Supporting Information for the paper

Deep Undercooling of Aqueous Droplets on a Superhydrophobic Surface: The Specific Role of Cation Hydration

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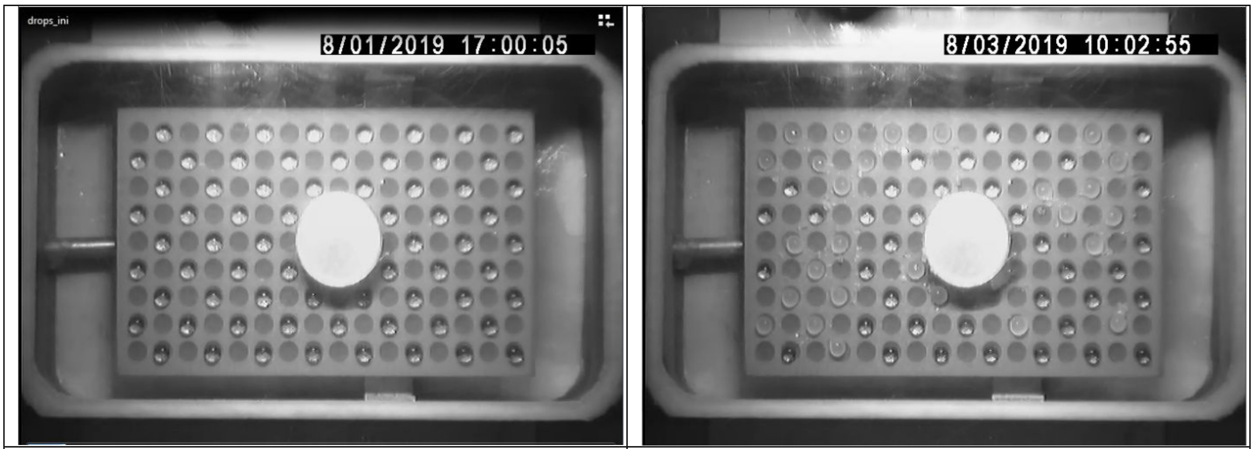
Experimental study of the kinetics of nucleation for the ensemble of sessile droplets of aqueous solutions of alkali metal halides

The droplets of a solution were deposited on a superhydrophobic substrate with an ordered array of dimples (Figure S1a). The droplet freezing delay was studied in a thermally homogeneous environment and vapor saturation close to 100% in the regime of instantaneous slow cooling until T = -20 °C, followed by continuous exposure at the above temperature. The time elapsed from the moment of attaining T = -20 °C by the droplet to the freezing of a given droplet was recorded as the freezing time delay for that droplet. Freezing of the droplets was detected by the change in appearance from clear to opaque (Figure S1b). Given the stochastic nature of the ice nucleation, we have performed multiple runs on the same samples to determine the statistically significant effect on the freezing delay for different salt solutions. The data presented in Figure 2 of the main manuscript for each salt solution were obtained by an analysis of the freezing of 200 - 250 sessile droplets.



CaCl2

Figure S1. (a) The experimental cell with liquid droplets of aqueous solution deposited onto the superhydrophobic sample with dimples. (b) Snapshot of the experimental cell taken after 41 h of exposure at T = -20 °C, with easy discerning between frozen (opaque) and undercooled liquid (clear) droplets.

The experiments were performed with the superhydrophobic substrates obtained using laser processing, as described in ref. S1, followed by chemisorption of methoxy-{3-[(2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluorooctyl)oxy]-propyl}-silane, used as a hydrophobic agent. Contact angles formed on such superhydrophobic surfaces by the droplets of solutions of different salts, studied here, exceeded 170°.

References

(S1) Boinovich, L. B.; Emelyanenko, A. M.; Emelyanenko, K. A.; Modin, E. B. *Modus Operandi* of Protective and Anti-Icing Mechanisms Underlying the Design of Longstanding Outdoor Icephobic Coatings. *ACS Nano* **2019**, *13(4)*, 4335-4346. DOI: 10.1021/acsnano.8b09549