Report

Franco et al., describes a new design of “Cloud chamber” and gives a characterization of dry particle experiments using sodium chloride, sucrose and soot particles. In these experiments, the wall loss rate, particle coagulation rate and dilution rate are estimated under dry conditions. Results show similar wall loss rate and different coagulation behaviors among these aerosols.

In this article, several key information on the aerosol generation, chamber characterization and result illustrations are missing. It is suggested to reject and re-submit the article after completing these informations.

Major comments:

1/ It is believed that authors would like to build a “Cloud chamber” in order to study physical and/or chemical processes during the cloud process and this is the first publication on this new design. However, the characterization of this new stainless-steel chamber is not complete, such as Surface/Volume ratio, working pressure, mixing ratio, gas monitoring (VOC from the combustion), etc.

2/ The research on the literature is not fully enough.

2.1/ Authors made a short introduction on the Cloud chamber. It is well known that RH is one of the most important parameters that impacts on the wall loss ratio and particle coagulation in the cloud chamber (Doussin et al., 2023). It is not clear why authors specifically made the study under dry conditions and would like to make a cloud chamber in the future.

2.2/ Authors highlighted in this work one critical aerosol: soot. Apparently, the characterization of soot is missing. Soot is generally fractal-like and highly dependent on the combustion conditions. The aggregation of soot particles is one of the most important parameters that impacts the mobility diameter measured by the SMPS, i.e., for a single freshly emitted soot particle, the different aggregation due to the aging processes (lifetime, RH, VOCs and chemical processes) brings different mobility diameters (Peng et al., 2017).

3/ Lack of results. Even the size distribution is shown in figure 3, but the total number concentration of each experiment is never presented in the article. Authors fitted observed rates to theoretical rates (line 139). However, no results are shown how difference between the fitting and experimental results.

Refrences

Doussin, J.-F., Fuchs, H., Kiendler-Scharr, A., Seakins, P., & Wenger, J. (Eds.). (2023). *A Practical Guide to Atmospheric Simulation Chambers*. Springer Nature. https://doi.org/10.1007/978-3-031-22277-1

Peng, J., Hu, M., Guo, S., Du, Z., Shang, D., Zheng, J., Zheng, J., Zeng, L., Shao, M., Wu, Y., Collins, D., & Zhang, R. (2017). Ageing and hygroscopicity variation of black carbon particles in Beijing measured by a quasi-atmospheric aerosol evolution study (QUALITY) chamber. *Atmospheric Chemistry and Physics*, *17*(17), 10333–10348. https://doi.org/10.5194/acp-17-10333-2017