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Interactive comment on “Development and validation of a portable gas phase standard generation and calibration system for volatile organic compounds” by P. Veres et al.

P. Veres et al.

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Received and published: 1 June 2010

Comment 1: I am not sure it is correct to use the generalized term “volatile organic compounds” (both in the title and the body of the text). The authors have shown their approach works for pure hydrocarbons and simple (monofunctional) oxy-hydrocarbons, but VOCs may contain heteroatoms other than O, e.g. N, S, or Cl atoms. Complete conversion cannot be assumed a priori for N-containing compounds and Pd catalysts are known to get deactivated by poisoning with S- or Cl- containing compounds (even at low ppm levels). Even for multifunctional oxy-hydrocarbons a complete conversion into CO₂ needs to be demonstrated.

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Answer: We concede that we have not studied VOCs that contain other heteroatoms; however for our purposes, compounds of this type were beyond the scope of this paper. To address this issue the following text has been inserted into the conclusion section: “While we have shown this technique to be effective for pure hydrocarbons and simple oxy-hydrocarbons studies of VOCs containing heteroatoms, such as nitrogen, must be performed to validate the efficacy of this method. MOCCS is somewhat limited in its applicability as S- and Cl- containing compounds are known to have the potential of deactivating such oxidation catalysts and as such may not be amenable to this technique.”

Comment 2: In addition to “inch” and “psi” the authors should also provide “cm” and “mbar” as units.

Answer: These comments have been addressed within the revised text where both units are now given.

Comment 3: page 337, lines 23-26: The authors should describe in detail how they constructed the permeation tubes (liquid volumes, tubing and cap materials, tubing dimensions including wall thickness, types of crimps, suppliers, etc.).

Answer: Permeation sources were made from permeation kits that are available from VICI Metronics. The dimensions of a particular source are chosen based on the expected and desired output of the permeation source, on a compound-to-compound basis, according to well-established empirical data available on the manufacturers website. The volume of pure liquid or mass of solid in the sources is determined by the size of the source used, and source geometry and temperature are all adjustable parameters. Hence, no details are reported here.

Comment 4: page 338, line 17: Did the authors find any evidence for an interference from IR absorption of VOCs ? Please specify.

Answer: It is perhaps unclear and confusing as previously written in the text. We would

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not expect any interference in the absorption measurements for CO₂. To elaborate the following has been added to the text “Various compounds, such as isocyanates and alkynes, present a potential interference at this wavelength (Lide, 2005). Additional work is necessary to determine a proper zeroing technique when measuring classes of compounds that present interferences. Within the context of this particular study the potential for absorption interferences is negligible.” In addition to reduce confusion I have modified the text to read “Measuring the background in this manner accounts for any CO₂ present in the carrier gas” where the text referring to IR interferences was removed as it is unnecessary with the above discussion added.

Comment 5: page 339, lines 17-19: Does the 20 % uncertainty refer to the accuracy in one individual mix, or the standard deviation from the 20 different mixes ?

Answer: To address this point of confusion the following has been added to the text in section 2.2 GC-MS: “Benzene measured by the GC-MS was independently calibrated using more than 20 single- and multi-component VOC mixes over the lifetime of the GC-MS. The GC-MS response to benzene as determined from all 20 calibration mixes has an overall measurement uncertainty of \pm 20%.

Interactive comment on *Atmos. Meas. Tech. Discuss.*, 3, 333, 2010.

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