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Atmospheric Measurement Techniques Discussions

Interactive comment on "A new approach for measuring the carbon and oxygen content of atmospherically-relevant compounds and mixtures" *by* James F. Hurley et al.

Anonymous Referee #1

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General Comments:

As is indicated by the title of the paper, a unique, lower cost method to estimate analyte O/C in real time by using FID and a carbon dioxide detector is presented. The importance of understanding ambient O/C is successfully established. Increased oxygen content of aerosol can influence volatility and hygroscopisity and thereby impact climate. Additionally, toxics in the atmosphere, which impact human health, are often the result of oxidation of biogenic precursors. Several higher cost continuous and non-continuous methods of measuring O/C are discussed. This work suggests coupling a flame ionization detector to a carbon dioxide detector for real time estimation of O/C.

The general apparatus schematic is clear and simple, however, it may be helpful to point out the three different "systems" on the apparatus figure 2a. Known concentrations of single compounds (with variable O/C) were injected through the apparatus in order to establish that: 1) FID/CO2 correlates with O/C; 2) FID/CO2 correlates with relative effective carbon number; and thus 3), O/C and relative effective carbon number are also correlated. Simple mixtures of 2 organic compounds were analyzed using a GC coupled to the FID+CO2 detector apparatus. The expected FID/CO2 trends nicely with measured FID/CO2. The authors argue that this trend indicates this apparatus can be used in the analysis of atmospheric particles.

The overall presentation is clear and concise. Appropriate high-quality references are made. Results suggest that this apparatus could be successful in the field for O/C, however, additional, more complex testing would make a more convincing case (See Specific Comments #3 and 4). Given the scope of this paper, I do not believe that additional testing is necessary prior to publications. I would recommend further testing prior to publication of field data (either in the lab using more atmospherically relevant conditions/mixtures or comparison tests along side a well established instrument that measures O/C).

Specific Comments:

1) In the "Materials" section, complex commercially available mixtures on unknown compounds (perfumes, colognes, etc.) are mentioned. I do not recall any discussion regarding the analysis of these complex unknown mixtures. Did I miss something? If I did not miss something, I am unclear why they are being discussed in the materials section.

2) As I read this paper, my initial thoughts went immediately to, "This looks great in the lab, but are the concentrations you used in the lab relevant to the field? Can this apparatus handle the concentrations you would expect to be measuring in the field?" The SI covers this nicely, but it may be an important to note or reference in the main

manuscript as well.

3) It is not clear to me how this apparatus would function in the field. If you are interested in the O/C of atmospheric particulate, how do you plan to deal with the presence of organic gasses entering your apparatus?

4) While I recognize the difficulty in replicating atmospheric conditions in the lab, I have a hard time accepting that a mixture of 2 compounds indicates that this method of O/C estimation would be successful in the field. Did you think about testing more complex mixtures? Even a mixture of 2 compounds would provide more adequate evidence that this method would work in the field.

5) Methanol was pointed out as an outlier. Are you confident that there are not many more atmospherically relavent "outliers"? Could this potentially skew the trends you are seeing and lead to poor estimations of O/C?

6) Is there a reason no nitrogen- or sulfur-containing organics were tested? Would you expect any changes in the FID/CO2 trends in areas rich with these compounds?

Technical Corrections:

1) There is no mention of where the data in Figure 4 (section 3.2) came from. I assume it is from the 90 different compounds that are mentioned in section 2.4.

2) Line 35: appears to be space between parentheses and period.

3) Line 71: two commas after "Generally"

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