

Review of "On the Thermodynamic and Dynamic Aspects of Immersion Ice Nucleation" by D. Barahona

August 30, 2018

The paper has improved and the author has properly addressed a large part of my comments. However, I still find the current presentation sometimes difficult to follow. Part of it comes from the technicality of the subject, but I believe that the organization could be improved further to help the reader better understand the line of the argumentation. I have picked some examples, listed below. I would recommend that the author considers my suggestions before the paper can be accepted for publication.

Major points :

1) Distribution of topics between the different sections: On several instances, a topic is brought up by the author but only discussed several pages later. For example, the water activity shift is introduced p 12 but only used then p 20. I would move sect 2.4.1 entirely to the discussion. Similarly, section 3.5 and 3.1 may be merged. The discussion of the preexponential factor could be combined with the kinetic derivation (since, in the end, it is mainly kinetics)

2) Clarification of the notations: I am confused by some of the notations; for instance, in Eq. 38, $\frac{\partial \Delta G}{\partial n_{hom}^*} = 0$ implies that the partial derivative is taken as a function of n_{hom}^* . I believe this should read $(\frac{\partial \Delta G}{\partial n})_{n=n_{hom}^*} = 0$. In several cases, n_{hom}^* is used while it should just be n , at least as far as the reviewer understands.

Other comments:

p 10 : The meaning of the critical temperature T_c should be made clearer. In particular, the absence of metastable equilibrium below T_c should be explained, as in one of the answers to the referees. A textbook reference would also be welcome.

p 15, section 2.4.3: I find the argument presented in that section difficult to follow. My understanding was that T_c should be determined experimentally, but here it is derived analytically "since T_c should also correspond to the temperature at which the work of nucleation becomes negligible." (p 10, l 13-14). Could the author elaborate on that? How negligible is the work of nucleation (how large is the minimum)?

Fig. 4: As far as I understand, this figure represents contours of constant $J_{het} = J_{threshold}$

for different values of ζ (i.e. $T_{ft}(a_w)$ is such that $J_{het}(T_{ft}(a_w), a_w) = J_{threshold}$). Is that correct? If so this should be specified, in particular the value of $J_{threshold}$. Otherwise, a mathematical definition of $T_{ft}(a_w)$ would still be required so that the reader can understand the figure.