SHORT COMMUNICATIONS

Comments on the paper by D. Clausse and F. Broto entitled "Influence of a precooling on the nucleation kinetics of ice from water droplets"

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The influence of precooling on the nucleation kinetics of ice in supercooled water drops reported by D. Clausse and F. Broto [1] is of interest, for it appears to indicate that the probability of nucleation taking place is dependent on the previous thermal history of the supercooled sample. While such a conclusion may indeed be justified from the experimental results, it is worth pointing out that the increased rate of ice production they observed after precooling may have resulted not from an increase in the rate of nucleation, as they have assumed, but from a process of crystal growth.

In similar nucleation studies with water droplets suspended on oil [2], it has been reported that an increase in the amount of the crystalline phase that is present occurs not only as the result of the nucleation of ice formation but by the growth of frozen droplets. Because the supercooled droplets have a greater solubility in the oil than the droplets that have frozen, water molecules rapidly diffuse through the continuous phase of the emulsion causing the frozen droplets to grow at the expense of the supercooled droplets.

The experimental results reported may have an alternative explanation. The statement, "The lack of a melting peak during the heating of one cell shows that no freezing has occurred during the preservation at θ_c' ," is open to question. As the authors have indicated earlier in their paper, there are limits to the sensitivity of their calorimetric measurements. It is, therefore, conceivable that during the preservation at θ_c' a significant number of the submicron water droplets turned to ice, but not a large enough number of them to produce a measurable "melting peak". In this event, when the sample was placed in the thermostat at a higher temperature, these small ice crystals that were formed at a lower temperature would then grow by diffusion to produce the increase in the mass of the ice

phase indicated by the calorimetric measurements. It is to be expected that the rate of growth of the ice phase by diffusion might be greater at higher temperatures, for the rate of diffusion, the solubility of water in oil, and the vapor pressure difference between ice and liquid water will be greater in the temperature range -10° to -20° than at -30°C at which temperature the sample was precooled.

The influence of precooling on nucleation kinetics that Clausse and Broto have inferred should be open to question until it can be established that negligible diffusion of water is taking place through the oil phase used to separate the supercooled drops from the frozen drops.

References

1. Clausse, D., F. Broto, *Colloid Pol. Sci.* **260**, 641 (1982).
2. Vonnegut, B., *J. Colloid Sci.* **3**, 563 (1948).

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