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Atmospheric Measurement Techniques Discussions
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Interactive comment on "Sub 3 nm particle size and composition dependent response of a nano-CPC battery" *by* J. Kangasluoma et al.

Anonymous Referee #1

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<General Comments>

It is a great collaborative work. Authors effectively use the information on the molecular structure of the test particles to guide readers to understand the activation behavior of CPCs. Using the inorganic particles generated by a candle frame the authors provided a new view of understanding the difference in the particle-material dependence of the DEG and water based CPCs. It was especially enlightening that the authors indirectly showed that lighter compounds are detected less effectively than heavier compounds although these two have the mobility diameter. This new observation may help explaining why the charger-generated ions are somehow detected poorly, or, may be implying that the sulfate ions in the lighter compounds are evaporating inside these CPCs.

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Interactive Discussion
Discussion Paper

Authors successfully showed the variation in the activation behavior with respect to the particle material in this work. It is encouraged that authors investigate the variation with respect to inlet RH for a given particle material in their future study since the topic is more relevant when these CPCs are implemented during field campaigns.

<Specific Comments>

- Sampling flowrates at the inlet of each CPC needs to be added to Table 1. It is difficult to guess how the flowrates add to 8.1 L/min.

- Authors mention that flowrates at the aerosol inlet and outlet was 6.1 L/min when Nano-DMA was used. Therefore, about 2.0 L/min needs to be aspirated at the DMA exit to have 8.1 L/min total flowrate for CPCs. The schematic shown in Figure 1 does not seem to be consistent with above flow setting since the schematic shows that the excess flow is always pushed out at the exit of the DMA.

- [Page 8863, Paragraph 5-12] It is recommended that authors show the size dependent transport efficiencies from the first separation point to the inlet of each CPCs. Then readers would be able to know the extent of correction applied to the each CPC at each size. It would be easier to see the difference if the transport efficiencies are shown in a form of a molded curve.

- The reader would be interested in seeing the size dependent efficiency ratios between the DEG-CPC to PSM (or vice-versa) since the methods for creating the supersaturated region is different between these two CPCs. Some scientists in this field may be questioning whether the different heating or cooling schemes used in these CPCs may induce the material dependence in activation behavior although the working fluids are the same. It may be difficult to see such effects since the aerosol particles in this study are well dried.

- It is not clear what the phrase “mixing state” is trying to infer. Is the mixing ratio given by Equation 1 is equivalent to the particle number concentration ratio of the aerosol

AMTD
6, C3385–C3387, 2013

particles?

- Authors are recommended to give the size range when they use the phrase “detects very poorly”.

<Minor Comments>

- DMPS and NAIS should be spelled out once when they appear first time in the paper.

- Page 8866, Line 1, the word “interpret” is repeated twice

- Figure 1. the sentence “setup to generate internally mixed sample” should be in the caption.

- Figure 4. The caption should indicate which side corresponds to which polarity.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 8855, 2013.