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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characterization of iodine particles with Volatilization-Humidification Tandem Differential Mobility Analyser (VH-TDMA), Raman and SEM techniques" *by* Z. D. Ristovski et al.

Anonymous Referee #2

Received and published: 14 March 2006

Iodine oxide particle formation in the coastal marine boundary layer (MBL) is a current topic of great interest to the atmospheric community. The composition of newly formed iodine oxide particles and their physical properties, however, are not well characterized. This study has compared the spectral and physical properties (volatilization and hygroscopy) of particles from iodine oxide standards (HIO3 and I2O5) with particles generated using methods analogous to those that produce particles in the MBL, photochemistry of a iodine precursor in the presence of ozone. Therefore, this study is

appropriate for publication in ACP.

The paper provides some relatively sound fundamental experimental results but is somewhat lacking in a quantitative interpretation of the data. Also, the possible implications of the results presented in this study to future studies or the interpretation of atmospheric iodine oxide particle formation is unfortunately not included.

Below are a few comments and questions that the authors should consider before the paper is accepted for publication in ACP.

The paper makes a point of differentiating in the use of filtered sheath air, air, and N2 without explaining why.

The stoichiometric ratio of iodine and oxygen in the iodine oxide particle formed following the photooxidation of CH2I2 in the presence of ozone is 1:2 with 10% error. How was this error limit determined or estimated? Is this a one sigma error limit? Is this analysis accurate enough to differentiate between a ratio of 1:2 (I2O4) and 1:2.5 (I2O5)? Is the composition of the particles measured using the SEM technique independent of the conditions used to form the particles, collection of the particles, age of the particles, exposure of the particles to water vapor?

On page 1489 a linear relationship is given between the temperature at which only particle residue remains and particle size. What is the significance of this relationship and is it useful? It is not used in the paper.

On page 1490, It is stated that “This is consistent with previous observations of associated species such asĚ” What observations are being referred too?

Page 1491, How were the particles exiting the photochemical reactor collected?

Page 1491, The authors need to discuss the proof that the particles being studied are indeed composed of I2O4. The cited references given here assume or propose that I2O4 is formed and involved in the formation of iodine oxide particles but they do not prove it. This is a very important point that is not clearly presented in this paper. One

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of the most significant conclusions that could be obtained from this work would be experimental evidence (volatilization, hygroscopy, SEM and Raman spectra) that the particles are composed of I2O4.

Page 1494, What do the Raman spectrum measurements tell us? The new spectrum measurements are for the particles formed in the photooxidation experiments. The band positions are listed and the spectrum does not agree with either I2O4 or I2O5. What does this mean in terms of the particle composition, please explain more clearly.

Page 1495, The conclusions section contains a summary of the experimental observations but almost no conclusions. What was learned in this study and how can it be used?

Typographical and other comments:

Volatilization is used in the title but volatilisation is used in the text in several places.

Page 1482, line 5; insert “as a function”

Page 1483, line 4: insert “in the presence”

Page 1483, line 13: insert “al., 2004).”

Page 1487, line 4: evinces ??

Page 1488, line 10: change-couples ?? Should this be “charge-coupled”

Page 1491, line 7: change “on” to “in”

Page 1492, line: change “shows” to “show”

Page 1492, line 23: change “references” to “reference”

Page 1492, line 25: explain why the size of the particles makes a difference in the spectrum”

Page 1493, line 10-11: Explain why smaller particles absorb water more easily?

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Interactive Comment

Page 1493, line 24: change “term” to “terms”

Page 1494, line 7: capitalize SEM

Page 1497, line 1: 90 nm

Page 1497: The model comparison shown in Figure 8 is good at higher relative humidity but deviates at lower values. The authors need to address this in there discussion.

Fig. 1 Caption: Delete “diagram” and most of the labels in the legend are unclear.

Fig. 2 shows multiple sampling ports along the flow reactor. However, the experiment described in the text does not indicate that they were used. Delete them from the drawing.

Remove graphical filling for the regions I, II, and III in all figures. The vertical lines are sufficient to separate these regions and the filling obscures the data points.

Fig. 3 caption; Add to the caption a description of the HIO3 particle source; subscript the 3 in HIO3; reference the text for a definition of hygroscopic and non-hygroscopic peaks.

Fig.4, it looks like there are two full lines in the figure. Also, what is the second line?

Fig. 5 and 6, the legend identifies the blue spectrum as I2O4 while the caption refers to it as photochemically generated particles. Change the legend to indicate the photochemical source. Add to the caption a statement to the affect that you have assigned this spectrum to I2O4.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 1481, 2006.