Supplement of

Effects of molecular weight and temperature on liquid–liquid phase separation in particles containing organic species and inorganic salts

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1. **Linear regression analysis to determine the level of significance of the temperature dependent trends.**

To further investigate the effect of temperature on SRH we carried out a linear regression analysis to determine the level of significance of the temperature dependent trends. Shown in Figure S1-S3, are plots of the SRH-values versus temperature for the individual organic compounds studied. Also included in the figure is a linear fit to the data. Listed in Table S1 are the slopes, uncertainties of the slope, correlation coefficients (r) and p-values associated with the fits. In short, 5 out of the 12 systems studied had a high correlation coefficient (r>0.9) and low p-value (<0.06).

Supporting tables

Table S1 Summary of the results from the linear regression analysis to understand the relationship between temperature and SRH.

| Compounds	Formula	Molecular weight	O:C	Slope	Uncertainty of slope	Correlation coefficient, r	p-value
2,5-hexanediol	$C_6H_{14}O_2$	118.2	0.33	0.12	0.22	0.94	0.06
Poly(propylene glycol)	$C_{3n}H_{6n+2}O_{n+1}$	425	0.38	0.14	0.19	0.99	0.01
Poly(ethylene glycol) diacrylate	$C_{2n+6}H_{4n+6}O_{n+3}$	575	0.5	0.15	0.19	0.94	0.06
Poly(ethylene glycol)	$C_{2n}H_{4n+2}O_{n+1}$	900	0.53	0.10	0.22	0.88	0.12
α,4-dihydroxy-3-methoxybenzene acetic acid	$C_9H_{10}O_5$	198.2	0.56	-0.06	0.18	-0.41	0.59
Diethylmalonic acid	$C_7H_{12}O_4$	160.2	0.57	0.00	0.15	-0.07	0.93
3,3-dimethylglutaric acid	$C_7H_{12}O_4$	160.2	0.57	-0.23	0.16	-0.87	0.13
Poly(ethylene glycol)	$C_{2n}H_{4n+2}O_{n+1}$	300	0.58	0.05	0.23	0.62	0.38
Poly(ethylene glycol)	$C_{2n}H_{4n+2}O_{n+1}$	200	0.63	0.20	0.19	0.95	0.05
Poly(ethylene glycol) bis(carboxymethyl) ether	$C_{2n+2}H_{4n+2}O_{n+5}$	600	0.63	0.08	0.20	0.94	0.06
2-methylglutaric acid	$C_6H_{10}O_4$	146.1	0.67	-0.02	0.19	-0.72	0.28
Diethyl L-tartrate	$C_8H_{14}O_6$	206.2	0.75	0.07	0.20	0.67	0.33
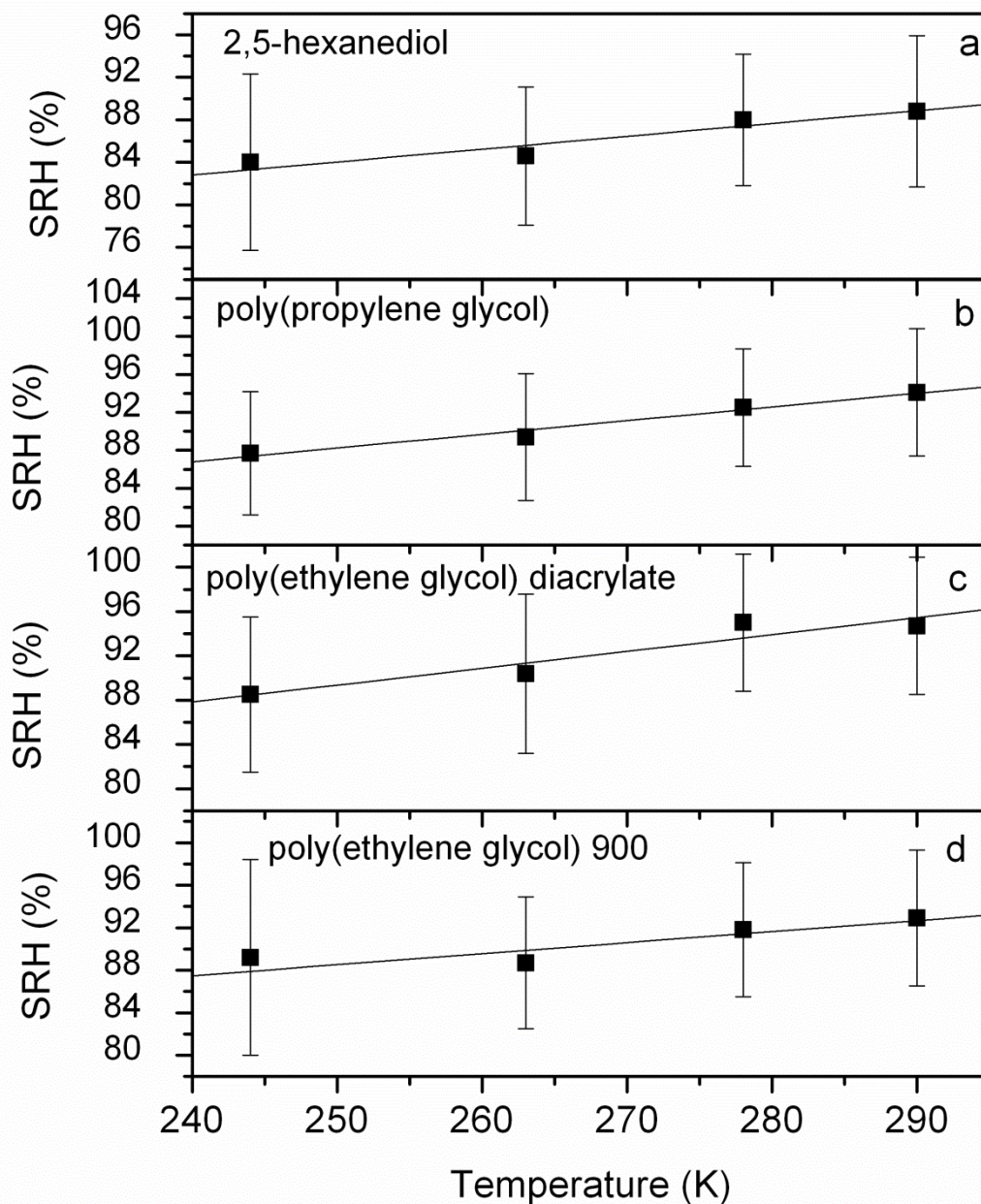
Figure S1 SRH as a function of temperature for particles which underwent liquid-liquid phase separation containing ammonium sulfate mixed with: a) 2,5-hexanediol; b) poly(propylene glycol); c) poly(ethylene glycol) diacrylate; d) poly(ethylene glycol) Mw= 900 Da. Organic species were labeled in each panel. Data plotted were taken from Table 4 of the main text. Bars for the data are 95% confidence intervals considering σ of multiple SRH measurements and the uncertainty from the calibration. OIR = 2.0 ± 0.1 in all the experiments. Black lines are linear fits of SRH as a function of temperature. The results of these linear fits are also shown in Table S1.
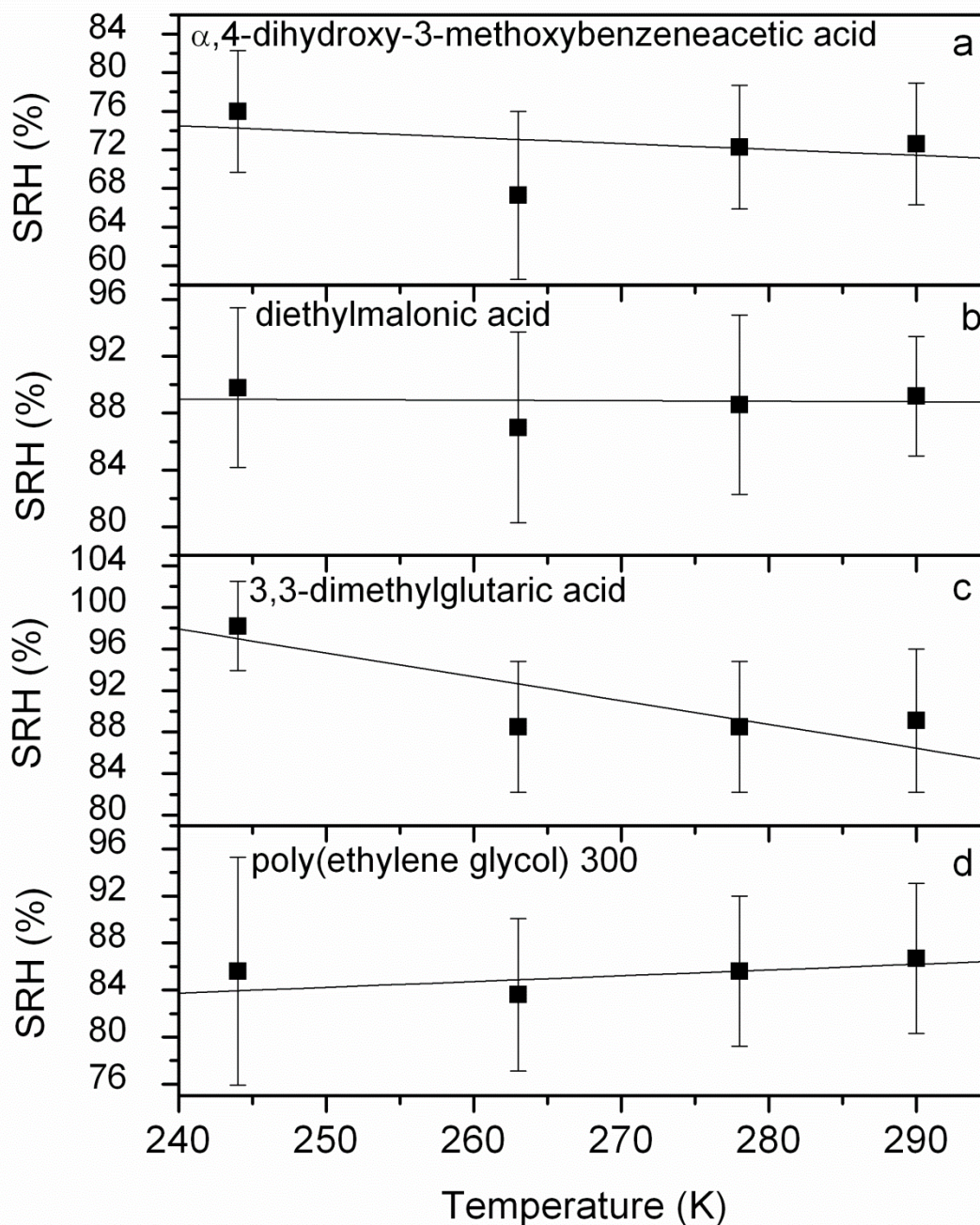
Figure S2 SRH as a function of temperature for particles which underwent liquid-liquid phase separation containing ammonium sulfate mixed with: a) α,4-dihydroxy-3methoxybeneacetic acid; b) diethylmalonic acid; c) 3,3-dimethylglutaric acid; d) ploy(ethylene glycol) Mw= 300 Da. Organic species were labeled in each panel. Data plotted were taken from Table 4 in the main text. Bars for the data are 95% confidence intervals considering σ of multiple SRH measurements and the uncertainty from the calibration. OIR = 2.0 ± 0.1 in all the experiments. Black lines are linear fits of SRH as a function of temperature. The results of these linear fits are also shown in Table S1.
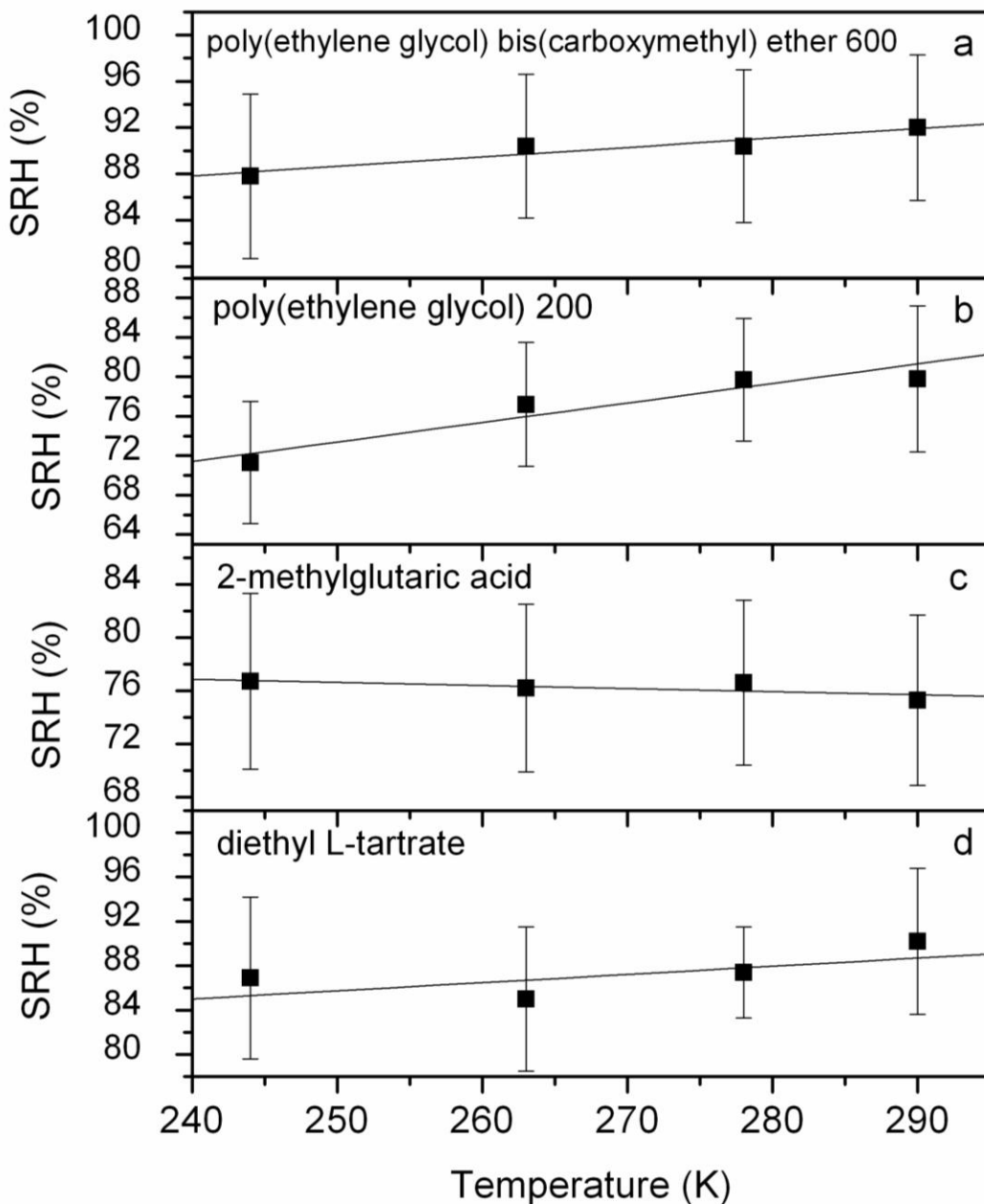
Figure S3 SRH as a function of temperature for particles which underwent liquid-liquid phase separation containing ammonium sulfate mixed with: a) poly(ethylene glycol) bis(carboxymethyl) ether Mw=600 Da; b) poly(ethylene glycol) Mw= 200 Da; c) 2-methylglutaric acid; d) diethyl L-tartrate. Organic species were labeled in each panel. Data plotted were taken from Table 4 in the main text. Bars for the data are 95% confidence intervals considering σ of multiple SRH measurements and the uncertainty from the calibration. OIR = 2.0 ± 0.1 in all the experiments. Black lines are linear fits of SRH as a function of temperature. The results of these linear fits are also shown in Table S1.