

Supplementary material

1. Birch pollen washing water

Pummer et al. (2012) published a T_{50} value for birch pollen washing water of approx. -18°C using the oil-water emulsion method. Measurements done with the freezing- chip resulted in an average T_{50} value of $-18,0^{\circ}\text{C}$.

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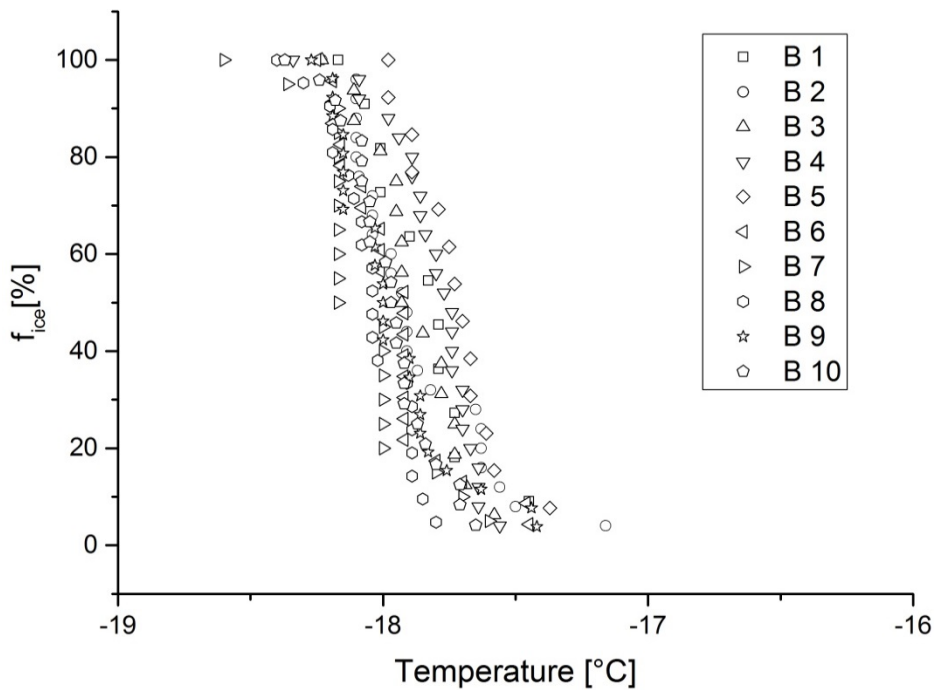


Figure 1 Freezing curves for 10 different measurements of birch pollen washing water (B1 to B10). Heterogeneous freezing of the washing water occurs between -17 and $-18,5^{\circ}\text{C}$.

2. Juniper pollen

To examine the freezing behaviour we prepared a suspension of juniper pollen in ultrapure water with a concentration of 50 g/l. An average T_{50} value of -23°C was found. A freezing range of 15°C can be observed between the first and the last freezing droplet (Figure 2). For comparison, Pummer et al. (2012) published a T_{50} value of -21°C using the oil- water emulsion.

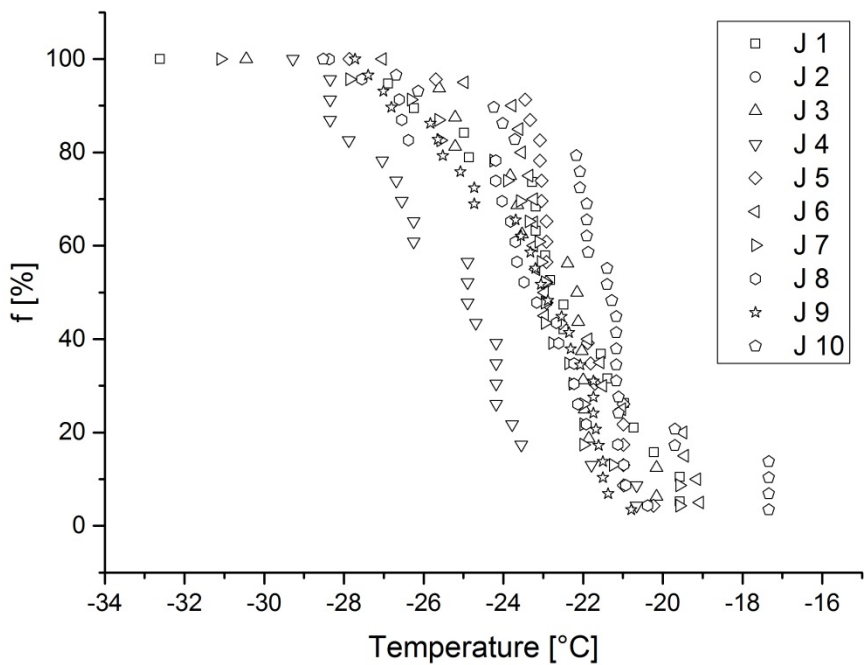


Figure 2 Fraction of frozen droplets against the temperature of ten freezing experiments with juniper pollen as INP (J1 to J10). Heterogeneous freezing occurs between -17 and $-32,5^{\circ}\text{C}$.

3. Milled Feldspar

Compared with the freezing spectra of ultrapure water or birch pollen washing water, a rather wide freezing range of 8,5°C (-11°C to -19,5°C) was found. Nevertheless the average T_{50} value of -16,5°C is a stable value exhibiting a rather small standard deviation (Figure 3).

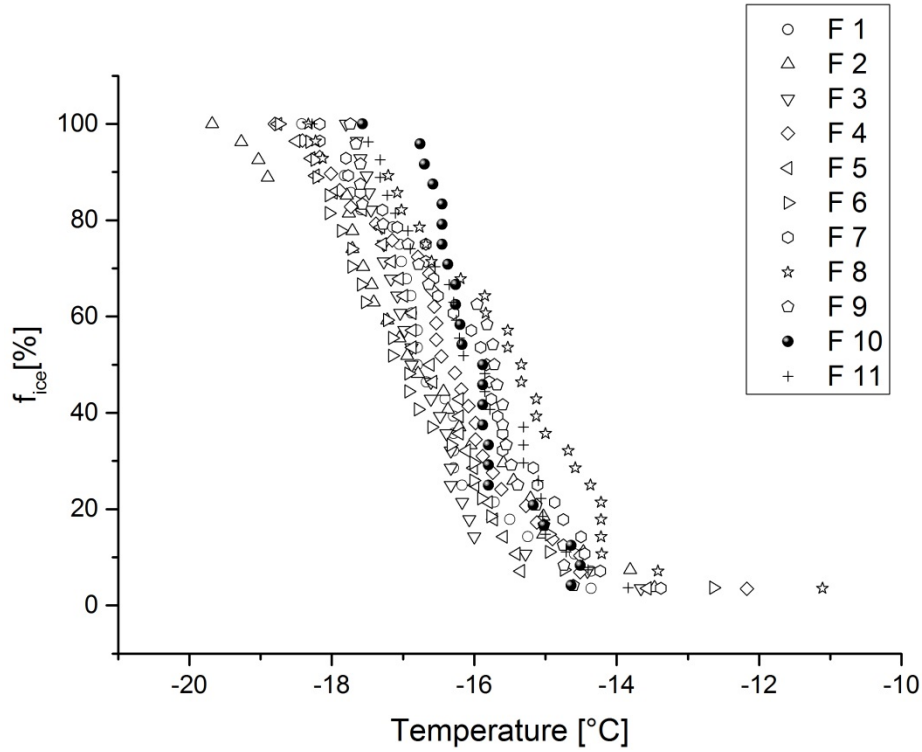
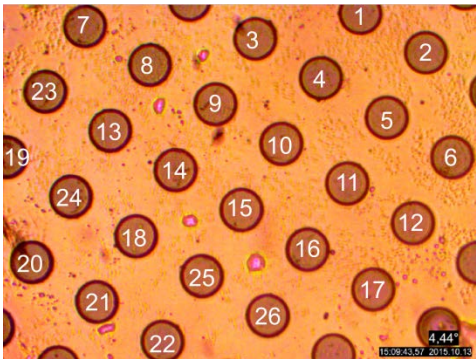


Figure 3 Fraction of frozen droplets against the temperature of eleven freezing experiments with feldspar as INP (F1 to F11). Heterogeneous freezing of ultrapure water with milled feldspar as an INP occurs between -11 and -19,5°C.

4. Contrast graphs

Contrast graphs of each droplet in the freezing video provided in supplements.



5 Figure 4 Numbering of the droplets from the provided freezing video in supplements as listed in the contrast graph (see Figure 5).

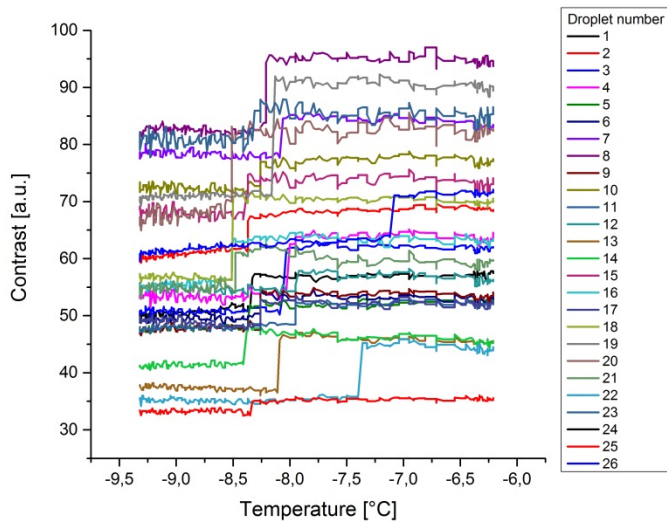


Figure 5 Contrast trend of each frozen droplet as listed in Figure 4 from the provided freezing video in the supplements. Differences in light scattering behaviour of water and ice lead to a contrast increase during the freezing process, which is used to determine the freezing temperature.