

## ***Interactive comment on “Ice nucleation efficiency of AgI: review and new insights” by C. Marcolli et al.***

### **Anonymous Referee #1**

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I have reviewed the article “Ice nucleation efficiency of AgI: review and new insights” by Marcolli et al. This article covers literature dating back to the 1960s on ice nucleation on AgI. The article focuses on the molecular level processes that may cause AgI to be an efficient ice nucleus. The article is timely, in that there is increasing interest in the processes that lead to efficient ice nucleation, and it would be of great interest to the readers of Atmos. Chem. Phys. I have a number of minor suggestions for authors to consider, which are listed below:

p2 line 7: It is interesting that condensation freezing is considered separately from immersion. To what extent does condensation freezing have a different efficiency than immersion? Can it also take place below water saturation, like deposition nucleation?

pg 2 line 32: Is having a defect enough even if none of these “requirements” are met?

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pg 2 line 31: It's odd to refer to these as requirements. Are they requirements, or simply properties that promote ice nucleation?

pg 3 line 28: You should specify if the symbols in Fig 1 are filled or open.

pg 4 line 6: What is meant by "adsorb iodide ions on the surface"? Does it mean that iodide in the solution is surface active or something else?

Fig. 1: Indicate that the orange circles and triangles overlap.

pg 11 line 25: If AgI particles stay on the surface of the droplets during immersion freezing, how is an "inside-out" contact freezing mechanism being separated from immersion freezing?

pg 11 line 1: A reference is needed here. Water molecules at the interface participate in fewer H-bonds and therefore may have greater mobility. In polymers for example, there is greater mobility at the air-polymer interface than in the bulk of the polymer.

pg 12 line 13: Why should the amount of water adsorbed on a surface at a given RH matter for immersion freezing, where the nucleation presumably takes place at a location on the heterogeneous nucleus inside the water droplet?

pg 12 line 15: I do not understand this result for condensation freezing. Again, the surface is immersed in a solution in this mechanism, so it is hard to believe that surface adsorbed water due to RH has an effect. Activation may mean that the solution is most dilute, allowing freezing to occur.

pg 12 line 31: Why is the observed dissolution greater for the contact freezing experiment (with the same particle diameter)? Also, is this mobility diameter?

pg 13 line 17: As long as the surface is dissolved, the ice nucleation activity should be reduced according to the arguments in this section. Why should the amount of dissolution matter? Do you suspect that at 0.04% dissolution the surface is not fully dissolved? Are these arguments consistent with the comparison of the two particle

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sizes?

pg 14 line 8: Why does the addition of AgCl increase the ice nucleation activity? (This is stated in the conclusions, but it should be stated here as well.)

Fig. A2: SAED diffractograms would be interesting to report to see the amount of different polymorphs in your sample. Were these taken?

Wording/Grammar: pg 3 line 9: “Such an analysis should also allow us to identify factors”

pg 6 line 27: “They noted that a supersaturation of 20%....”

pg 8 line 29 & 30: For Miller indices, it is more typical to write 001 with a bar over the 1 rather than 00-1.

pg 10 line 21: What is meant by “in sum”?

pg 15 line 14: change “with different shares” to “in different proportions”

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