, which represent the temperature-averaged excess molar isobaric expansion, A^E , and (b) intercepts of the linear temperature dependence of the excess molar volume of solutions of cyclohexane in PEG200.

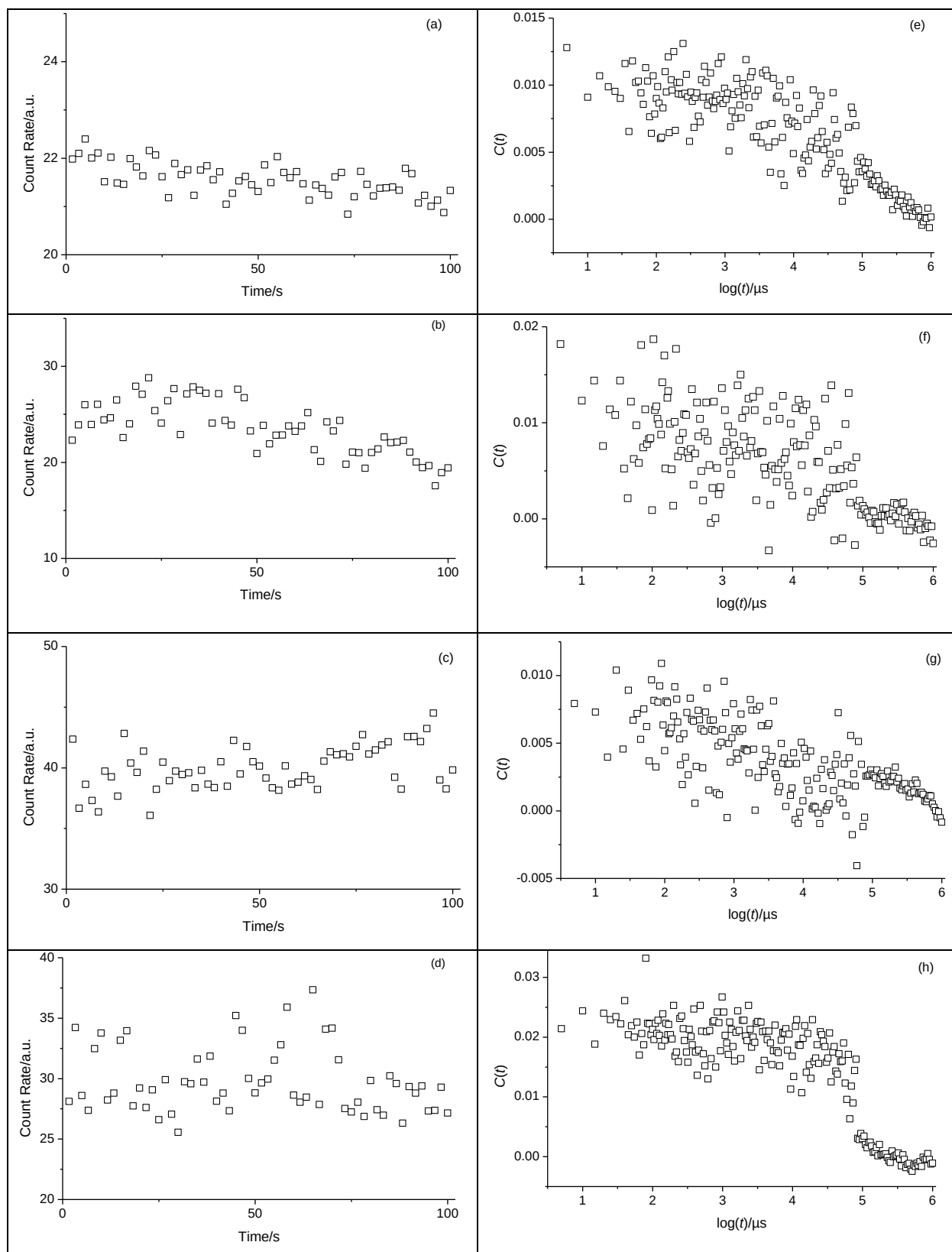


Figure S2: Count rates (a-d) and associated correlation time graphs (e-h) from DLS of solutions of cyclohexane in PEG200 from top to bottom as $x_{CH} = 0, 0.0201, 0.0402$, and 0.0422 .

1. Hoffmann, M.M.; Kealy, J.D.; Gutmann, T.; Buntkowsky, G. Densities, viscosities, and self-diffusion coefficients of several polyethylene glycols. *J. Chem. Eng. Data* **2021**, *67*, 88-103, doi:10.1021/acs.jced.1c00759.