Viscosity, Interfacial Tension, and Density of 2-Propanol and Acetone up to 423 K by Surface Light Scattering and Conventional Methods

Manuel Kerscher,[a] *Lena M. Braun,*[a] *Julius H. Jander*,[a] *Michael H. Rausch*,[a] *Thomas M. Koller*,[a] *Peter Wasserscheid*,[b,c] *Andreas P. Fröba**,[a]

[a]Institute of Advanced Optical Technologies − Thermophysical Properties (AOT-TP), Department of Chemical and Biological Engineering (CBI) and Erlangen Graduate School in Advanced Optical Technologies (SAOT), Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Paul-Gordan-Straße 8, 91052 Erlangen, Germany

[b]Forschungszentrum Jülich GmbH, Helmholtz Institute Erlangen-Nürnberg for Renewable Energy (IEK-11), Cauerstraße 1, 91058 Erlangen, Germany

[c]Institute of Chemical Reaction Engineering (CRT), Department of Chemical and Biological Engineering (CBI), Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Egerlandstraße 3, 91058 Erlangen, Germany

Email addresses: manuel.kerscher@fau.de, lena.br.braun@fau.de, julius.jander@fau.de, michael.rausch@fau.de, thomas.m.koller@fau.de, peter.wasserscheid@fau.de, andreas.p.froeba@fau.de

*Author to whom correspondence should be addressed. Tel.: +49-9131-85-29789, fax: +49-9131-85-25878

S1 – Results for the liquid density from vibrating-tube densimetry (VTD)

Table S1 – Liquid density ρ_L of 2-propanol and acetone measured by VTD at atmospheric conditions and p = 0.1 MPa using the densimeter DMA 5000 M as a function of T.[a]

T / K	ρ_L / (kg·m^{-3})		T / K	ρ_L / (kg·m^{-3})	
	2-propanol	**acetone**		**2-propanol**	**acetone**
278.15	797.37	807.00	318.15	763.31	760.99
283.15	793.33	801.38	323.15	758.67	755.01
288.15	789.24	795.76	328.15	753.92	–
293.15	785.10	790.08	333.15	749.04	–
298.15	780.90	784.36	338.15	744.04	–
303.15	776.63	778.59	343.15	738.89	–
308.15	772.28	772.77	348.15	733.60	–
313.15	767.84	766.91	353.15	728.16	–

[a] The uncertainties for T and p are $U(T)$ = 10 mK and $U(p)$ = 3 kPa. The estimated relative uncertainty of ρ is $U_r(\rho_L)$ = 0.06%. All uncertainties are given on a confidence level of 0.95.

Table S2 – Liquid density ρ_L of pure 2-propanol and acetone measured by VTD in the slightly compressed liquid state at p close to their vapor pressure p_{vap} using the densimeter DMA 4200 M as a function of T.

T / K	p / MPa	p_{vap} / MPa[b]	ρ / kg·m^{-3}	p / MPa	p_{vap} / MPa[b]	ρ / kg·m^{-3}
		2-propanol			**acetone**	
298.15	0.115	0.006	781.11	0.059	0.031	784.47
323.15	0.125	0.024	758.82	0.098	0.082	755.11
343.15	0.125	0.061	739.02	0.193	0.160	730.67
348.15	0.125	0.075	733.72	0.206	0.186	724.36
373.15	0.219	0.196	704.92	0.403	0.372	691.71
383.15	0.293	0.275	692.17	0.485	0.478	677.77
398.15	0.483	0.440	671.67	0.743	0.677	656.13
403.15	–	–	–	0.766	0.756	648.28
423.15	0.891	0.879	632.68	1.136	1.142	615.82

[a] The uncertainties for T and p are $U(T)$ = 30 mK and $U(p)$ = 15 kPa. The estimated relative uncertainty of ρ is $U_r(\rho_L)$ = 0.12%. All uncertainties are given on a confidence level of 0.95.
[b] The vapor pressure p_{vap} for 2-propanol [1] and acetone [2] is obtained from the cited literature.

S2 – Results for the liquid viscosity by capillary viscometry (CV)

Table S3 –Liquid dynamic viscosity η_L of 2-propanol and acetone measured by CV at p = 0.1 MPa under ambient atmosphere. Values for ρ_L used for the calculation of η_L are included.[a]

T / K	ρ_L / (kg·m^{-3})	η_L / (mPa·s)	100 $U_r(\eta_L)$	T / K	ρ_L / (kg·m^{-3})	η_L / (mPa·s)	100 $U_r(\eta_L)$
2-propanol				**acetone**			
303.28	776.55	1.7929	0.73	283.20	801.40	0.3503	0.99
313.16	767.86	1.3573	0.75	293.19	789.97	0.3163	1.1
323.14	758.70	1.0423	0.82	303.17	778.48	0.2873	1.2
333.13	749.08	0.8138	0.92	313.15	766.89	0.2617	1.3
343.13	738.94	0.6458	1.1	323.17	755.08	0.2388	1.5
348.11	733.70	0.5783	1.3				
353.07	728.32	0.5203	1.5				

[a] ρ_L is calculated from the correlations according to Eq. (3) in the main paper based on present measurement results. The corresponding uncertainty is $U_r(\rho_L)$ = 0.06%. The uncertainty for T is $U(T)$ = (50 and 60) mK at $T \leq 313$ K and above. All uncertainties are given on a confidence level of 0.95.

REFERENCES

1. G. Scalabrin and P. Stringari, J. Phys. Chem. Ref. Data **38**, 127 (2009). https://doi.org/10.1063/1.3112608.

2. E. W. Lemmon and R. Span, J. Chem. Eng. Data **51**, 785 (2006). https://doi.org/10.1021/je050186n.