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CNT effective interfacial energy and pre-exponential kinetic factor from measured NaCl crystal nucleation time distributions in contracting microdroplets.

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ABSTRACT

Nucleation, the birth of a stable cluster from disorder, is inherently stochastic. Yet up to date, there are no quantitative studies on NaCl nucleation that accounts for its stochastic nature. Here, we report the first stochastic treatment of NaCl-water nucleation kinetics. Using a recently developed microfluidic system and evaporation model, our measured interfacial energies extracted from a modified Poisson distribution of nucleation time show an excellent agreement with theoretical predictions. Furthermore, analysis of nucleation parameters in 0.5 pL, 1.5pL and 5.5 pL microdroplets reveals an interesting interplay between kinetic confinement and shifting of nucleation mechanisms. Overall, our findings highlight the need to treat nucleation stochastically rather deterministically to bridge the gap between theory and experiment.

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