

## ***Interactive comment on “Hygroscopic growth and droplet activation of soot particles: uncoated, succinic or sulfuric acid coated” by S. Henning et al.***

### **Anonymous Referee #1**

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This manuscript describes the hygroscopic growth and droplet activation of uncoated and coated soot particles. Soot particles were generated via a GFG-1000 soot generator, with nitrogen and argon as carrier gases, and also a miniCAST soot generator, which allowed variation of the OC ratio in the soot. Soot was coated with both sulfuric acid and succinic acid, chosen to simulate chemical aging by inorganic and organic atmospheric species. Hygroscopicity and volatility of the uncoated and coated aerosol was studied by both an HTDMA and a VHTDMA at relative humidities up to 98.4%; activation was studied using a CCNC, with chamber supersaturation varying from 0.14–1.54%. Results show that uncoated soot (with the exception of GFG soot with Argon as the carrier gas) exhibited neither hygroscopic growth nor activation. Succinic acid

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coatings enhanced both hygroscopic growth and activation of GFG soot (with Argon as the carrier gas), while CAST soot experienced only enhanced activation. Sulfuric acid coatings exhibited enhanced hygroscopic growth of CAST soot, with a dependence on the OC content; the OC dependence was not observed for activation. The differences in soot particles generated by the two methods, such as the presence of PAHs on CAST soot, can explain differences between activation and growth of both types of soot coated with succinic acid and sulfuric acid. The results are well supported, and the subject is relevant to the journal's audience. The experiments are well defined and methods are supported by previous studies. I recommend publication after a few questions and concerns are addressed.

Major concerns and questions:

-How is it known that homogeneous nucleation of the coating substance wasn't occurring? Are the temperatures of the coating section and saturation tube low enough to avoid homogeneous nucleation of succinic and sulfuric acid?

-How much coating was deposited on the core soot particles? Can you quantify in monolayers? Are you assuming uniform coverage of the coating substance?

-It is unclear in the text what size soot particles were selected. I see 150 and 200nm for the HTDMA studies, but CCNC activation studies?

-Do you have any hypotheses for why activation was observed for GFG-soot with Argon as the carrier gas?

Minor concerns or comments:

-Pg 28446 Line 5 confusing with "applying nitrogen, respective argon. . ."

-Pg 28446 line 16 "lead" to "led"

-Pg 28446 Line 21 don't need comma after "we assume"

-Pg 28448 lines 8-10 more references?

-Pg 28449 lines 18-19 “with and without being coated with either. . .” can make clearer by: “with and without coatings of either. . .”

-Pg 28449 Line 30: “feed” should be “fed”

-Pg 28454 line 6 “analogous” to “analogously”

-Pg 28457 line 8 “at” should be something else, “on”?

-Pg 28458 line 25 dash after CAST shouldn't be there, or meant CAST-soot

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 28445, 2011.

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