



Interactive
Comment

Interactive comment on “A novel method for on-line analysis of gas and particle composition: description and evaluation of a Filter Inlet for Gases and AEROsols (FIGAERO)” by F. D. Lopez-Hilfiker et al.

Anonymous Referee #2

Received and published: 24 December 2013

General Comments

Here the authors describe a new device (FIGAERO) for sampling gases and particles for chemical analysis. The device employs filter collection for particles followed by thermal desorption into a chemical ionization mass spectrometer (CIMS), although it could be connected to other analyzers. Gases are analyzed by direct sampling into the CIMS. The authors provide a very comprehensive background review to justify the development of this device and then a very thorough description of the device

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



and its operation. They then describe a variety of experiments that were conducted to evaluate the performance of the device, which involve experiments using standard compounds, and SOA generated in a small smog chamber, a plant chamber, and a forest. The results are impressive and the instrument represents a major advance in organic aerosol analysis. I highly recommend that it be published in AMT after a few minor comments are addressed.

Specific Comments

1. It might be mentioned that although particles are present in the sampled air during gas analysis, they are not analyzed because they do not evaporate in the CIMS (at least that is my understanding of the way this works). This might not be the case with other instruments coupled to the FIGAERO.

2. Page 9367, lines 4-6: It has been shown that Teflon readily absorbs organic compounds that would normally be entirely in the gas phase (Matsunaga and Ziemann, AST, 2010), so this statement may not be true. In addition, because the FIGAERO is constructed of Teflon it is probably worthwhile discussing the possible effects of absorption of organic compounds. Some of the issues are touched on here in the context of adsorption, but that effect is likely to be minor compared to absorption, which is much more substantial and can occur on short timescales (a few minutes).

3. It might be useful to evaluate losses of gaseous and particulate organics during sampling and analysis by conducting experiments with a homologous series of monoacids, for example. I think with the CIMS one would expect about the same signal from all compounds regardless of carbon number, so that differences in measured concentrations could be used to evaluate losses within the system.

4. Section 3.3. I am not quite sure why the authors chose to correlate compound desorption temperatures with enthalpy of vaporization rather than vapor pressure (e.g., at 25C), as has been done by others with reasonable success (e.g., Ziemann, JPCA, 2002; Faulhaber et al., AMT, 2009). Although both correlations have their caveats, it

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

seems that estimating an effective vapor pressure is more useful than an effective heat of vaporization, since gas-particle partitioning depends on the former not the latter. Effective heats of vaporization, as usually defined based on the temperature-dependent evaporation of a complex aerosol, seem to have less use since they do not reflect the heats of vaporization of individual compounds but instead the distribution of vapor pressures of the compounds in the mixture.

5. Section 3.4. The authors might be interested to know that the behavior observed for m/z 185 (C₉H₁₃O₄-) in Figure 5, which is presumably pinic acid, has been reported previously for the temperature-programmed thermal desorption of SOA formed from this same reaction (Docherty et al. EST, 2005). In that study pinic acid was monitored by EI-MS and a large low-temperature peak and high-temperature tail indicative of the monomer and oligomers, respectively, was observed.

Technical Comments

1. Page 9376, lines 11-13: It sounds like the authors are saying that thermograms, thermal desorption information, and thermal separation have not previously been used in OA analysis. This is obviously not the case, since a number of groups have done so, but perhaps something else was meant. I suggest clarifying the sentence.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 9347, 2013.

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)