

Supplementary Material: X-ray Scattering Study on the Crystalline and Semi-Crystalline Structure of Water/PEG Mixtures in their Eutectic Phase Diagram

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1 Temperature cycle

To ensure reproducible structures of the samples at all three experimental techniques a brief discussion of the crystallisation kinetics is necessary. In figure 1 a full cooling and heating cycle is exemplarily shown for the $w_{\text{poly}} = 0.5$ sample. Besides a weak crystallisation peak during cooling and the strong eutectic melting peak in the heating curve an additional exothermic feature is observed. This cold crystallisation process leads to the stabilisation of metastable crystals formed during the cooling procedure.^{1,2} Thus in order to perform all structural investigations on maximised stable crystals all samples are first cooled down to 208 K, i.e. below every observed crystallisation or cold crystallisation process. After thirty minutes samples are re-heated to 233 K and annealed for another thirty minutes before the measurement program starts.

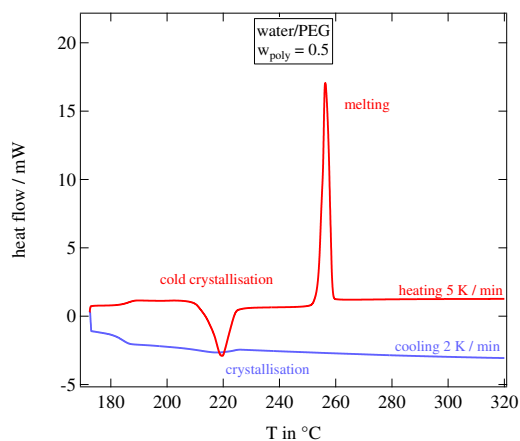


Figure 1 DSC cooling and heating curve of the water/PEG sample with $w_{\text{poly}} = 0.5$.

2 Diffraction pattern of the empty sample holder

For WAXS experiments the standard brass sample holder of the Anton Paar TTK 450 is used. To avoid evaporation and

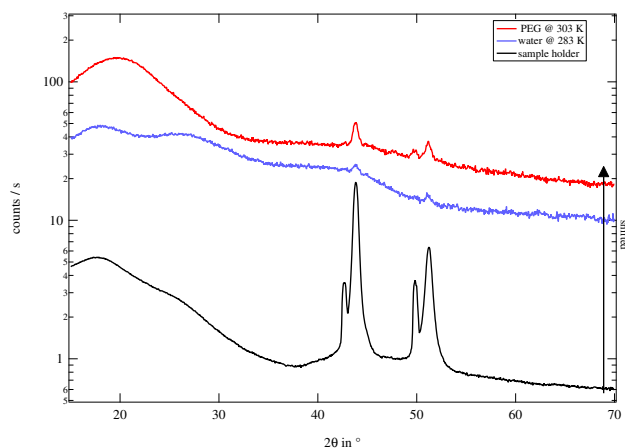


Figure 2 Diffraction patterns of the empty but Kapton sealed sample holder in comparison with scattering from pure liquid water and PEG.

flooding of liquid samples it is additionally sealed by a thin Kapton foil. Because of the small depth of the sample holder ($d = 1$ mm) and the low X-ray absorption of water and PEG scattering at the bottom of the sample holder occurs. Scattering from the sealing Kapton foil has to be also considered. In figure 2 the diffraction pattern of the empty but Kapton sealed sample holder is depicted in comparison with scattering from a pure liquid water and PEG sample. At large scattering angles the well known brass diffraction peaks are clearly visible for the empty sample holder while they remain as tiny cusps when the sample holder is filled. At the smallest scattering angles two broad halos arising from Kapton are seen. For the detailed analysis of peak intensities sample holder scattering is subtracted as a background.

References

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