

Interactive comment on “Real-time monitoring of trace-level VOCs by an ultrasensitive compact lamp-based VUV photoionization mass spectrometer” by W. Q. Sun et al.

Anonymous Referee #2

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General comments:

The manuscript by Sun et al. presents an ultrasensitive compact mass spectrometer for real-time measurements of trace-level VOCs. The authors used a lamp-based vacuum ultraviolet (VUV) light as a photoionizer, coupled it with a laboratory-built compact time-of-flight mass spectrometer (TOF-MS) and built a so-called VUV-PIMS system. The system was characterized and evaluated using benzene calibration samples and then used in measurements of atmospheric VOCs. The VUV-PIMS shows good sensitivity and linearity in benzene measurement. It seems to be a promising tool for monitoring ambient aromatics. Using VUV as photoionizer in the mass spectrometry

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measurement was reported years ago. The advantage of the VUV-PIMS is its high VOC sensitivity and low interference signal. In the design of the VUV photoionizer, the authors encountered problems caused by photoelectron ionization. They solved problems successfully by using a baffle in the photoionizer. Although there is still room for improvement, the VUV-PIMS described in this manuscript indicates one of the potential directions of technique development in real-time monitoring atmospheric VOCs. The paper is well structured and written. Its topic fits the scope of AMT. However, some points need to be clarified. I recommend publication of this paper in AMT after minor revisions.

Specific comments:

- 1) P5881, section 2.2, the description suggests that the benzene mixing ratio in your 6.35 L bottle should be about 0.001 (v/v) or 1000 ppmv. How did you produce ppb-level benzene samples for your tests? Is there any possibility that the benzene samples you produced were not ppb-level? This should be made clear because it tells the readers whether or not you have really made an ultrasensitive instrument for VOCs.
- 2) Section 3.3 and Figure 4, it seems that the VUV-PIMS is mainly sensitive to aromatic species. There are many other VOC species in the urban air, with some of them being at the levels close to those of aromatics. However, the organic species other than aromatics are nearly invisible in Figure 4. Why? Limitation of photoionization? If this instrument cannot measure most of ambient VOCs but is good for monitoring aromatic species, the title of this paper should be changed accordingly.
- 3) P5879, L16, delete the “an” before “instrument”.
- 4) P5881, L6, how high is the repetition rate?
- 5) P5881, L12, do you mean the mass spectra were collected at 0.1Hz? Why so slow?
- 6) P5884, L14, “ $R^2=0.9968$ ”. I do not think it make sense to give four digits after “.” because your measurements cannot be so accurate.

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