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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Lignin's ability to nucleate ice via immersion freezing and its stability towards physicochemical treatments and atmospheric processing" *by* Sophie Bogler and Nadine Borduas-Dedekind

Anonymous Referee #1

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The manuscript presented ice nucleation ability of a commercial lignin via immersion freezing. This study measured the frozen fraction for lignin at different carbon contents. It was shown there is a non-linear relationship between freezing temperature (T50) and lignin concentration of 2-200 mgC/L. This study also investigated the effects of sonication, heating and reaction with H2O2 and O3 on ice nucleation ability of lignin. The filtration at 0.22 and 0.2 micrometer was used to exam the size dependence of lignin's ice nucleation ability. This study provides additional data sets for the better understanding in the ice nucleation potential of lignin-like aerosol particles. Part of the

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Discussion paper

methods and conclusions need clarifications before it can be considered for publication.

Comments:

Line 100, 145, why the molecular biology reagent water was used as background water? The milli-Q water was also used during the filtration, what are the differences between these two in terms of ice nucleation measurements?

Line 180, how can ozonation approach used in this study represent the atmospheric aging by ozone? What are the potential differences or impacts?

Line 190, without detail description of FINC, it is not easy for readers to judge whether the method is appropriate. First, how the temperature uncertainty is determined? Secondly, what are the temperature differences across the whole PCR tray wells? Third, is there any correction on the data with the background water? When looking at the 2mgC/L sample, there may be over 0.3 FF contributed by the background water to 0.5 FF at T50? For 2mgC/L sample, it is about 0.2 FF. For these lower concentration samples, the background water could contribute significantly to the ice nucleation events.

Line 204, what are the estimated uncertainties in TOC concentrations and the uncertainties in ice-active mass site density (nm)? For most of the data in Fig.4C, the values of nm are well within one order of magnitude. How does it look like if uncertainties are considered? Is it still significantly different?

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