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Modeling homogeneous ice nucleation from drop-freezing experiments: impact of droplet volume dispersion and cooling rates

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S1 Analysis of survival probability data in presence of nucleating particles

We used the present model to analyze the heterogeneous nucleation data. Zhang and Maeda, has reported the survival probabilities with various nucleating particles. We will present the analysis on data with Kaolinite at two different cooling rates 0.003 K/s and 0.001 K/s. Key point to note here is that the model does not account for the variation in the activity of the particles as well as areas. We present the experimental data along with model predictions in the following plot. Even though the fits agree pretty good with experimental data we observed very low free energy barrier for nucleation at both cooling rates. For example, at 0.003 K/s, the nucleation parameters obtained from the model are $A = 2.94 \times 10^2$ and $B = 1.14 \times 10^{-3}$, corresponding free energy barrier for nucleation is approximately 1.5 $k_B T$. Even at the other cooling rate 0.001 K/s, we observed free energy barrier to be lower and approximately 2.0 $k_B T$ ($A = 1.6 \times 10^3$ and $B = 9.41 \times 10^{-4}$). We observed similar trend for free energy barriers in the case of snomax and silver Iodide also.

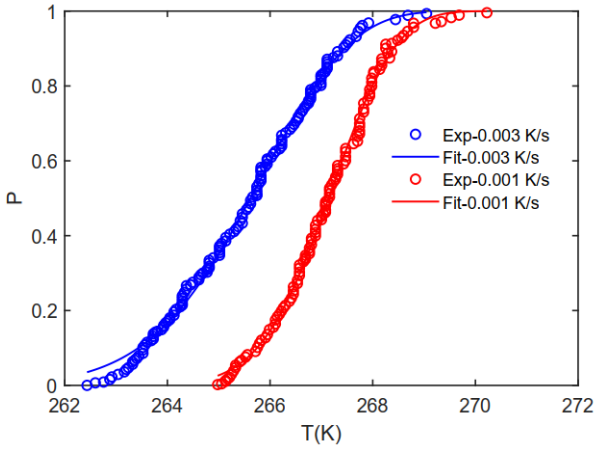

Figure S1. Illustration of fits for heterogeneous nucleation data with kaolinite at two different cooling rates. Open circles represent experimental data, and solid lines are the model predictions.

References

Zhang, X. and Maeda, N.: Nucleation curves of ice in the presence of nucleation promoters, Chem. Eng. Sci., 262, 118 017, 2022.