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Discussions

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Interactive comment on "Effect of atmospheric ageing on volatility and ROS of biodiesel exhaust nano-particles" by A. M. Pourkhesalian et al.

A. M. Pourkhesalian et al.

alimohammad.pourkhesalian@qut.edu.au

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Major comments

Comment 1: Very sweeping statements are made by the authors that need to be "toned down" by indicating more specifics. For instance in starting off the Volatility measurements (section 3.1) the authors state: a. "It is clearly seen in the figure [Figure 2] that the volatility of the particles increased after exposure to oxidative agents." This is not clear to this reviewer; I see a possible increase with the C810 fuel (pending clarification of the values and bars [spec comment #1] and then statistical analyses) but certainly not C1875, C1618, and maybe not C1214. The authors back off of the generalization further on in the ms text; this overstatement of a general trend needs to be eliminated.

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b. Similarly the same type of overgeneralized statement are made again later in the ms: (p.6492) "In Figure 5 it is clearly visible" and A clear trend between the fuel oxygen content and ROS concentration is evident from Figure 6." Any inferences from these data need to be stated more carefully by being more specific.

Response 1: Authors agree with the reviewer. Changes have been made: Lines: 154, 165, 235, 237, 240

Comment 2: In discussing the implications of their conclusions, the authors should also point out that these studies were done only with one load/one engine speed and one engine type, and therefore the findings may or may not be applicable to other engines, loads and/or speeds until tested

Response 2: To address reviewer's comment the following sentence has been added to the manuscript: "Tests were not done at several different loads and speeds to avoid too many variables. This test was designed to isolate the influence of changing fuel composition on the aging potential and related physico-chemical changes in PM." Line: 149

Specific comments: Comment 1: It is unclear how the data are expressed. Means or me- dians; are the bars (where they exist) SD or SEM; any statistical analyses done, etc. For correlations, what are the R2 values? Until these parameters are clearly stated it is difficult to ascertain if differences in points are truly statistically different.

Response 1: To address reviewer's comment, R2 values and type of the measurement error were added to the captions.

Comment 2: Please increase the symbol size in the figures- they are difficult to discern.

Response 2: All figures were regenerated using larger symbols.

Comment 3: Is there a biodiesel fuel that has the majority of fatty acid Carbon length as C18 and C75?

Response 3: No, according to the table provided in our previous publications referenced in this manuscript (Rahman et al., 2014; Pourkhesalian et al., 2014) FAME labelled as C1875 has a composition dominated by FAMEs with 18 carbons (94%) and the rest is C22 and C16 FAMEs.

Comment 4: How variable were the ozone concentrations and UV flux values?

Response 4: Ozone concentrations were monitored and constant during the whole sampling time with values 0.5 ± 0.1 ppm. UV lamps are considered as a very stable source and the intensity of their light mostly emitted at the wave length of 253 nm was not changing for the duration of experiments.

Comment 5: Editing: ageing or aging- this is spelled two different ways in the ms; some abbreviations are introduced appropriately ie, spelled out the first time) but others are not, eg DPM on p 6482; some words do not need capitalization (though the abbreviation may be capitalized), eg, p6485 should be reactive oxygen species (ROS), ditto for fatty acid methyl ester.

Response 5: Authors agree with the reviewer. Aging is adopted through the entire manuscript.

Comment 6: Awkward statement p. 6483: "there are numerous studies reporting using biodiesel decreases the diesel primary emissions." Suggest a rewording

Response 6: Authors agree with the reviewer. The sentence has been reworded: "Numerous studies reported the decrease in some controlled emissions with the usage of biodiesel". Line: 38

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/15/C5039/2015/acpd-15-C5039-2015-supplement.pdf

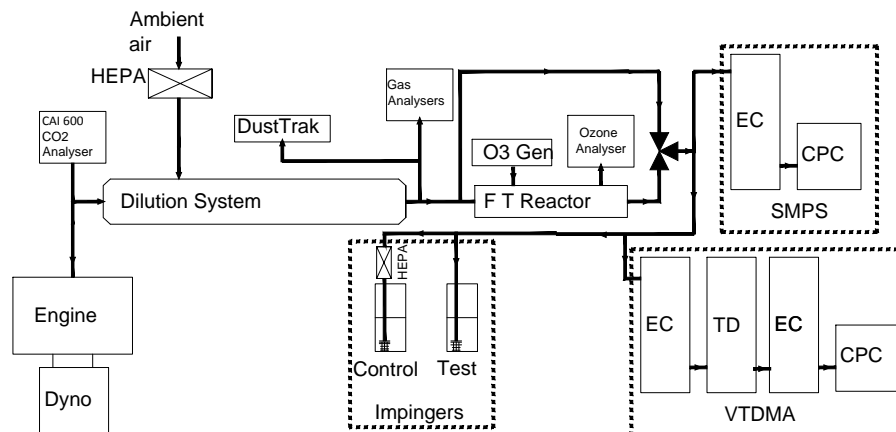Interactive comment on Atmos. Chem. Phys. Discuss., 15, 6481, 2015.

Fig. 1. Experiment setup HEPA: High-Efficiency Particulate Air Filter; F T reactor: Flow-Trough Reactor; O3 Gen: Ozone Generator; Ozone Analyser: EC9810 Ecotech; EC: Electrostatic Classifier; TD: Thermo-Denud
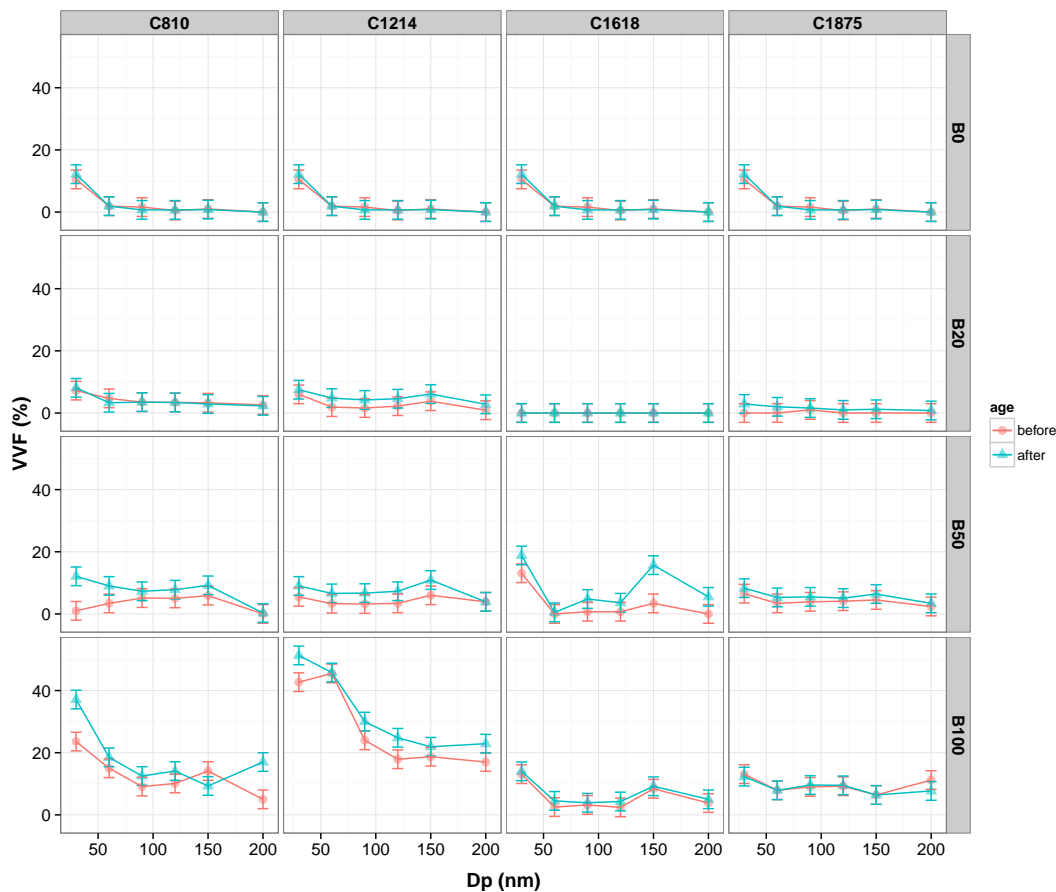
Fig. 2. the volumetric volatile fraction (vvf) of particles versus particle pre-selection sizes for different biodiesels and different blends before and after aging. Each column is dedicated to one of the bio
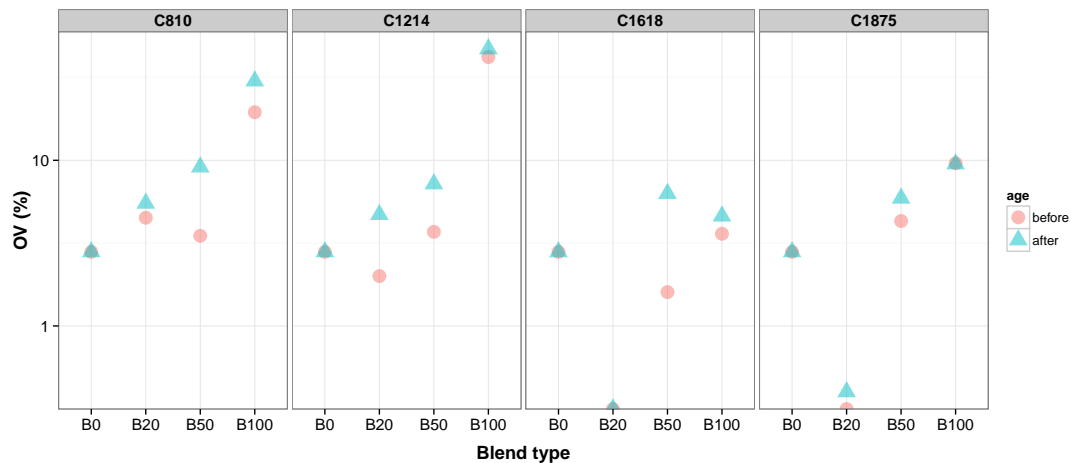
Fig. 3. volatility of particulate matter versus different blends for petro-diesel and tested biodiesels before and after aging in the flow through reactor. Blue points are due to aged particulate matter and r
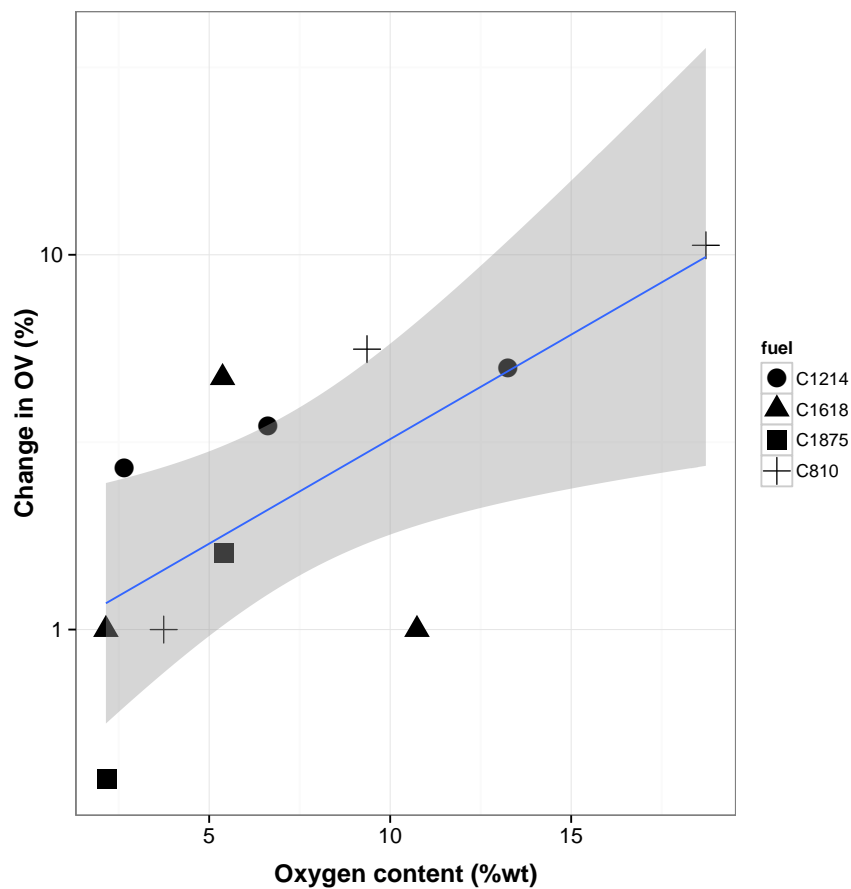
Fig. 4. change in volatility of particles before and after aging against oxygen content of the blends. Different blends are shown with colours and different shapes as can be seen in the legend show different
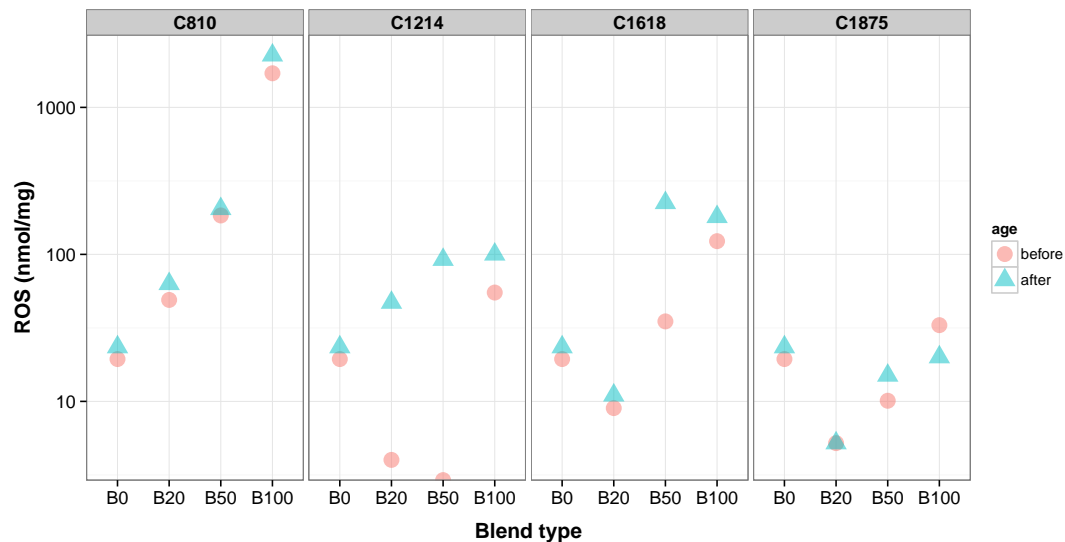
Fig. 5. ROS levels of particulate matter versus different blends for petro-diesel and tested biodiesels before aging (red circles) and after aging (blue triangles). Different tested biodiesels can be seen at
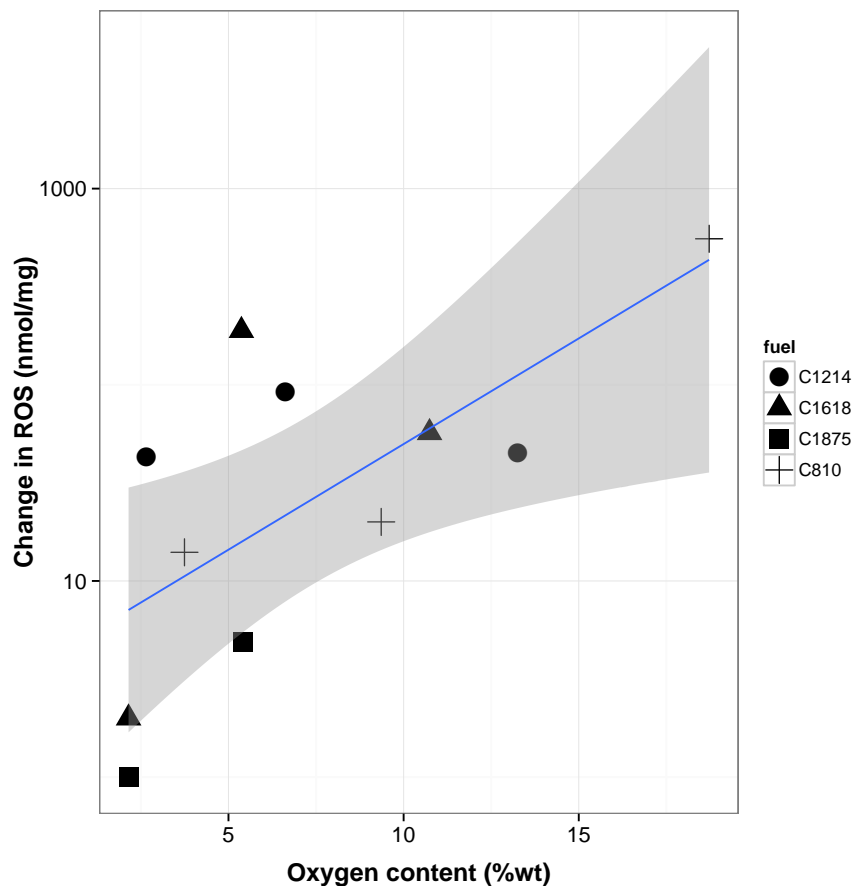
Fig. 6. the correlation between the change in ROS levels and oxygen content the fuels before and after aging . The point corresponding to C1875 is excluded from the model. The grey area shows the 95% confiden
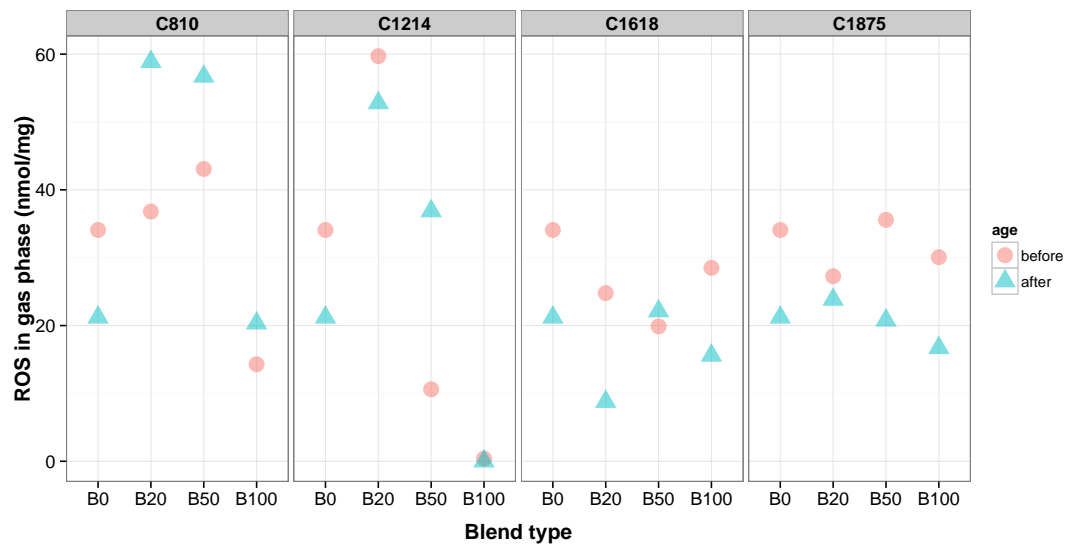
Fig. 7. ROS levels in gas phase before and after aging. Fresh and aged particulate matter are separated using blue color for aged PM and red for fresh PM.
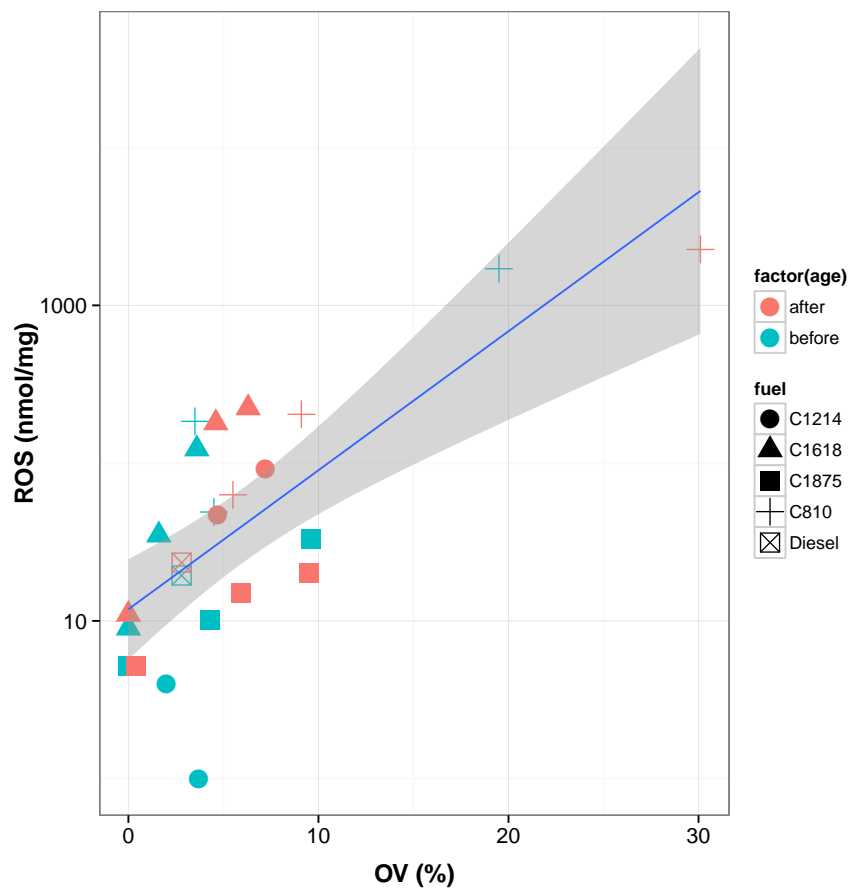
Fig. 8. the correlation between ROS of particulate matter and the volatility of particulate matter. Fresh and aged particulate matter are separated using blue color for fresh PM and red for aged PM, also the