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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Homogeneous nucleation of sulfuric acid and water mixture: experimental setup and first results" *by* D. Brus et al.

Anonymous Referee #2

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The authors describe the characterisation of a flow-tube experiment designed for investigations in the field of H2SO4/H2O nucleation as well as first result using this equipment. This manuscript represents a continuation of the work published first by Viisanen et al.(1997). The process of new particle formation is currently a hot topic in atmospheric science. Up to now, in the literature there are a couple of experimental investigations showing quite different results, at least partly. Elementary processes leading to measureable particles are poorly understood. It is not clear how different experimental techniques/parameters do influence new particle formation in the labora-

tories. All experiments (H2SO4 point source or continuous production; H2SO4 from gas-phase saturator or from evaporation of a liquid sample) are welcome. With that there is a chance to find out what the most important points are in the process of H2SO4/H2O nucleation. Therefore, the experimental approach shown here and first findings should be interesting for the readership and the paper is well suited to publish in this journal. Before publishing, some changes or revisions could improve this manuscript. Here my remarks:

1) Use "molecules cm(-3)" instead of "molecules in cm(3)" , etc. throughout in the text and figures. Apply for sulphate ions the commonly used formula/notation in chemical literature.

2) P.23877, line 25: Wyslouzil et al.(1991) observed an increase of the nucleation rate of 2 – 4 orders of magnitude as a result of increasing the temperature by 5 K, not decreasing! See fig.11 in the original paper.

3) P.23878, line 20: The filter is located downstream the furnace. Is the filter also held at furnace temperature? What is the dimension of the mixing unit? Is it surrounded with a thermo-jacked? What is the wall temperature? The filter is used to remove any residual particles after the heating zone at 470 K. What is the source of these particles? Are they produced in the high-temperature zone or do they arise from evaporation of liquid H2SO4 and survived the heated zone?

4) P.23881, line 6: A 50% cut-off size of 2.18 nm is stated for a TSI 3025A counter using Ag particles for calibration. What kind of modification has been done? Originally, this counter has a 50% cut-off size of 3 nm. Some explanations would be helpful.

5) Fig.5: What are the corresponding H2SO4 concentrations for the 3 measurement series?

6) P.23881, line 12; Fig.6: Is it possible to describe the shape of N vs. t in this figure as a result of the sum of nucleation and wall loss? This should be discussed.

7) P.23888, line 7; Fig.11: For more clearness in fig.11, experimental conditions should be given in the caption or better in a table summarizing laboratory findings and ambient measurements. Brus et al. show their results for r.h. = 10, 30, 50% with separate symbols pointing at r.h.-dependence of nucleation. The same should be done in the case of literature data where r.h. dependence was observed.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 23875, 2009.