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The impact of (bio-)organic substances on the ice nucleation activity of the K-feldspar microcline in aqueous solutions

Kristian Klumpp et al.

Correspondence to: Kristian Klumpp (kristian.klumpp@env.ethz.ch) and Claudia Marcolli (claudia.marcolli@env.ethz.ch)

S1 DSC thermograms of immersion freezing experiments of emulsified microcline suspensions in aqueous solutions

We show sets of DSC thermograms (cooling rate: 1 K/min) for freshly prepared emulsions with various solutes.

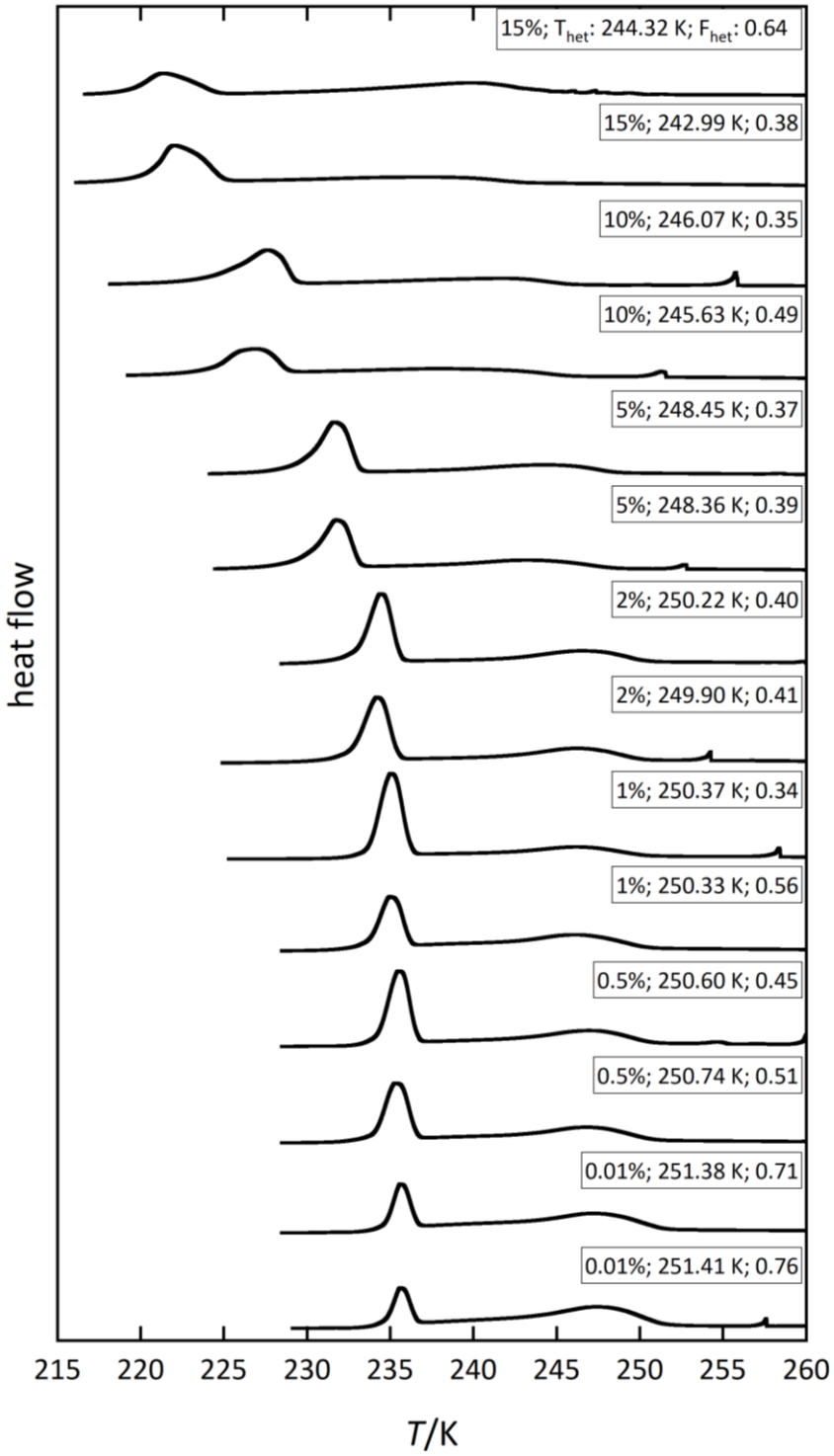


Figure S1: DSC thermograms of 2 wt% microcline suspensions with varying acetic acid content. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

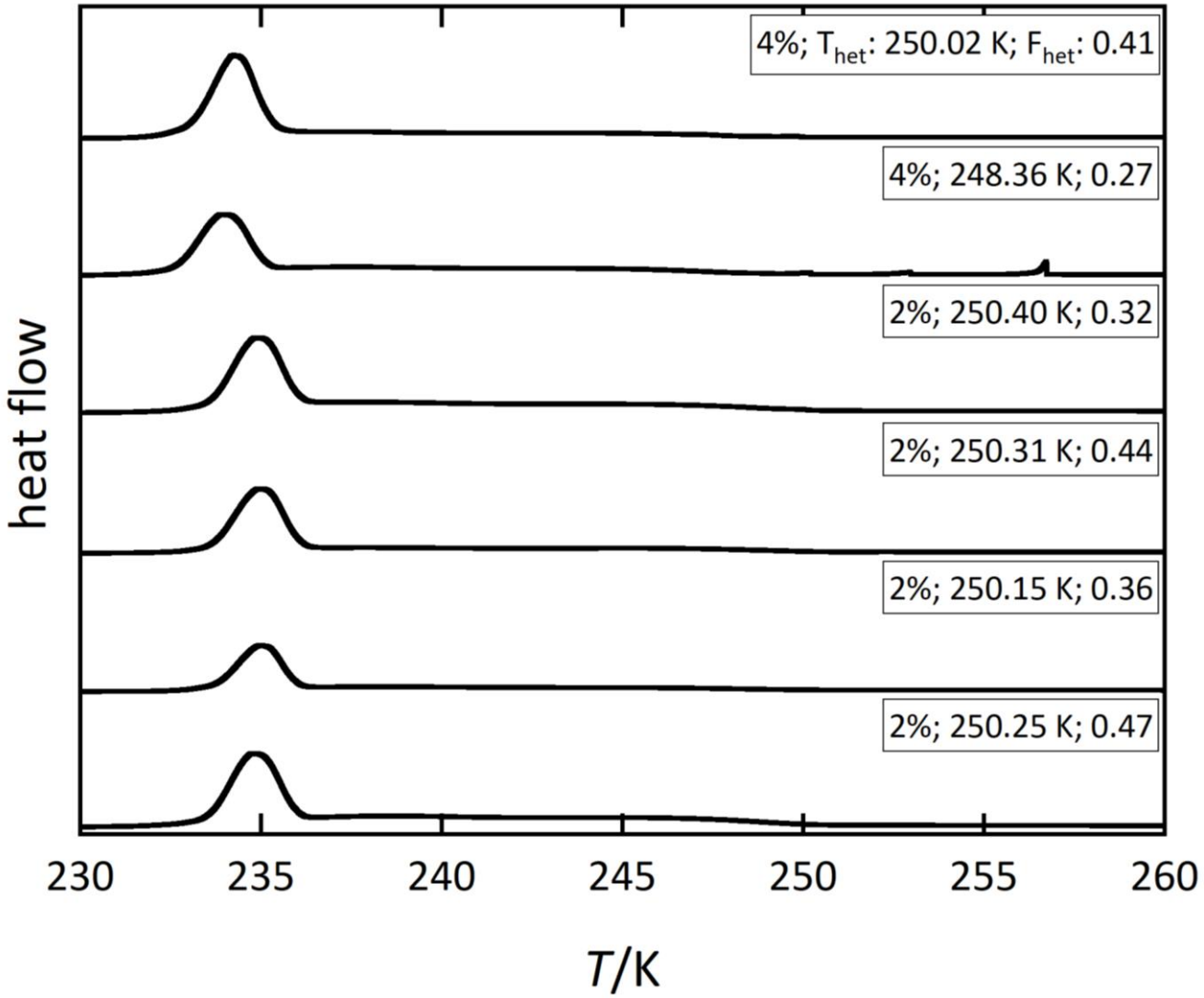
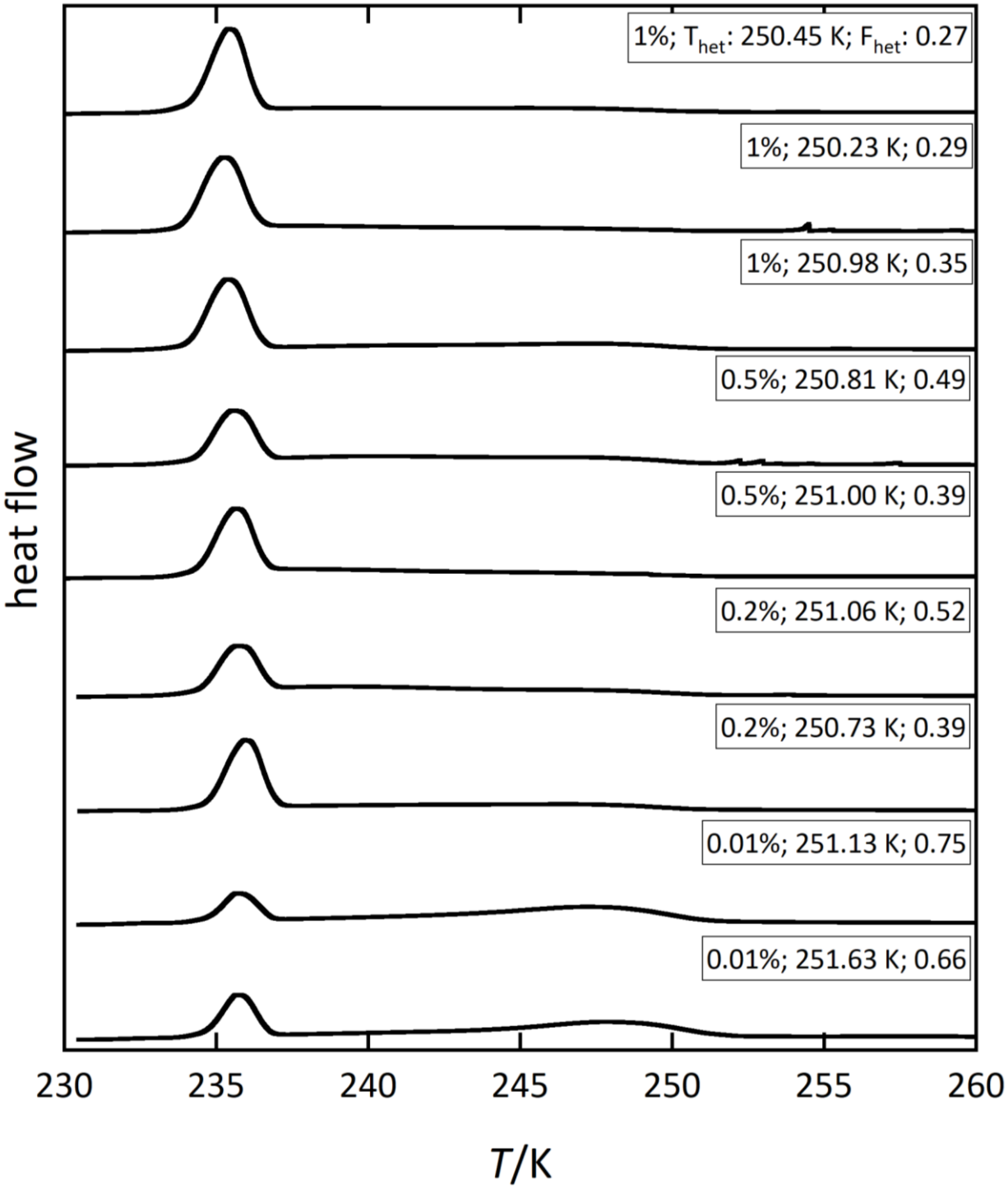


Figure S2: DSC thermograms of 2 wt% microcline suspensions with varying oxalic acid content. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.



25 **Figure S3:** DSC thermograms of 2 wt% microcline suspensions with varying oxalic acid content. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral

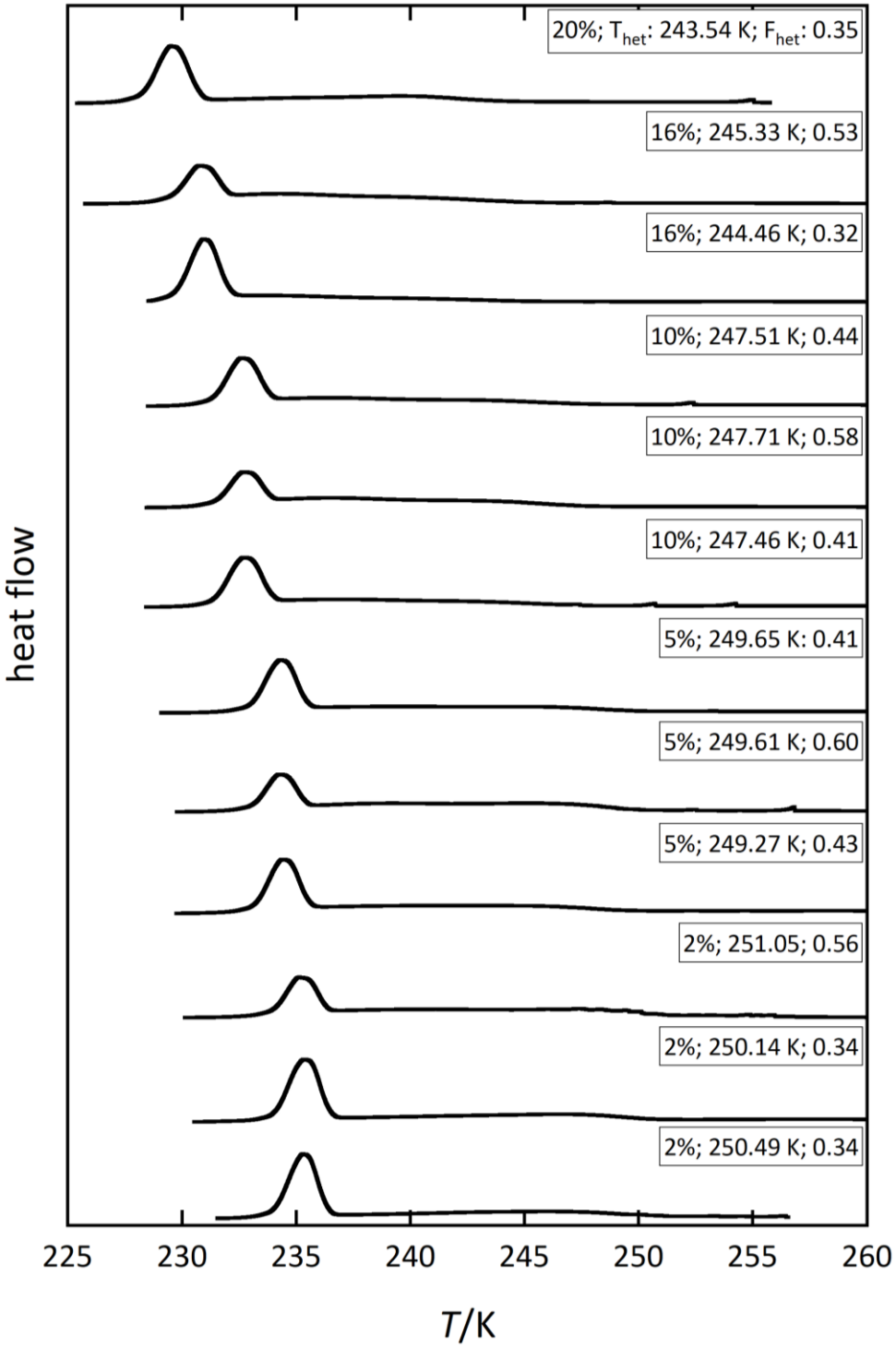


Figure S4: DSC thermograms of 2 wt% microcline suspensions with varying citric acid content. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

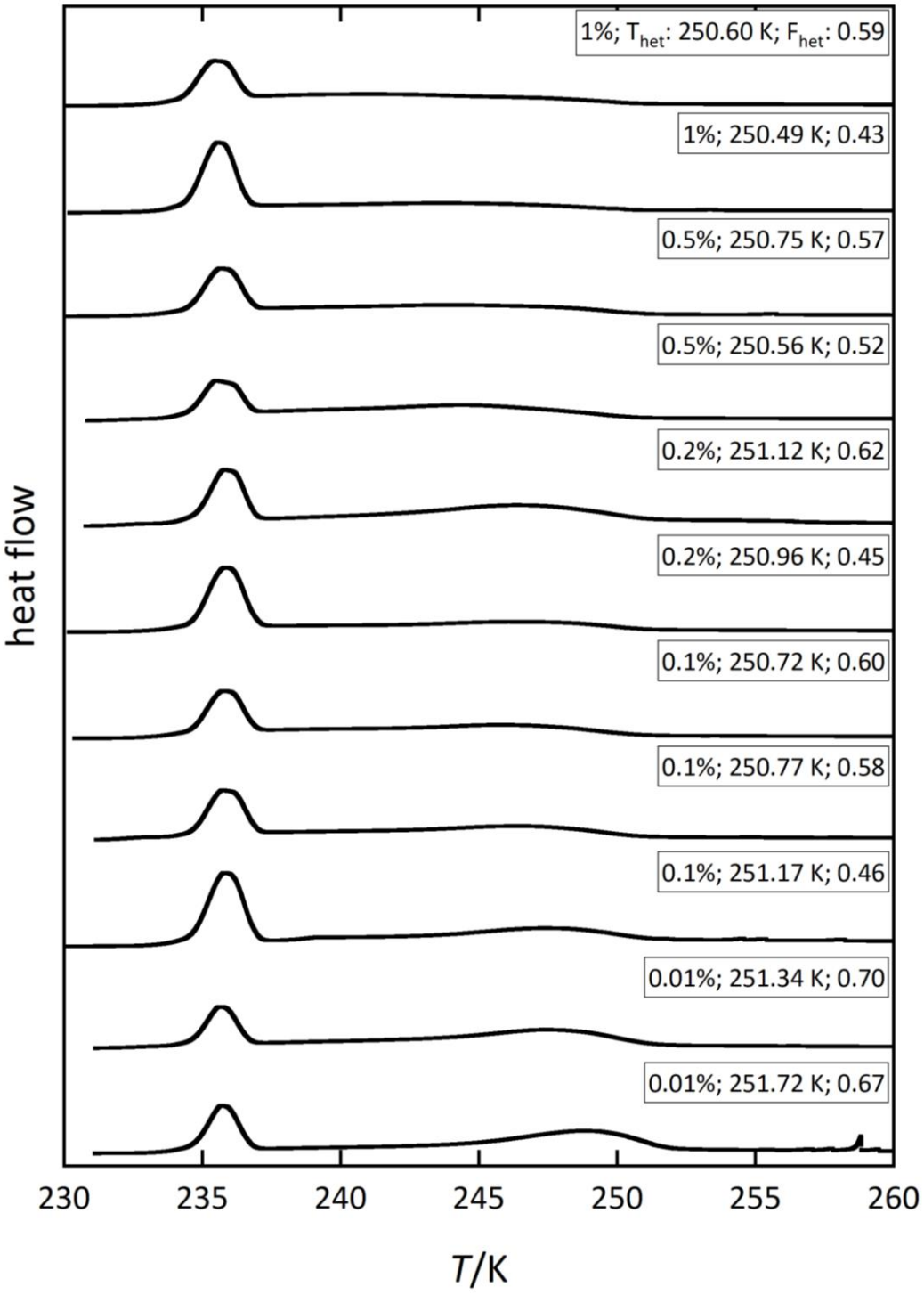


Figure S5: DSC thermograms of 2 wt% microcline suspensions with varying citric acid content. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

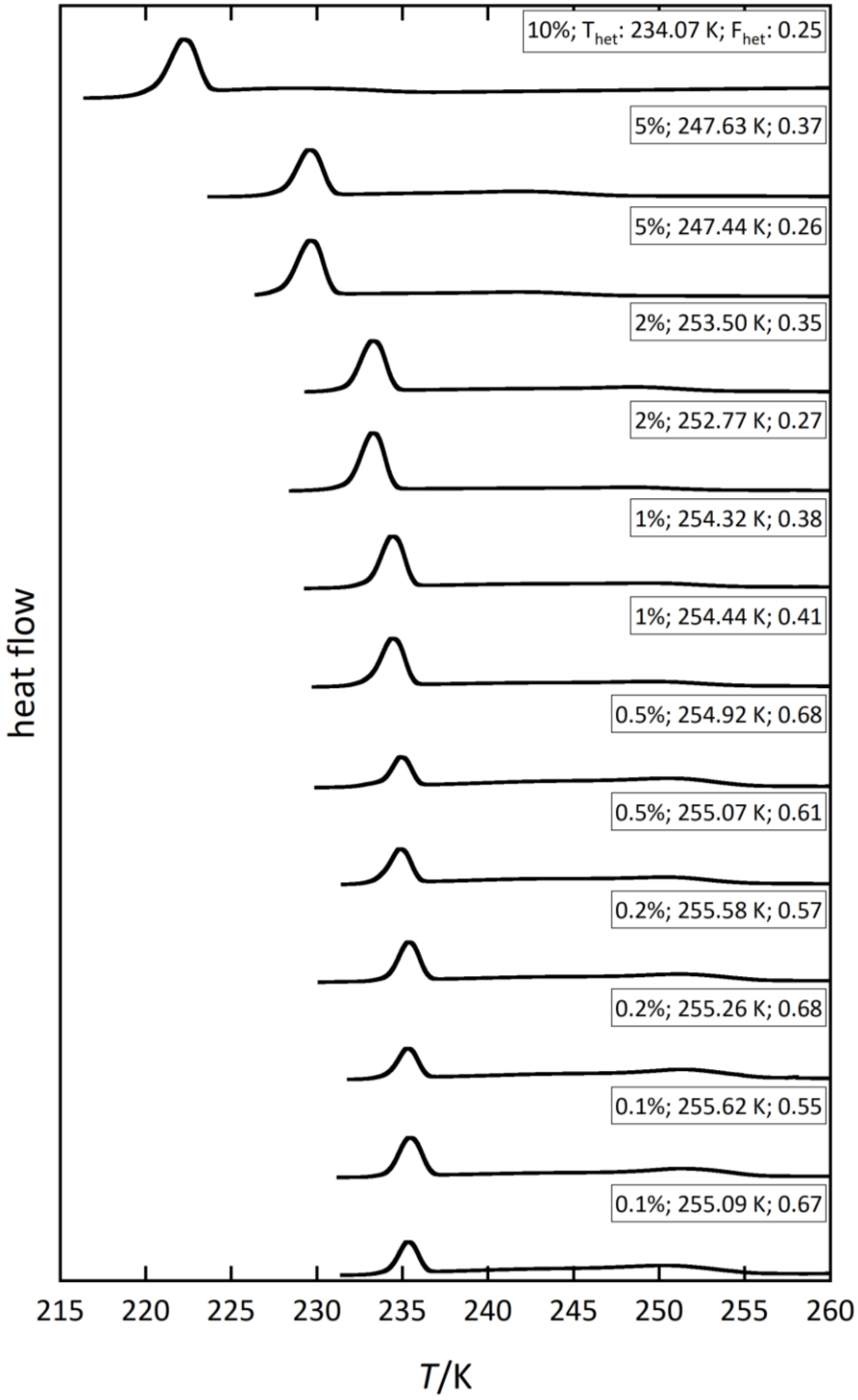


Figure S6: DSC thermograms of 2 wt% microcline suspensions with varying acetic acid (neutralized with ammonia) content. Stated in the labels are the weight percentage of acetic acid, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

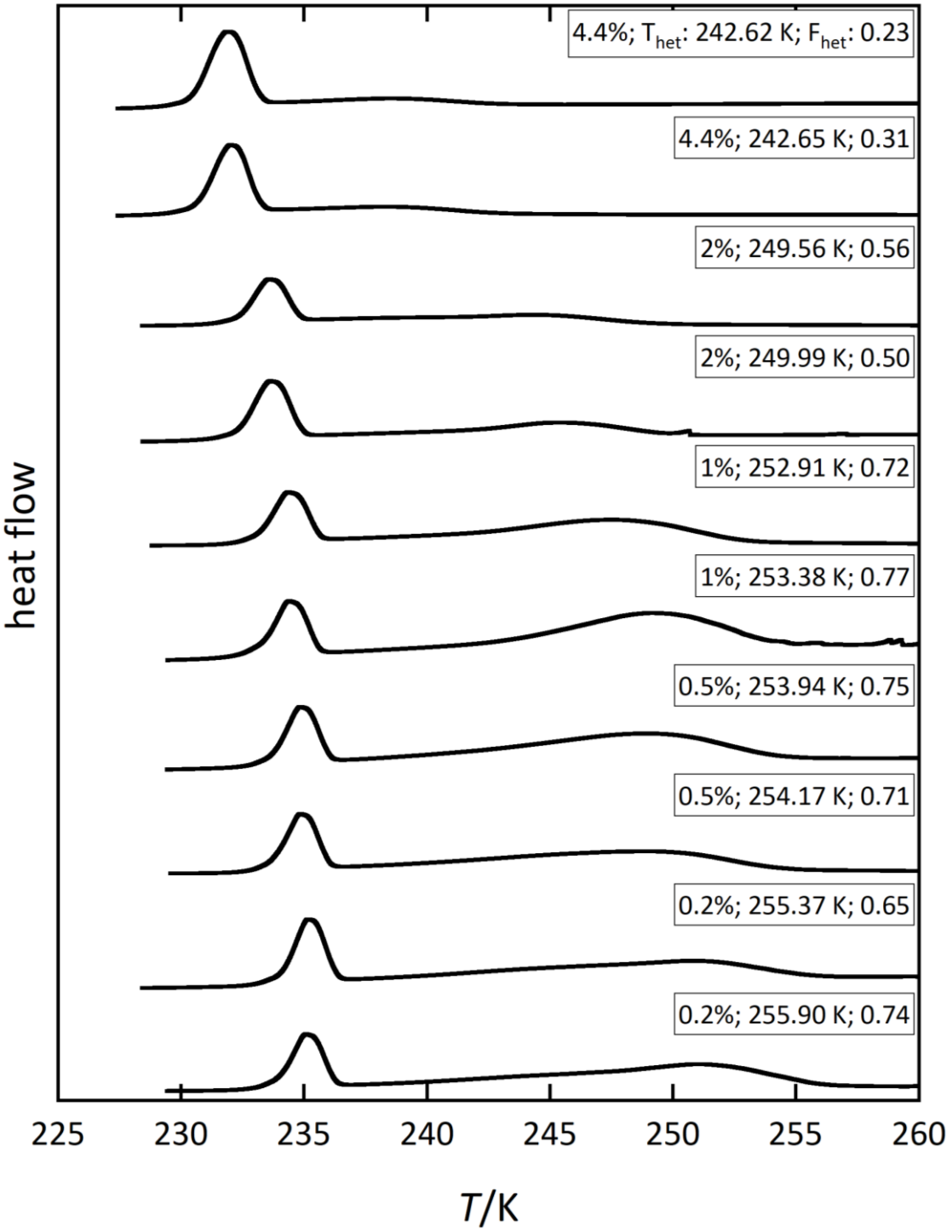


Figure S7: DSC thermograms of 2 wt% microcline suspensions with varying oxalic acid (neutralized with ammonia) content. Stated in the labels are the weight percentage of oxalic acid, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

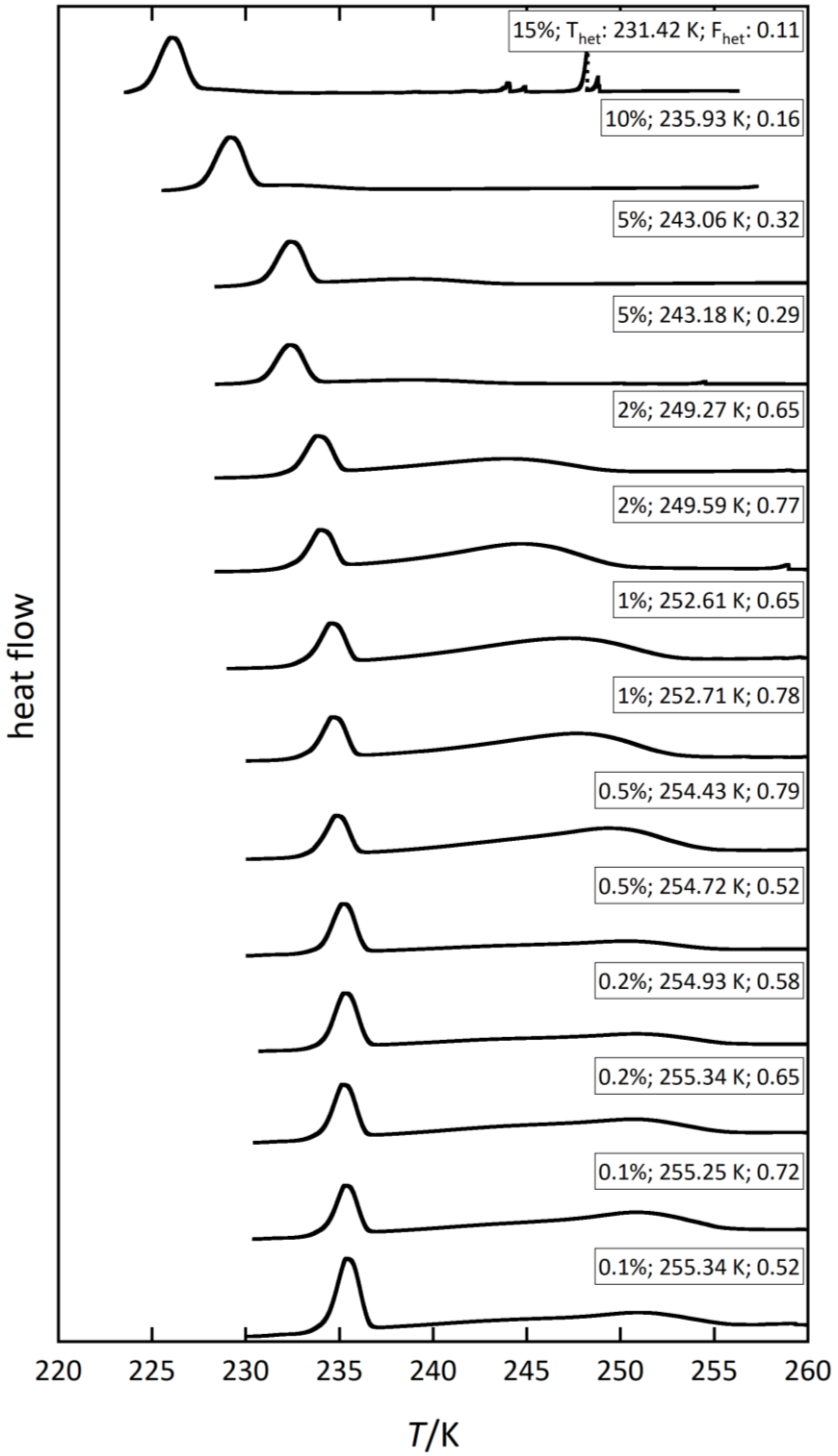


Figure S8: DSC thermograms of 2 wt% microcline suspensions with varying citric acid (neutralized with ammonia) content. Stated in the labels are the weight percentage of citric acid, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

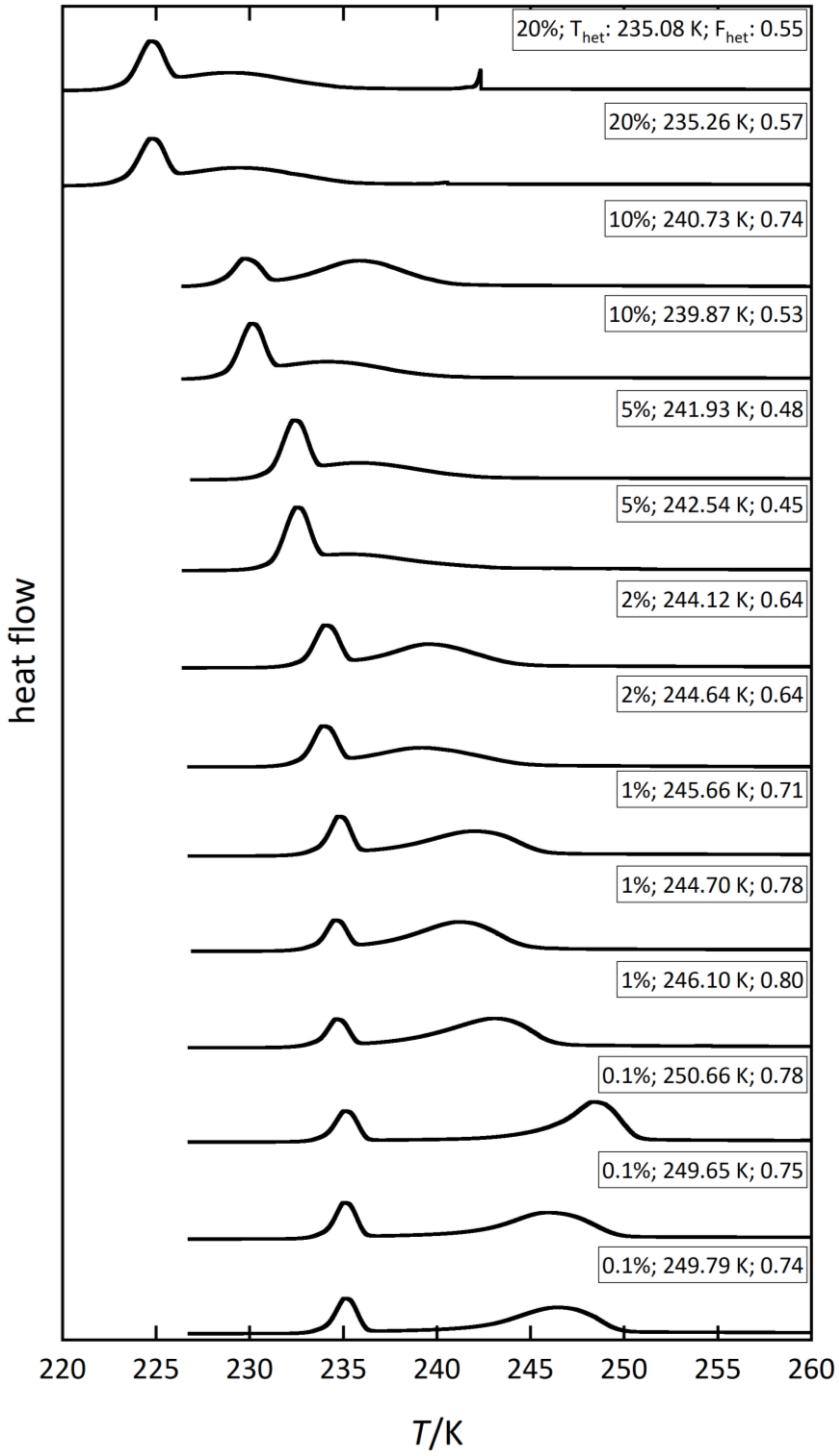


Figure S9: DSC thermograms of 2 wt% microcline suspensions with varying glycine content. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

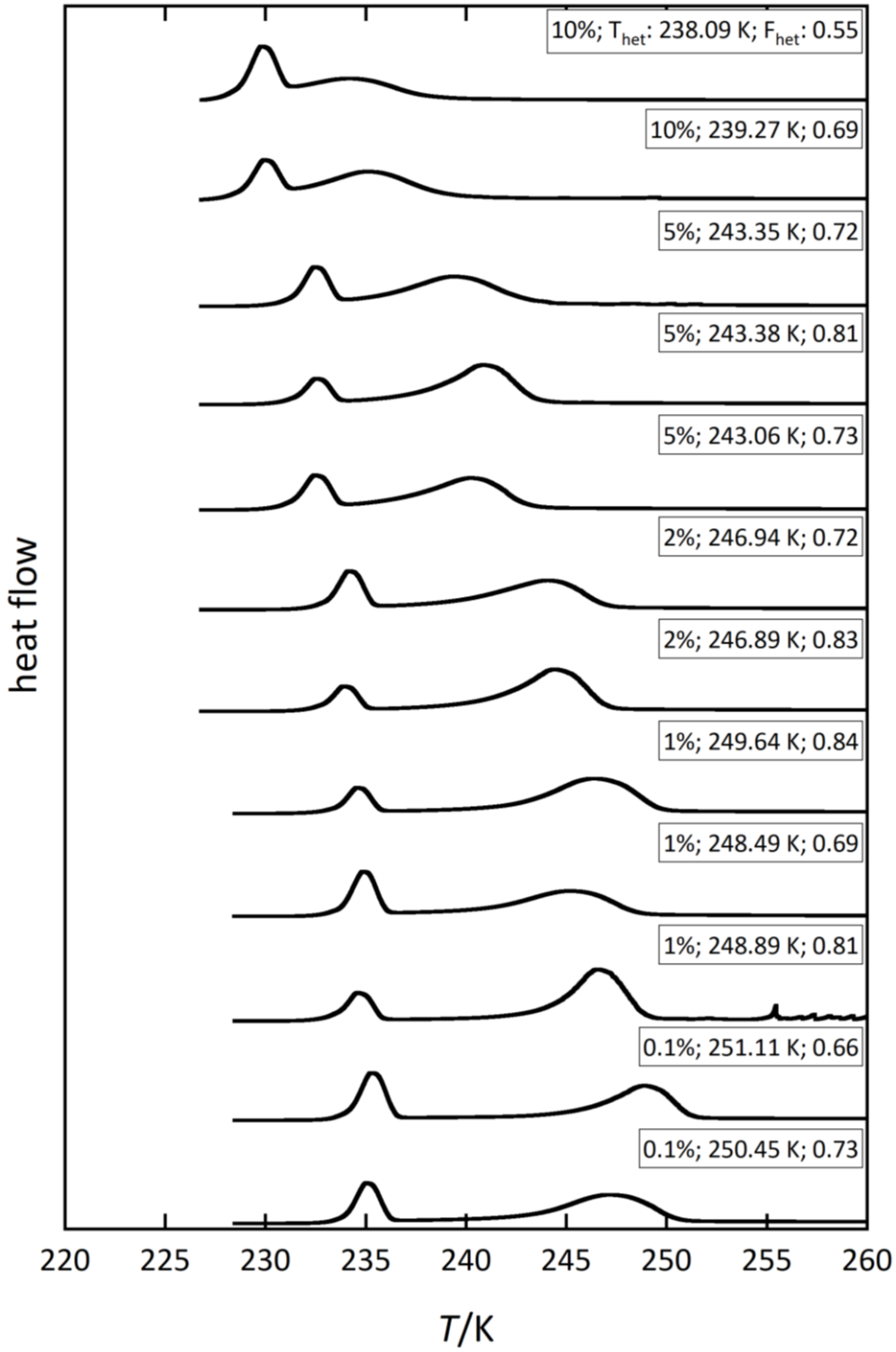


Figure S10: DSC thermograms of 2 wt% microcline suspensions with varying L-alanine content. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

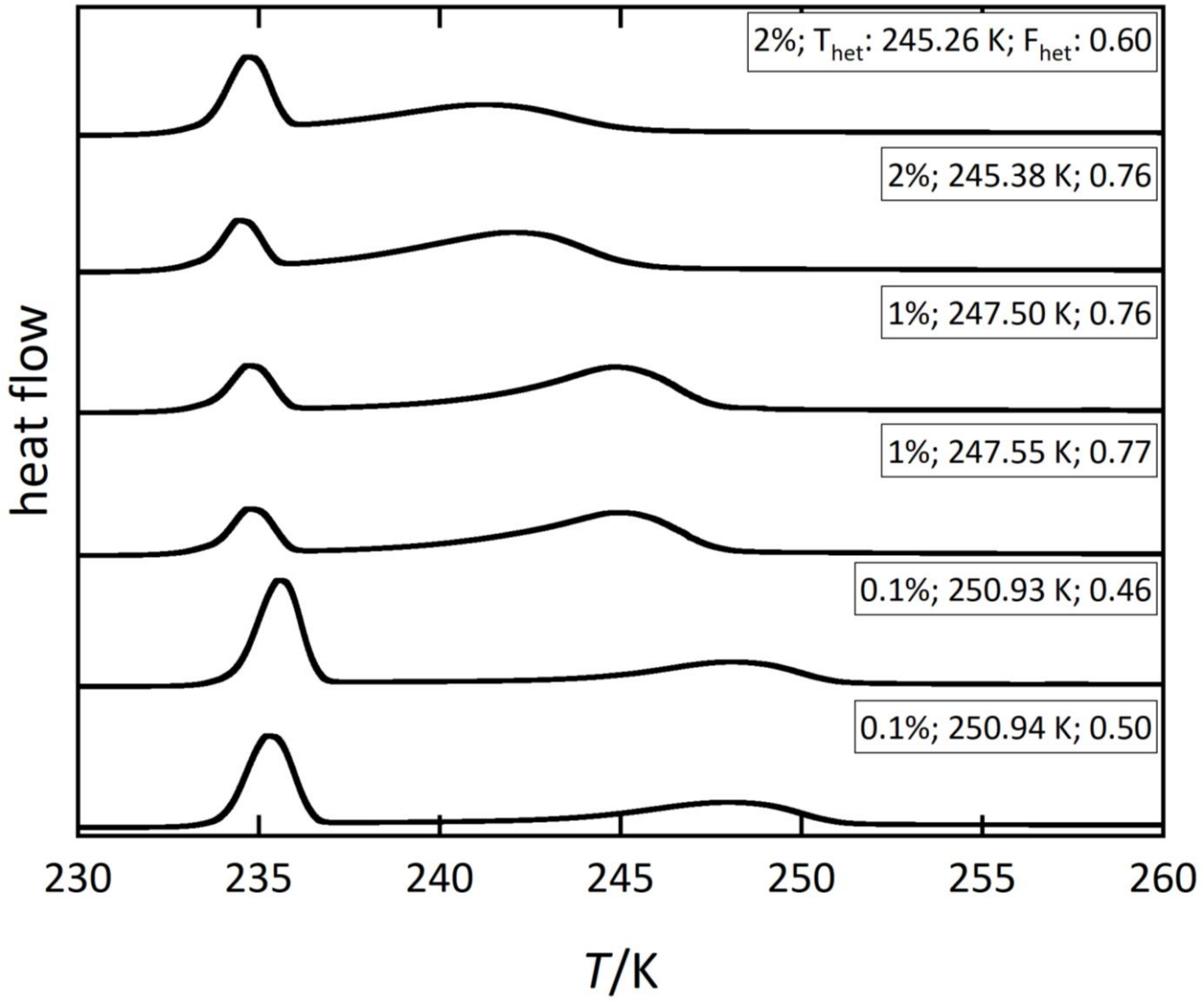


Figure S11: DSC thermograms of 2 wt% microcline suspensions with varying L-glutamine content. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

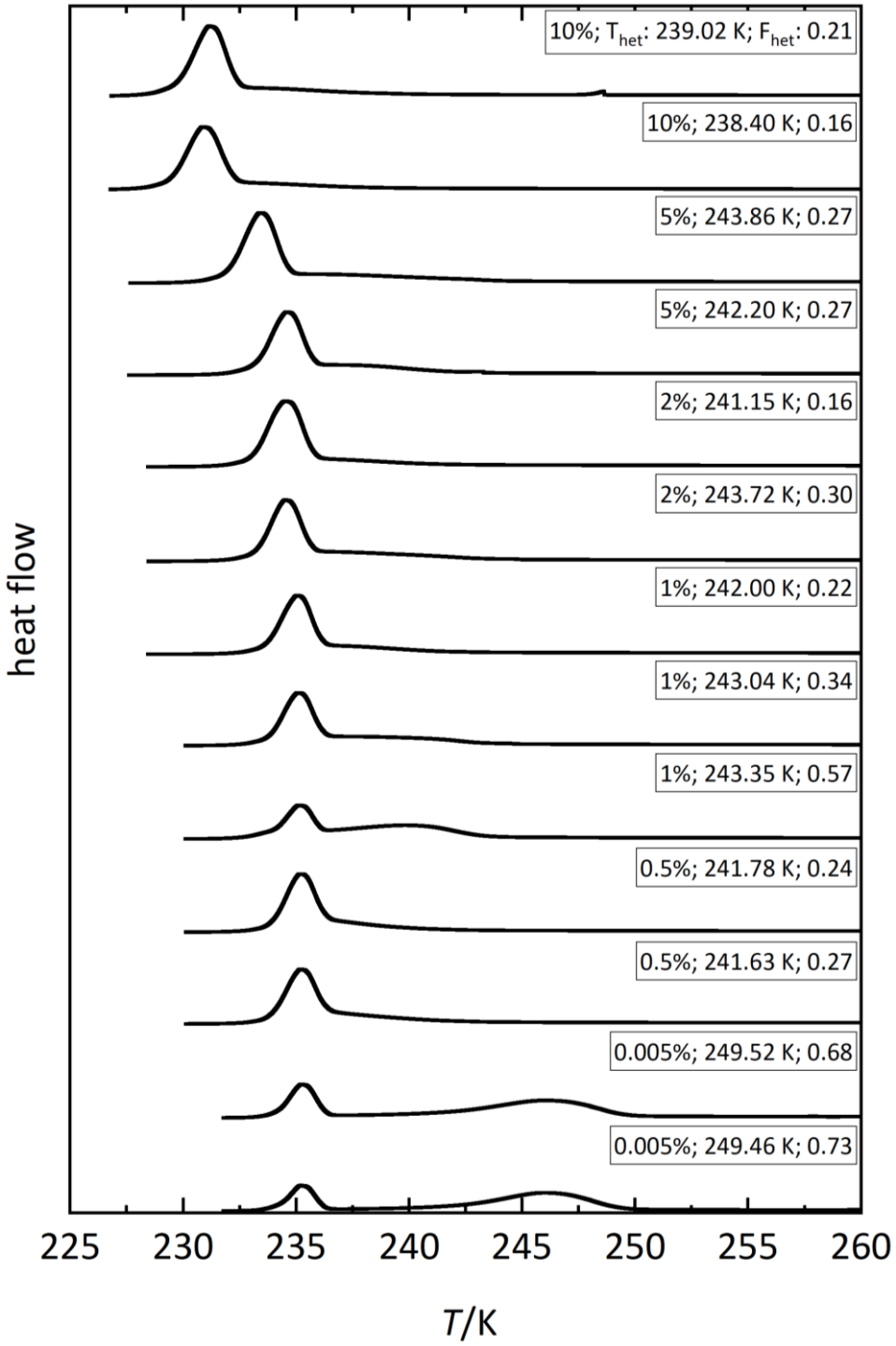


Figure S12: DSC thermograms of 2 wt% microcline suspensions with varying L-lysine content. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

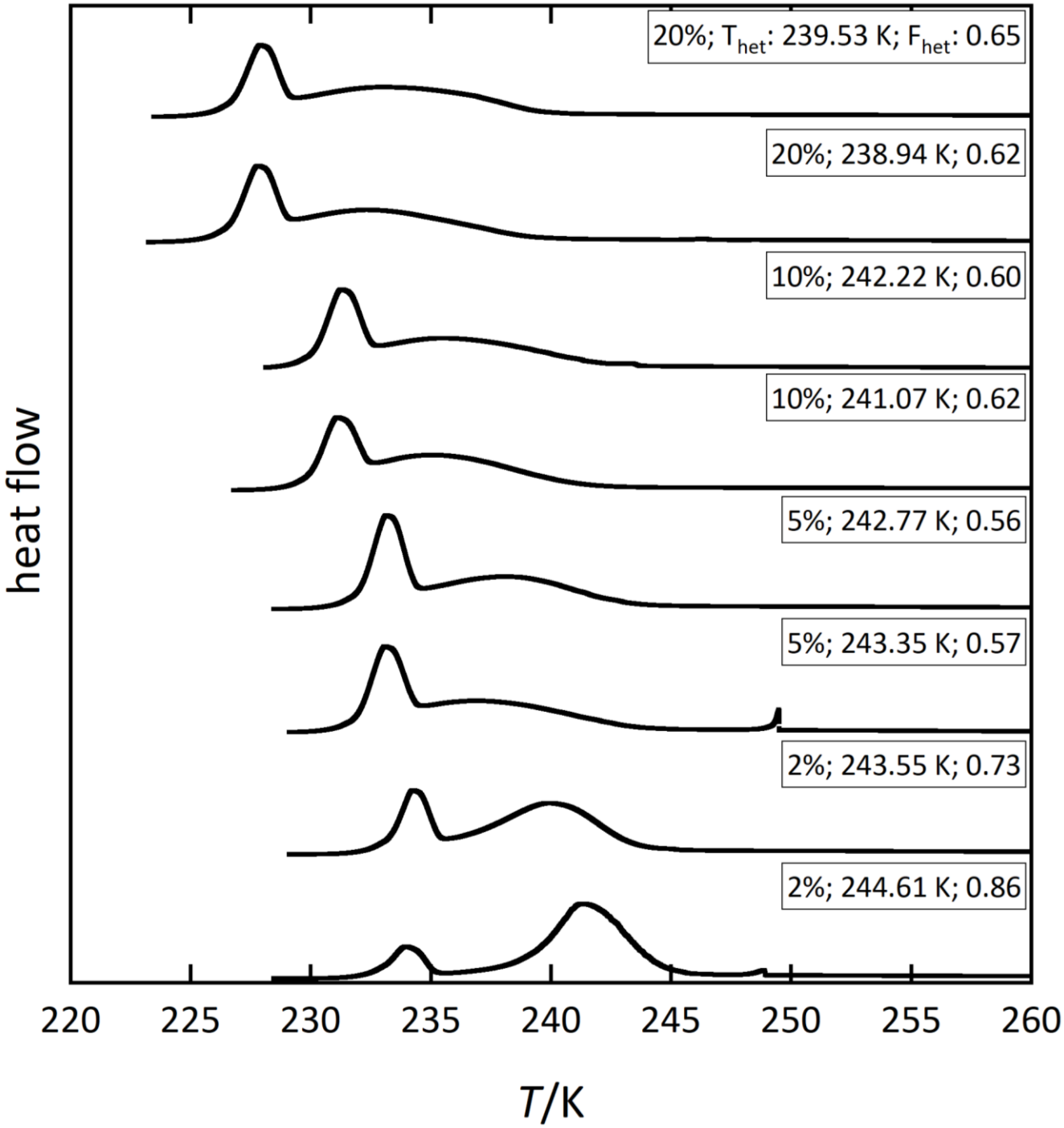


Figure S13: DSC thermograms of 2 wt% microcline suspensions with varying L-serine content. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

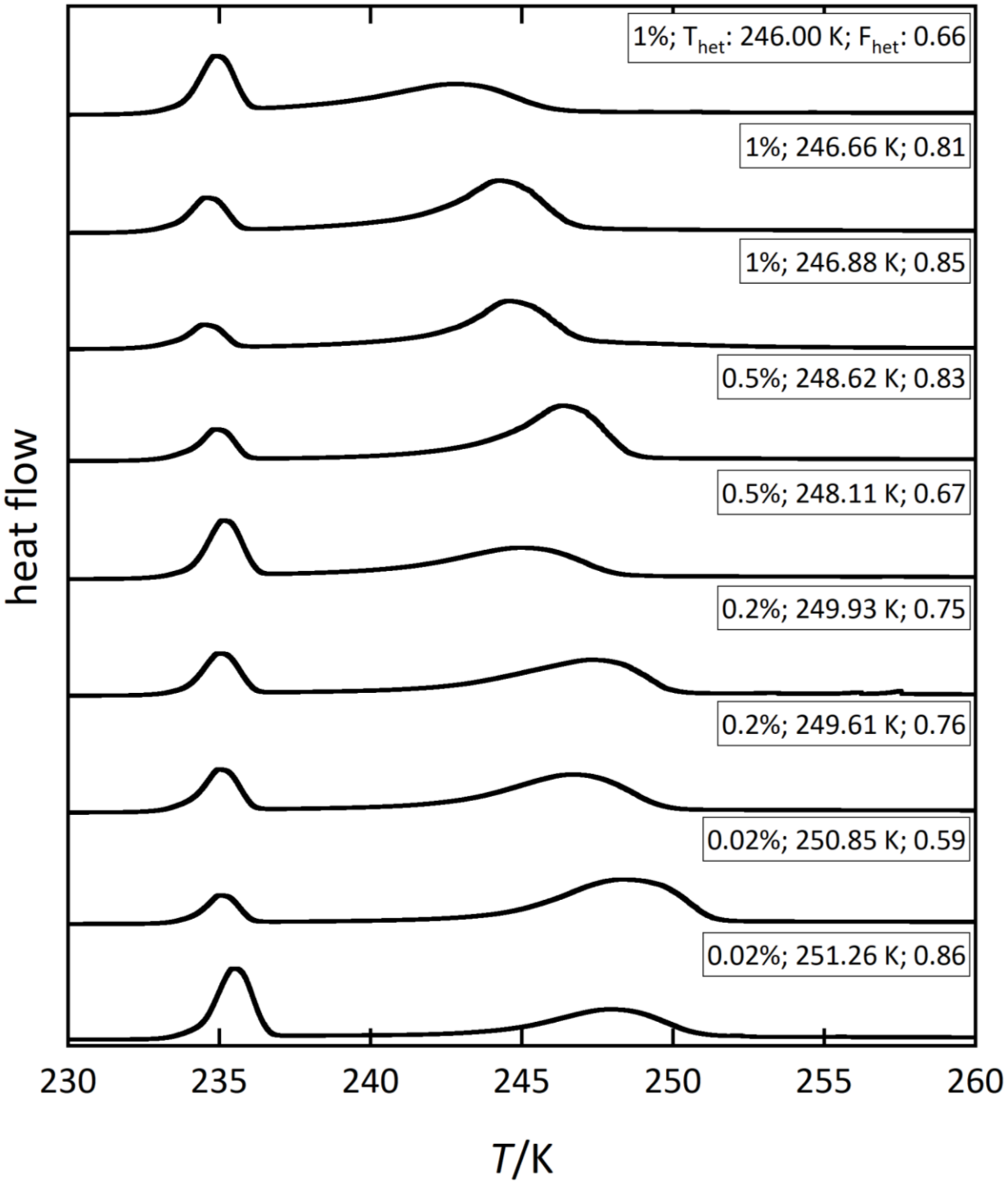


Figure S14: DSC thermograms of 2 wt% microcline suspensions with varying L-serine content. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

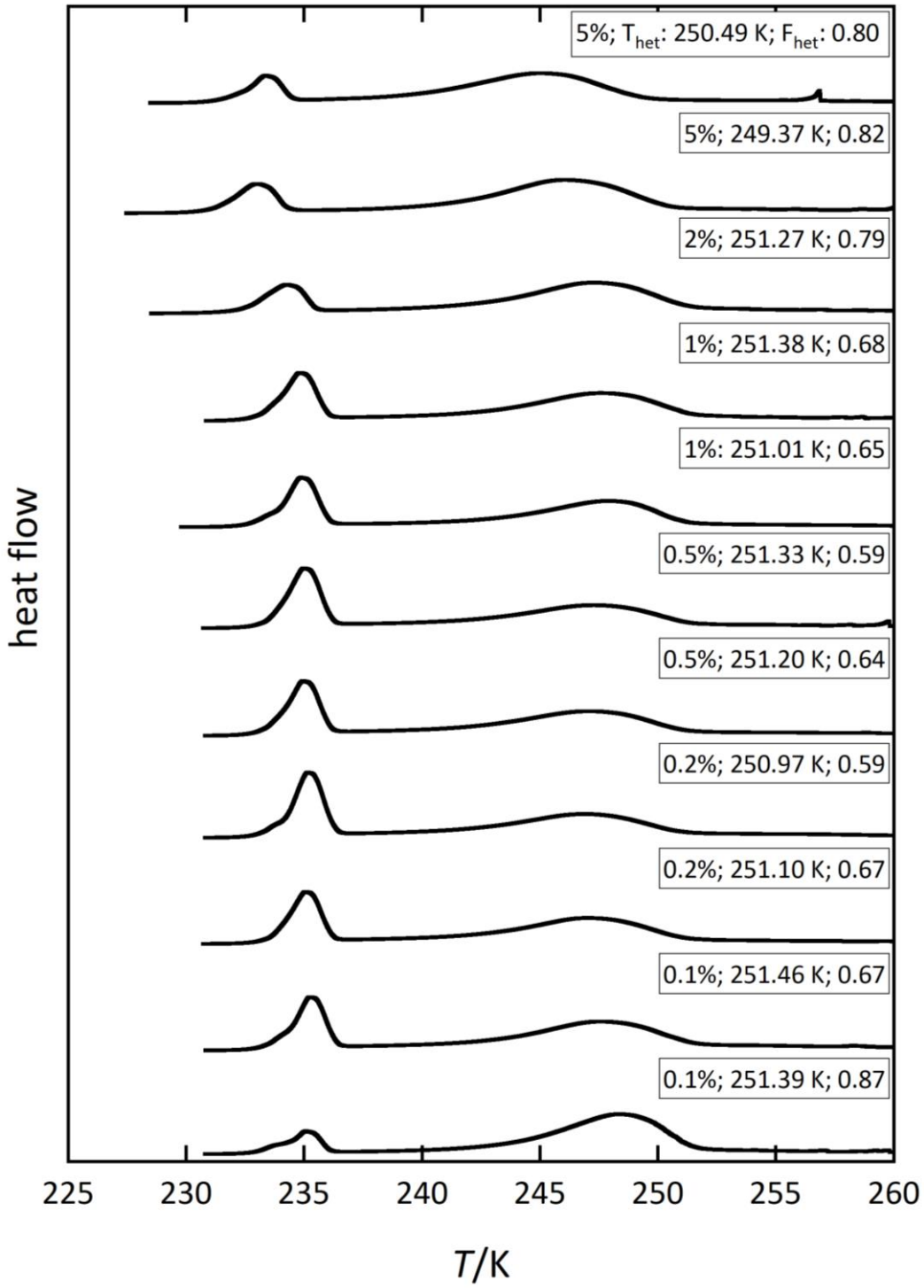


Figure S15: DSC thermograms of 2 wt% microcline suspensions with varying 1,7-heptanediol content. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

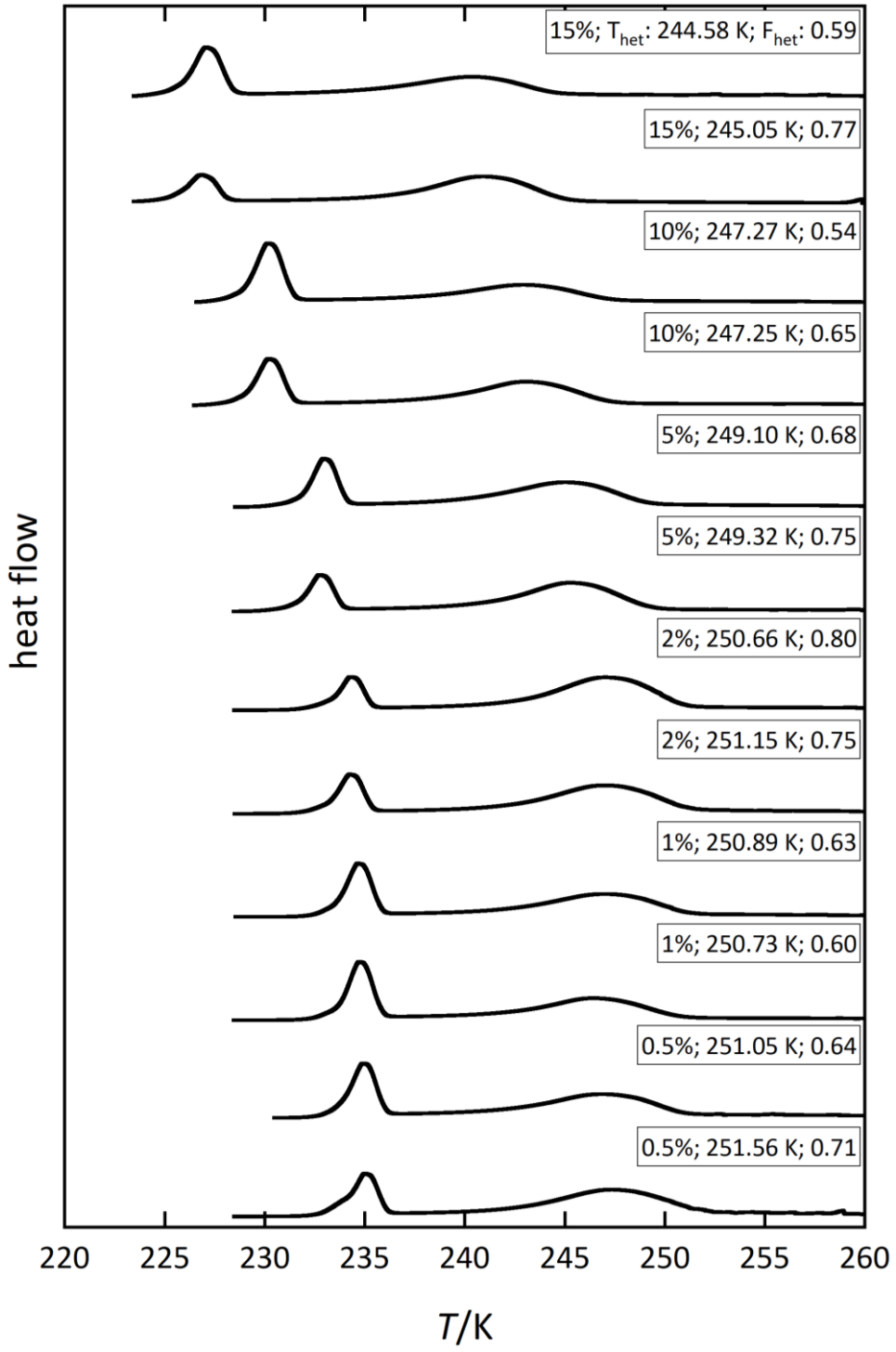


Figure S16: DSC thermograms of 2 wt% microcline suspensions with varying glycerol content. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

S2 DSC thermograms of immersion freezing experiments of emulsified microcline suspensions in water

We show sets of DSC thermograms (cooling rate: 1 K/min) for freshly prepared emulsions of 2 wt% microcline suspensions in pure water (Sigma Aldrich Molecular bioreagent water). Figure 17 shows thermograms from the first microcline sample. Figure 18 and 19 show thermograms resulting from the second microcline sample.

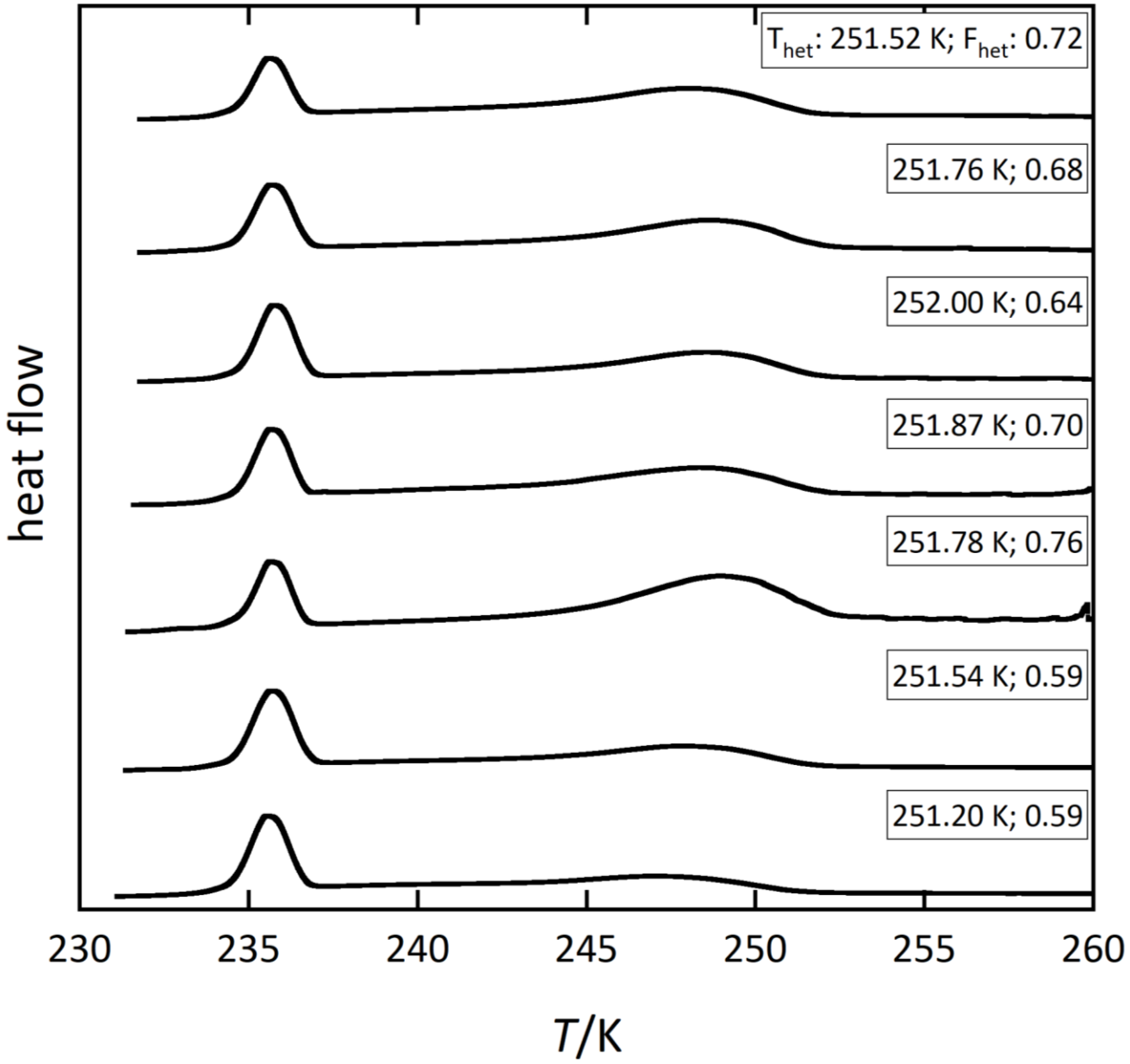


Figure S17: DSC thermograms of 2 wt% microcline suspensions. Stated in the labels are the the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

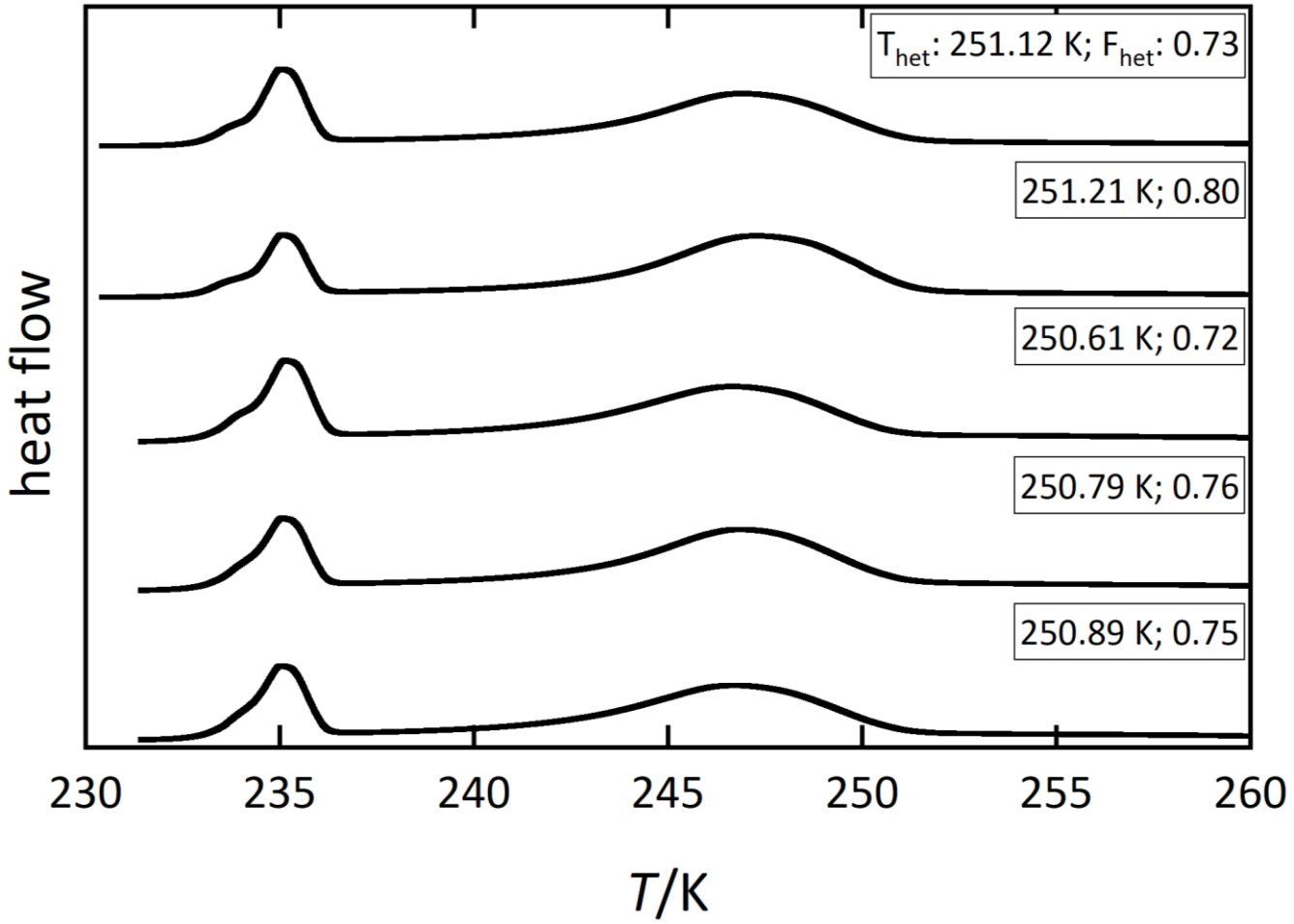


Figure S18: DSC thermograms of 2 wt% microcline suspensions. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

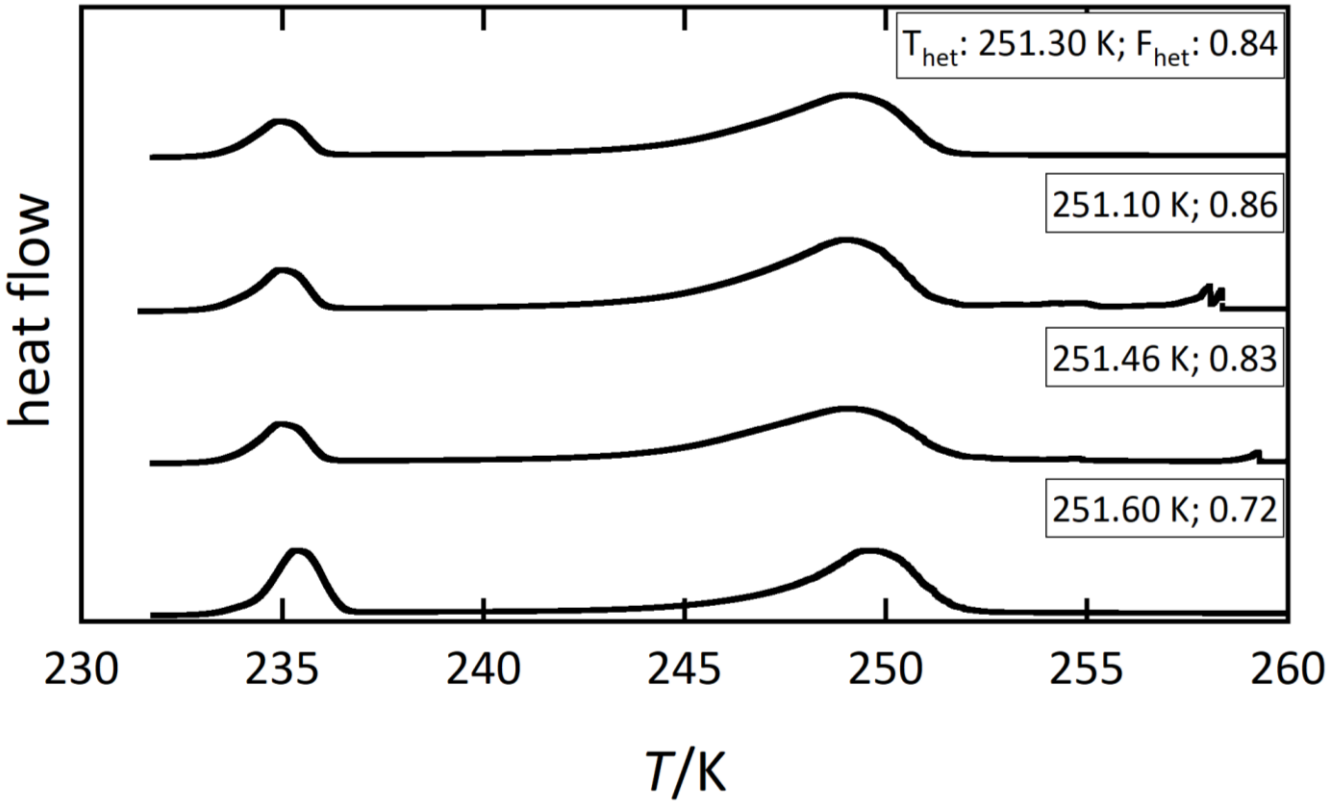


Figure S19: DSC thermograms of 2 wt% microcline suspensions. Stated in the labels are the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

S3 DSC thermograms of aging and immersion freezing experiments of emulsified microcline suspensions in aqueous solutions

We show sets of DSC thermograms (cooling rate: 1 K/min) for freshly prepared emulsions of aged 2 wt% microcline suspensions in various aqueous solutions and pure water.

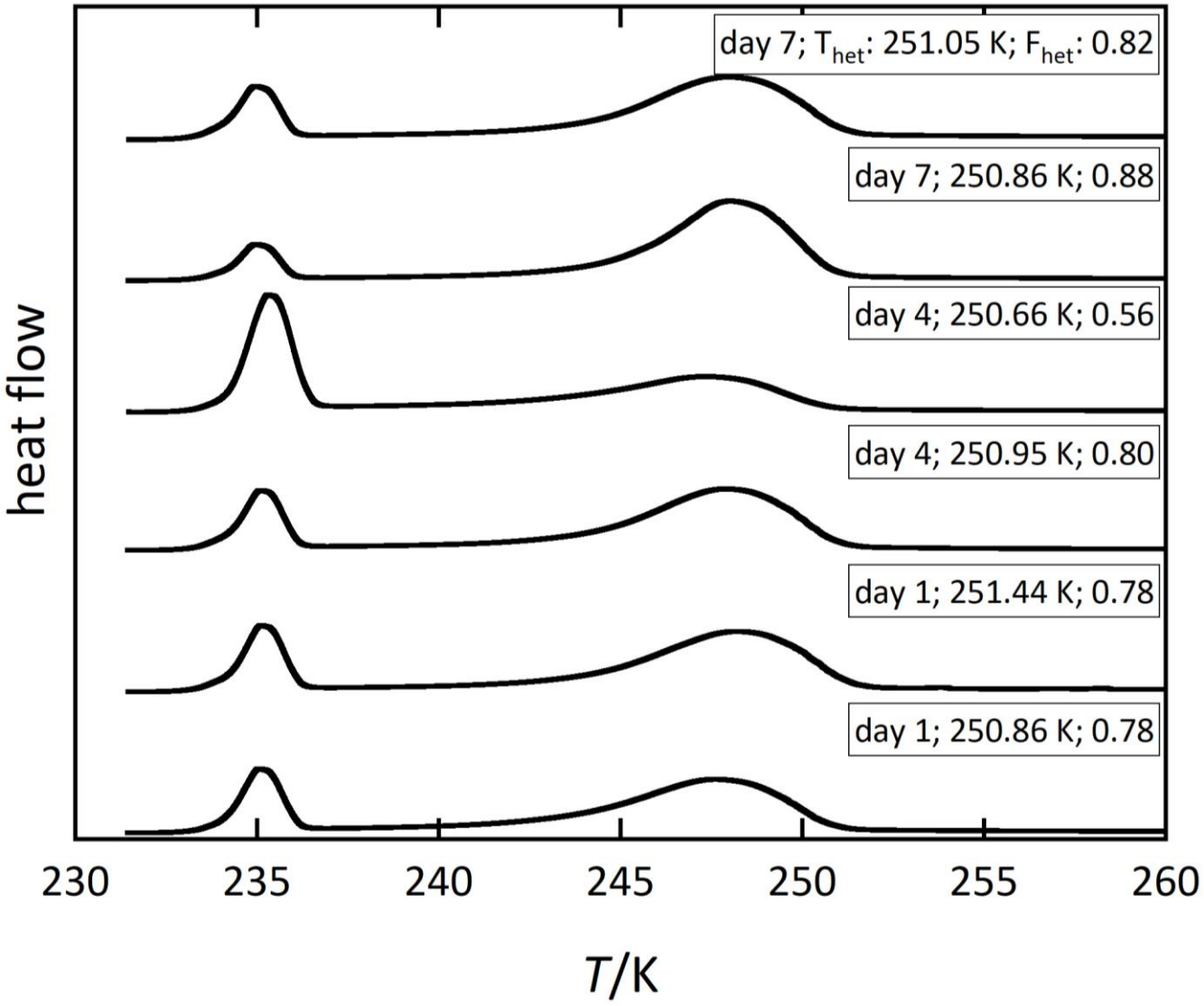


Figure S20: DSC thermograms of 2 wt% microcline suspensions. Stated in the labels are the aging time, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

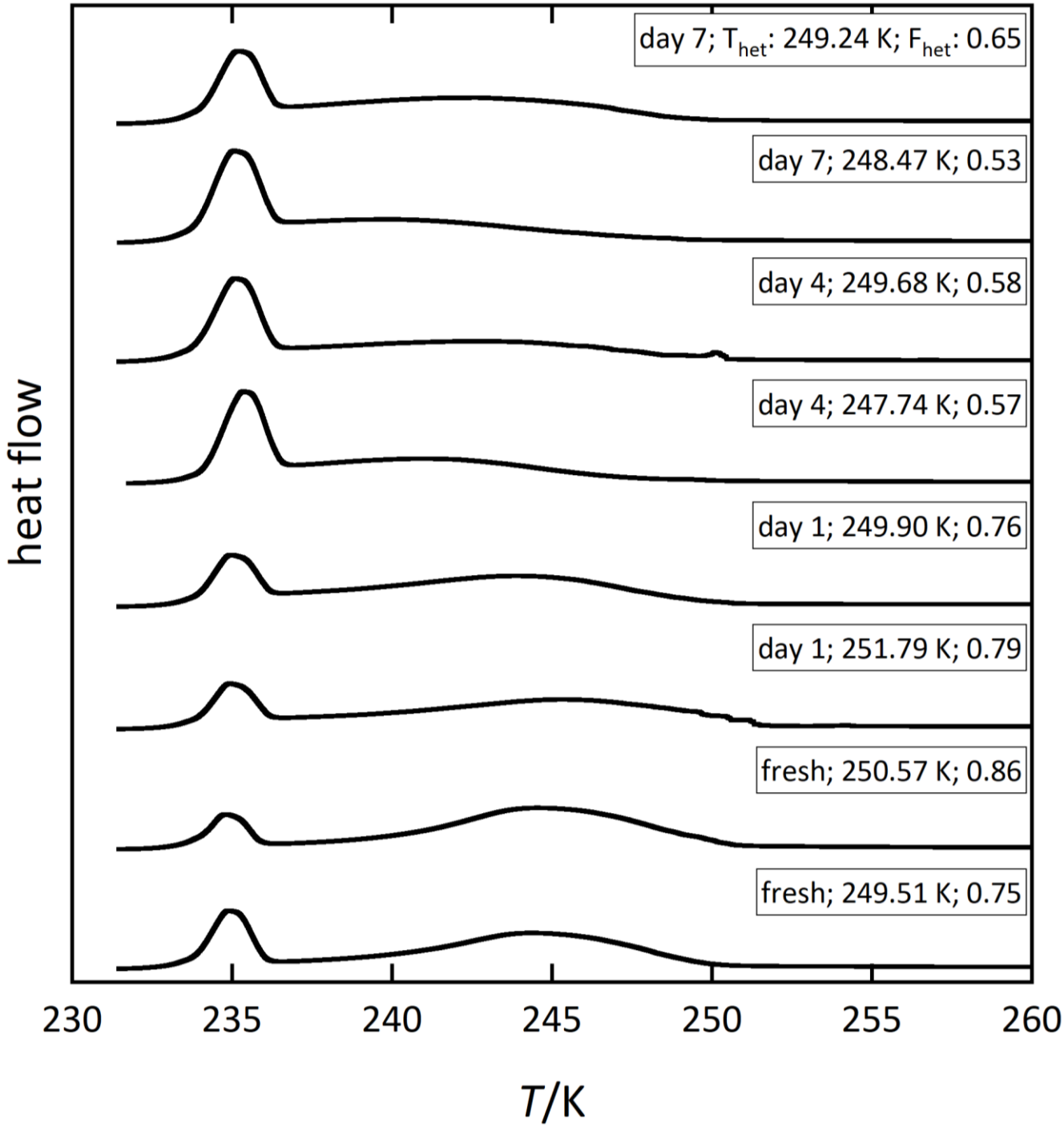


Figure S21: DSC thermograms of 2 wt% microcline suspensions aged in 1 wt% citric acid solution. Stated in the labels are the aging time, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

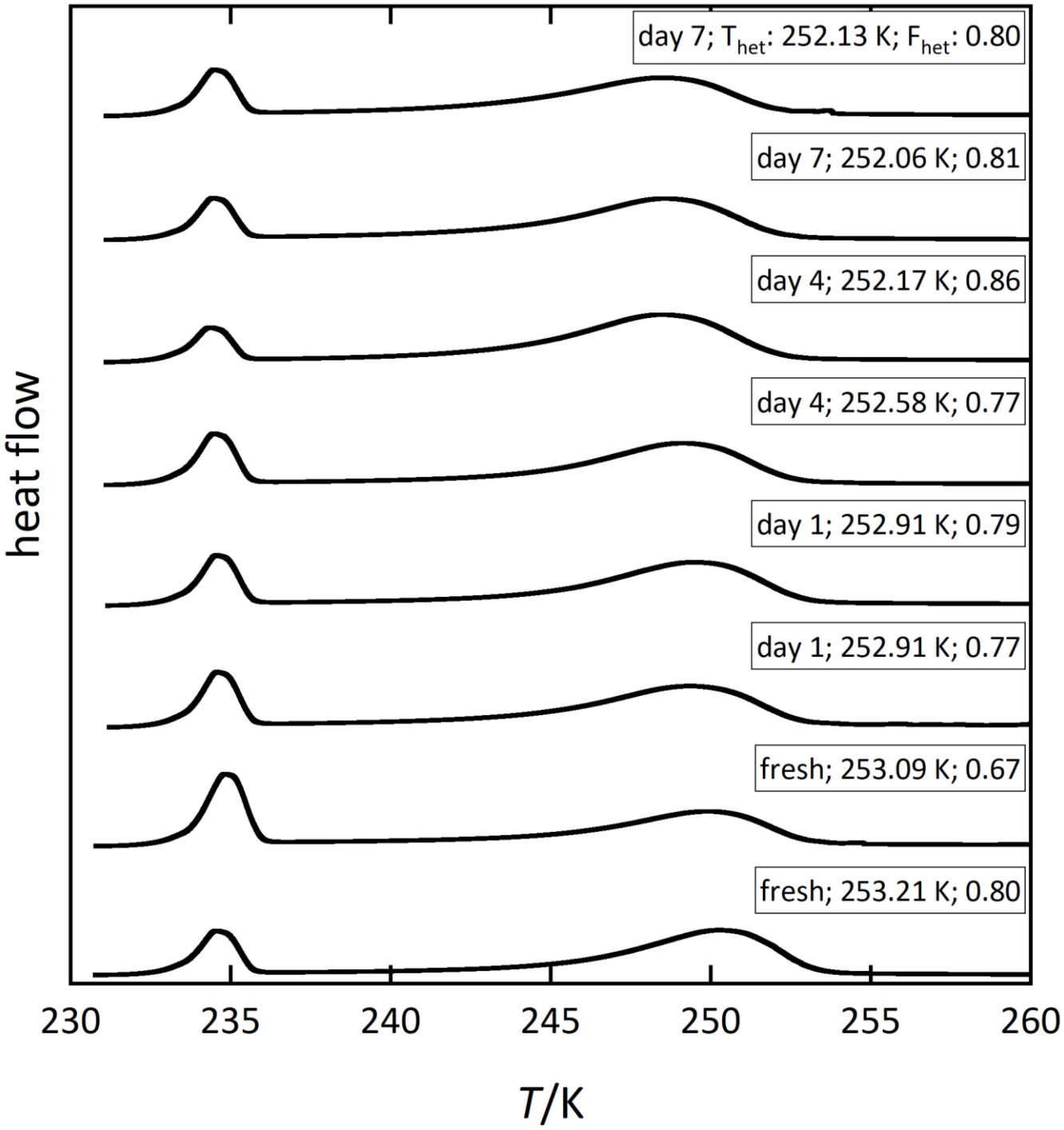


Figure S22: DSC thermograms of 2 wt% microcline suspensions aged in 1 wt% citric acid solution (neutralizd with ammonia). Stated in the labels are the aging time, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

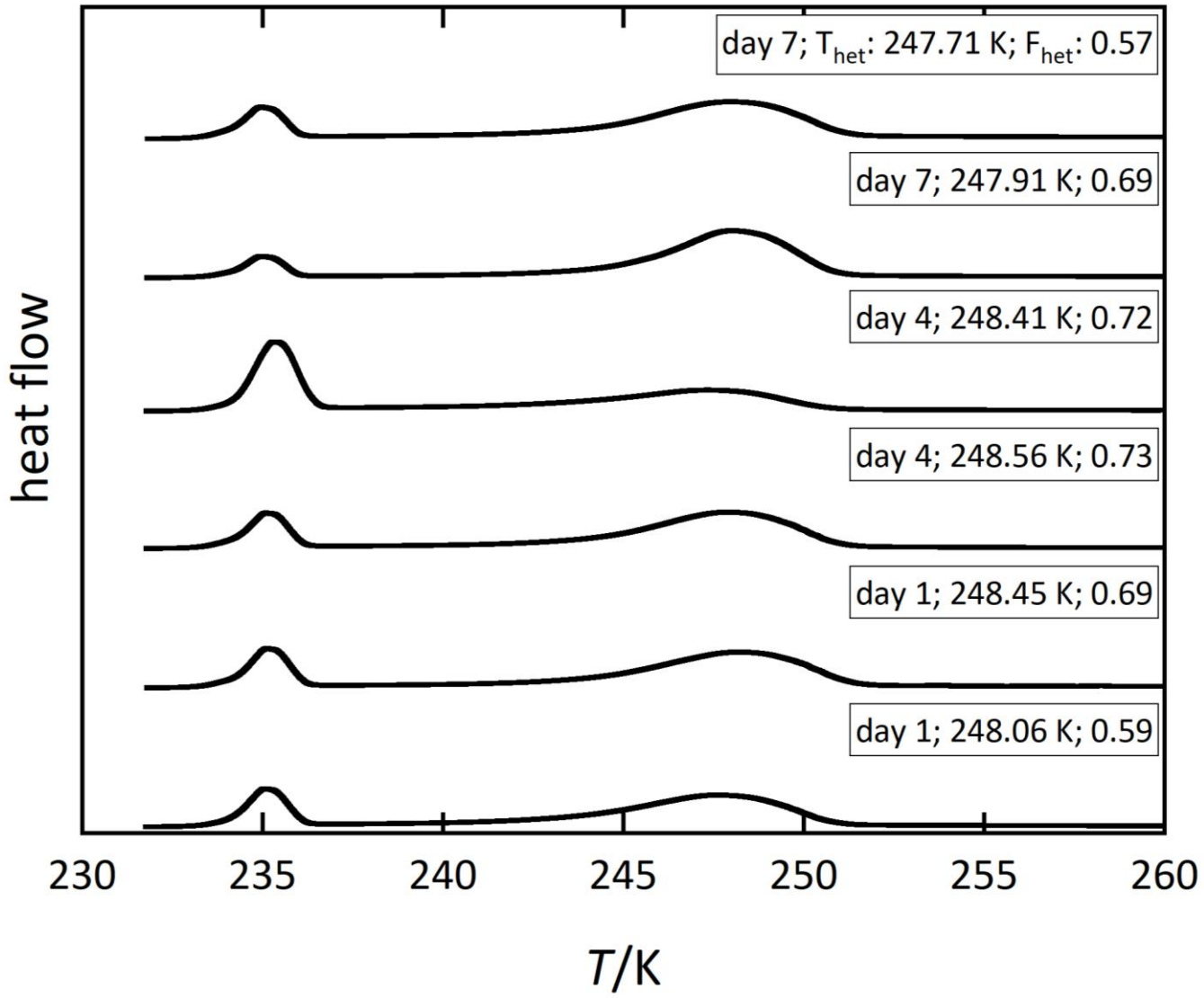


Figure S23: DSC thermograms of 2 wt% microcline suspensions aged in 1 wt% l-alanine solution. Stated in the labels are the aging time, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral. The thermograms of the corresponding freshly prepared suspensions you can find in section S1.

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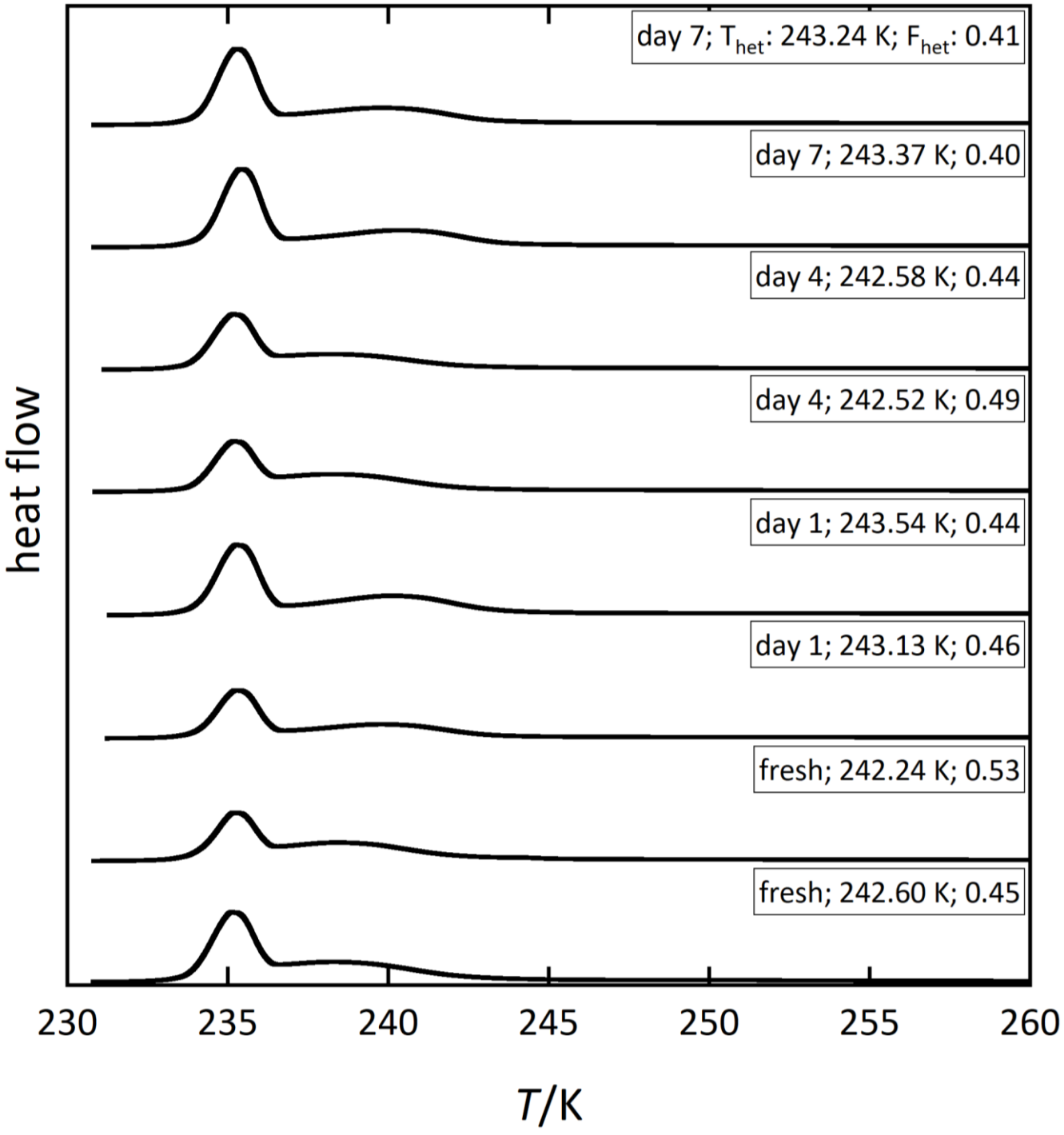

Figure S24: DSC thermograms of 2 wt% microcline suspensions aged in 0.05 wt% l-lysine solution. Stated in the labels are the aging time, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral. The thermograms of the corresponding freshly prepared suspensions you can find in section S1.

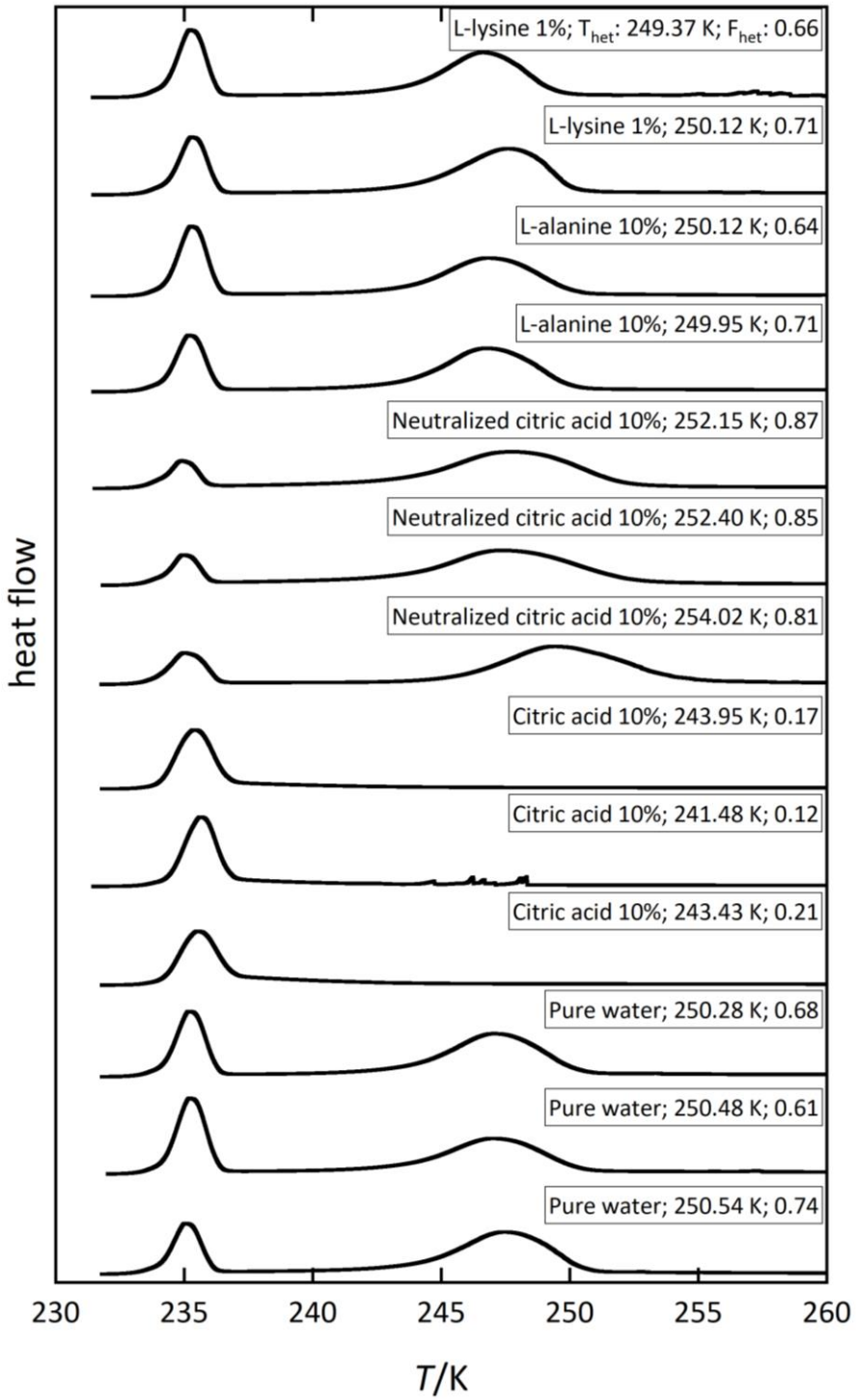

Figure S25: DSC thermograms of 2 wt% microcline suspensions aged in various solutions for 10 days and subsequent washing. Stated in the labels are the solute, the weight percentage of the solute, the heterogeneous freezing onset temperature and the heterogeneously frozen fraction. The curves are normalized with respect to their total integral.

S4 DVS BET Analysis of the microcline samples

We show sorption isotherms and BET plots of the two microcline samples used in this study

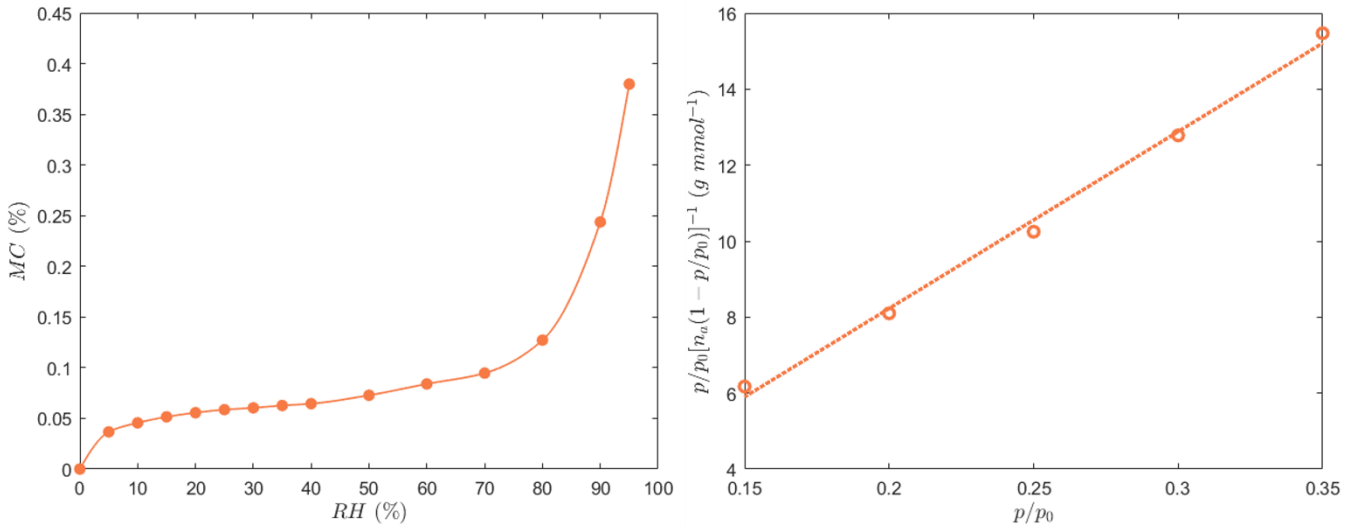

Figure S26: Results of the DVS Analysis of the first microcline sample. Left panel: sorption isotherm. Right panel: Corresponding BET plot.

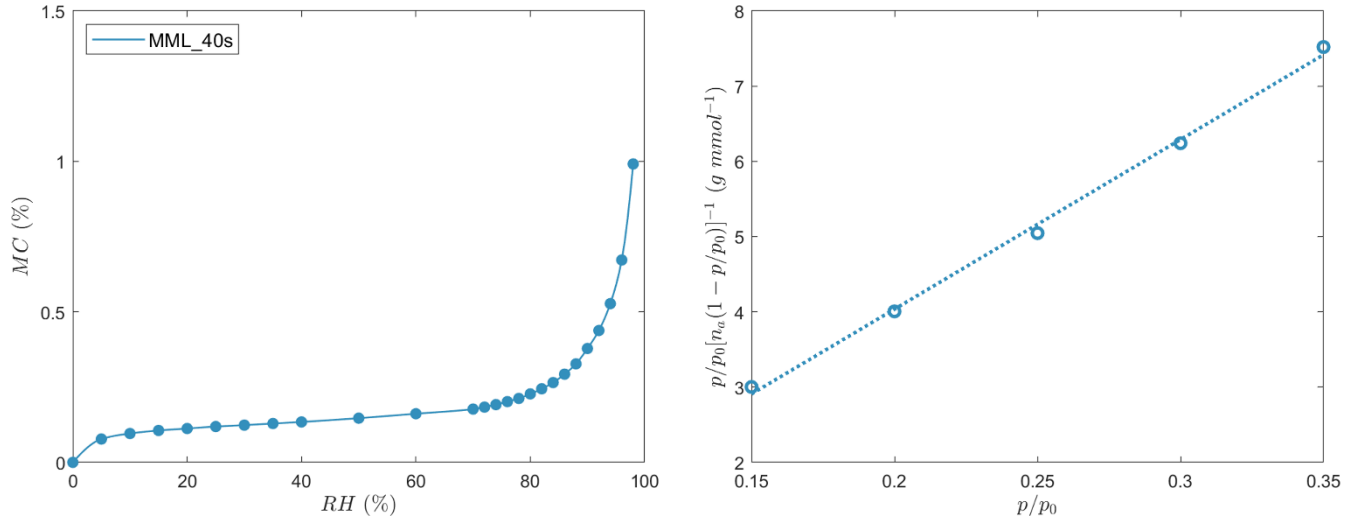

Figure S27: Results of the DVS Analysis of the second microcline sample. Left panel: sorption isotherm. Right panel: Corresponding BET plot.

S5 Particle size analysis of the microcline samples via dynamic light scattering (DLS)

We show the particle number size distribution of the second microcline sample. The measurement was conducted with a Beckman Coulter LS 13320 particle size analyzer.

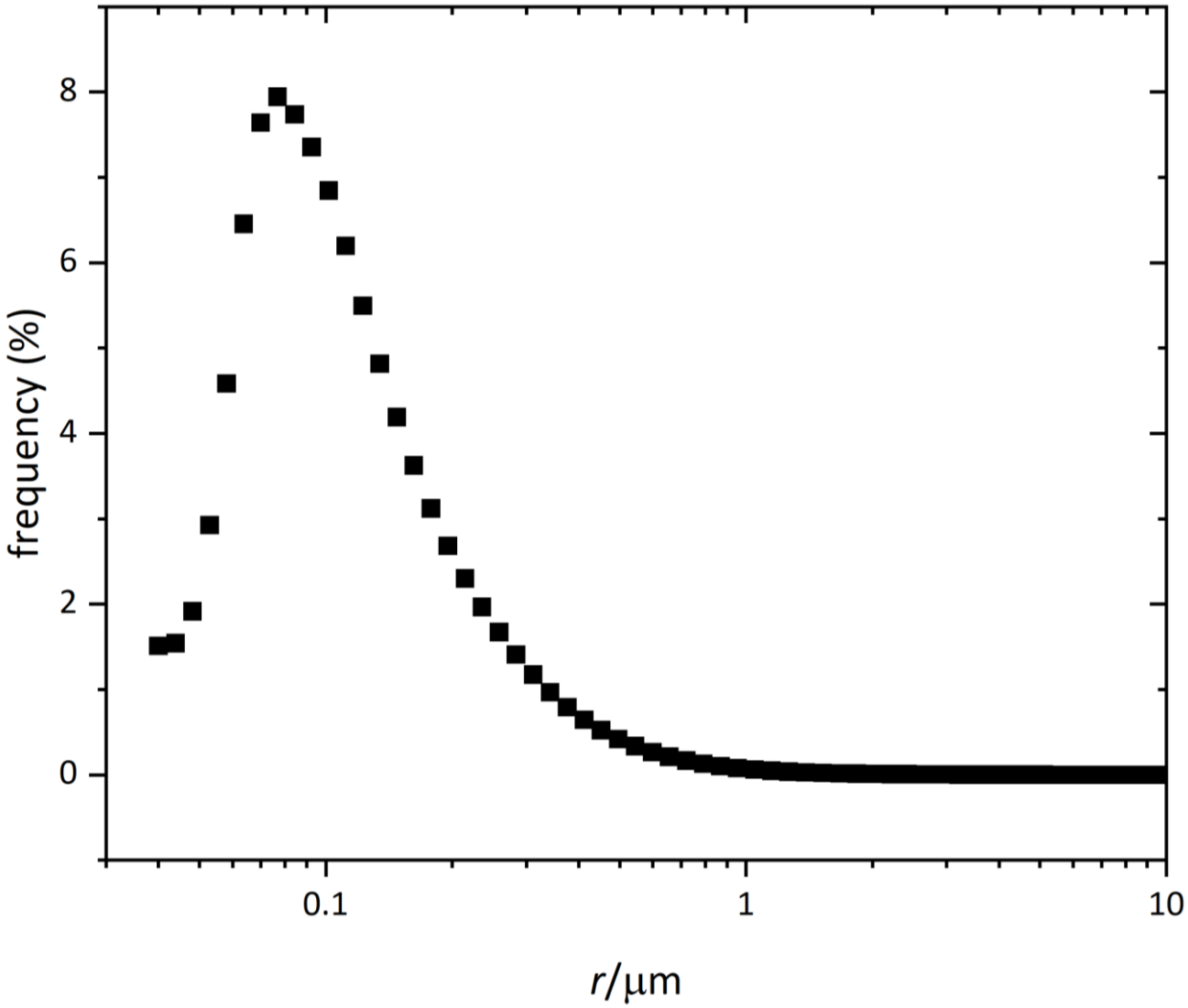

Figure S28: Particle number size distribution. Plotted are the frequency in percent against the equivalent volume diameter *r*.