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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Water-soluble iron correlation to primary speciated organics in low-emitting vehicle exhaust" *by* Joseph R. Salazar et al.

Anonymous Referee #1

Received and published: 3 November 2019

General:

This paper characterizes Fe solubility found in tailpipe emissions from different vehicle classes and proposes a mechanism involving Fenton chemistry with aromatic compounds to explain their results. This work is novel and of interest to the aerosol community. On another note, I found it refreshing to read an ACPD paper that was well-written yet concise. I recommend this paper for publication after addressing my minor comments.

Major Comments:

1. The title is a bit awkward and overly complicated. I suggest that the authors simplify

their title to something like "Water-soluble iron emitted from vehicle exhaust is linked to cyclic organic compounds".

2. The rationale for targeting the IVOCs was not well-explained. I suggest a paragraph in the introduction briefly discussing different organics emitted from vehicles and what their possible role in Fe solubility may be.

Specific Comments:

Abstract:

1. Define EC and OC.

2. Sentence on lines 21-24 needs to be rephrased. I found it confusing.

3. The end of the abstract should more clearly spell out the mechanism for the increased Fe solubility and include the role of Fenton chemistry.

Introduction:

1. I suggest mentioning the different organics found in vehicle exhaust with attention to cyclic compounds and IVOCs. I also suggest mentioning how those compounds could affect Fe solubility to help establish the rationale for that aspect of your work.

2. I encourage the authors to include and discuss the following papers relevant to this study in the introduction and the results section: [Chen and Grassian, 2013; Fu et al., 2012; Meskhidze et al., 2017]

Methods:

1. Define FID

Results:

1. Figure SI1 is important for showing that bulk organics and markers of inorganic acid processing (e.g., sulfate and nitrate) do not correlate with Fe and are not important for Fe solubility. I suggest showing at least these two aspects of your correlation analysis

in the main manuscript and not in the SI.

2. Line 311: Define LFC.

3. Line 324: provide some more rationale for why you targeted these specific organics.

4. Lines 330-336: While these plots are compelling, the authors should provide a sentence or two with some explanation for the scatter in the data.

Conclusions:

1. I suggest that the authors reiterate that Fe solubility was not related to inorganic acid processing. This is a very important point since many studies assume that sulfuric acid, in particular, is the most important acid that induces changes in Fe solubility.

References:

Chen, H. H., and V. H. Grassian (2013), Iron dissolution of dust source materials during simulated acidic processing: The effect of sulfuric, acetic, and oxalic acids, Environmental Science & Technology, 47(18), 10312-10321.

Fu, H. B., J. Lin, G. F. Shang, W. B. Dong, V. H. Grassian, G. R. Carmichael, Y. Li, and J. M. Chen (2012), Solubility of iron from combustion source particles in acidic media linked to iron speciation, Environmental Science & Technology, 46(20), 11119-11127.

Meskhidze, N., D. Hurley, T. M. Royalty, and M. S. Johnson (2017), Potential effect of atmospheric dissolved organic carbon on the iron solubility in seawater, Marine Chemistry, 194, 124-132.

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