

Anonymous Referee #2

We thank the reviewer for the careful reading of the manuscript and the suggestions for improvement. The comments are addressed below in italic.

General comment:

The paper summarizes results about the ice nucleating efficiency of silver iodide in different modes obtained by various experimental techniques. Studies from several decades are summarized and explanations about the reasons of the efficient ice nucleating ability of silver iodide are described in molecular levels. Such a review gives important scientific insights and findings and is of high scientific relevance.

However, representing such a review is not a trivial task. The descriptions of the utilised techniques are not given in a way that the reader could easily follow (which is, of course, a challenge). I see some weaknesses in defining the different ice nucleating processes in their differences. The discussion about the stochastic nature of freezing processes and the neglecting of time dependence should be more detailed. Furthermore, I find it critical that the paper mixes the review of previous findings with new experimental results which have not been published elsewhere. This should be treated separately in the paper, such as starting with an experimental part with new results, and then continue with the review part.

To my opinion, major revisions regarding the presentation quality are requested before publishing the manuscript in APC.

We improved the structure of the manuscript as suggested by the reviewer and added a paragraph at the end of the introduction to outline the structure to the reader.

Specific comments

1. The paper should be rearranged so that previous findings are clearly separated from new experimental results which have not been published elsewhere, such as starting with an experimental part with new results, and then continue with the review part.

We moved the Appendix A1 to the main text as an experimental part and rearranged the main text as suggested.

2. Clear definitions of the treated freezing modes should be given in a section in the Review part.

We added Sect. 3.1 (Modes of heterogeneous ice nucleation) to the revised manuscript.

3. The descriptions of the utilised techniques should be completely reworked. Maybe it would be better not to describe too many details in the text which are listed in the tables.

We carefully went through the text and improved it.

4. In the text the use of the terms ice nuclei and IN, ice nucleating particles and INP is not consistent. Please correct this.

In the revised manuscript, we avoid using an abbreviation.

5. Temperatures are sometimes given in °C, sometimes in K. Please change this consistently.

We converted all temperatures to Kelvin.

6. Abstract: Including full references with all details in a paper is not usual; the same is the case for including references at all in the Abstract.

We delete the references from the abstract in the revised version.

7. Abstract, page 2, line 10: Deposition freezing: What about experimental results from deposition freezing with AgI particles?

Our main focus was to compare ice nucleation efficiency at water saturation from studies performed in contact, immersion, and condensation mode. We agree that a review on ice nucleation by AgI should also treat deposition nucleation. Therefore, we added a Table 4 that summarizes studies performed in deposition mode and discuss them in more detail in the text.

8. Abstract, and Introduction, page 3: The remark that "this paper is one of three papers that present and analyse contact freezing experiments with AgI" is somehow confusing. Unpublished results should be clearly presented in the paper as suggested, previous results should be treated equally all together.

We delete the references from the abstract in the revised version.

9. Introduction, page 2, line 8: There are recent studies showing that the freezing temperature in the contact mode is dependent on the particle size, e.g., Hoffmann et al., 2013, Faraday Discuss, 165. Therefore, only for large particle sizes contact freezing temperatures are higher than for immersion freezing.

Hoffmann et al. observed a surface area dependence for contact freezing. Such a dependence is also expected for immersion freezing. Hence, freezing efficiencies in immersion and contact mode should show the same size dependence.

10. Introduction, page 2, line 15: I would suggest to start a new paragraph here.

This is done.

11. Page 3, line 21, and many other places: In the text, there is often written something like “range from x – y” or “diameters of x – y”. Please avoid using “– “ in the text and write, e.g. “range from x to y”.

We changed the text as suggested.

12. Page 8, line 10: The sense of the last sentence of this paragraph is not clear.

To make the meaning of the last sentence clearer, we insert the following sentence: “Thus, the difference in temperature between a frozen fraction of 0.1 and a fully frozen sample is 8 K.”

13. Page 8, line 14: What is meant by “even stronger dependence”?

We add to the sentence: “An even stronger dependence of freezing temperature ...”

14. Page 10, line 27: Please reformulate the sentence “ simulations ... were able to simulate ...”.

We reformulated this sentence: “In agreement with this, Fraux and Doye (2014) and Zielke et al. (2015) were able to simulate ice growth ...”

15. Page 11, Section 3.4, and other places: Please replace “totally” by “completely” or “entirely”.

We replaced “totally” by “completely”.

16. Figure 1: At least some short explanations of the symbols included directly in the figure would help the reader.

We inserted a legend to the right of the Figure in the revised manuscript.