

Interactive comment on “A comparison of spectrophotometric and denuder based approaches for the determination of gaseous molecular iodine” by R. J. Chance et al.

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We would like to thank referee#2 for their helpful comments, our response to which are listed below:

1. The mass of the permeation gas source was measured at regular intervals (approx. every two weeks) and the rate of mass loss was found to be fairly constant over time (see figure 1 below). To account for any short term fluctuations, the permeation rate used to calculate recovery for a given experiment was that measured over the time period in question.

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2. See response to referee#1 for a discussion of potential interferences from dihalogens in the spectrophotometric method.

3. Laminar flow is required to minimize capture of aerosol by the denuder, rather than to enhance the efficiency of gas recovery. As only gas phase iodine was present in the test experiments reported here, absence of laminar flow would not affect iodine recovery. Laminar flow is required if the denuders are to be used in situations where iodine containing aerosol may be present; if necessary this can be ensured by adding a short length (~ 4 cm) of uncoated tubing to the denuder tube inlet - within the experiments reported here this was effected by the tubing leading from the permeation oven to the denuders. However, the denuder tube dimensions are still relevant, as the theoretical trapping efficiency for a reactive gas is a function of its diffusion coefficient, flow rate and denuder length. The tube dimensions used in this work were the same as those used by Chen et al. (2006) and the length was theoretically sufficient for close to 100% capture of molecular iodine to be achieved (a full description of this is given in Chen, 2005).

4. The following text has been added to P2195, Ln10: “Chen et al. (2006) used amber glass denuder tubes (6 mm internal diameter, 9 mm external diameter, 500 mm length) coated using 2 mL of starch in ethanol (2 g L^{-1}) to detect molecular iodine in air.” The phrase “Following the method of Chen et al. (2006),” has also been added to the beginning of section 2.2.3 (P2196, Ln25) to emphasize that the method as described here is the same as that used by Chen et al. (2006).

5. The TMAH used was supplied by Riedel-de Haën, this is now stated on P2196, Ln26. The blank values of TMAH that had been stored and handled at the University of York were tested a number of times and compared to blank values for TMAH that had only been used at CSL laboratories, these tests demonstrated that contamination was occurring at the University of York. As we only used TMAH from one supplier in this work, we do not have evidence to show that iodine contamination varies with TMAH supplier, so although this is quite possible we do not feel it is appropriate to comment

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on it here.

6. The value of 26% cited here is for dry amylose (Rundle and French, 1943), to clarify this we have added the word “Dry” before “amylose” on Ln4. We accept the referee's point that the rate of complex formation and equilibrium constant may not be the same on the surface of the denuder tube and that the very short residence time of the iodine in the denuder tube may hinder recovery. However, we still feel it is worthwhile pointing out that the amount of amylose used was in excess according to these figures – the amount of iodine was only <0.1% of the maximum that might be absorbed.

7. The phrase “This is below the upper limit of concentrations observed in the coastal marine atmosphere (Saiz-Lopez et al., 2006b)” has been deleted from P2205, Ln3 (see earlier comments). The sentence “The LoD is comparable to peak concentrations of molecular iodine in coastal air observed at low tide (93 pptv; Saiz-Lopez et al., 2006b), suggesting the traps may be used in laboratory investigations (for example, seaweed chamber studies) at concentrations close to those observed in the atmosphere” has been added in its place. P2205, Ln20: The word “very” has been inserted before “high” to help emphasize that the traps are not generally applicable for ambient measurements.

8. Table 2 already gives the solvent trap temperature in note b (as table 1 contains denuder tube results, we assume the referee is referring to table 2). The trap temperature (-9°C) has been inserted into the caption for figure 4. We have also inserted the word “prototype” to the figure and table captions to make it clearer which trap set up the results refer to.

Minor points:

1. P2201, Ln21: We feel the use of ‘as per the method’ is correct in this sentence.
2. The Citations for Chen Hongwei's 2006 paper have been corrected to read ‘Chen et al., 2006’, we apologise for using the names incorrectly.

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References:

Chen, H.: Development of analytical methodologies for iodine species in gaseous and particulate phases of the coastal atmosphere, Ph.D. thesis, Institute of Inorganic and Analytical Chemistry, Johannes Gutenberg-University Mainz, Duesbergweg, 10-14, D-55128, Mainz, Germany, 2005.

Chen, H., Brand, T., Bandur, R., and Hoffmann, T.: Characterization of iodine species in the marine aerosol: to understand their roles in particle formation processes, *Front. Chem. Chin.*, 2, 119-129, 2006.

Rundle, R. E., and French, D.: The configuration of starch in the starch-iodine complex. III. X-Ray diffraction studies of the starch-iodine complex, *J. Am. Chem. Soc.*, 65, 1707-1710, 1943.

Saiz-Lopez, A., Shillito, J. A., Coe, H., and Plane, J. M. C.: Measurements and modelling of I₂, IO, OIO, BrO and NO₃ in the mid-latitude marine boundary layer, *Atmos. Chem. Phys.*, 6, 1513-1528, 2006b. <http://www.atmos-chem-phys.net/6/1513/2006/>.

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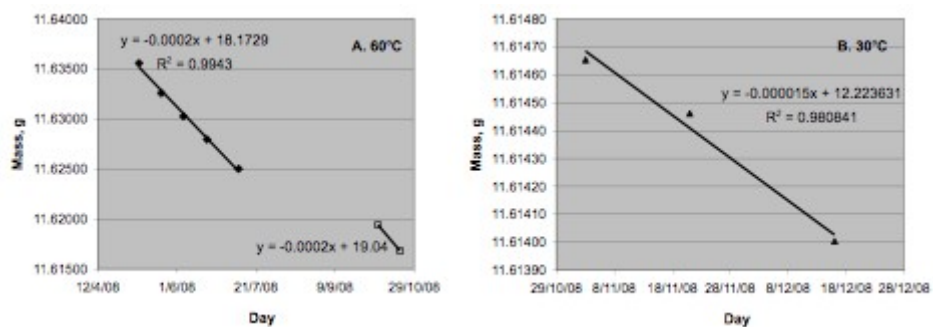


Fig. 1. Decrease in mass of molecular iodine permeation tube over time at 60degC (A) and 30degC (B).