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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influence of functional groups on toxicity of carbon nanomaterials: implication for toxicological evolution during atmospheric relevant aging of soot" *by* Yongchun Liu et al.

Anonymous Referee #1

Received and published: 13 March 2019

General Comments: This work deals with the very complex nature of how small particles affect human health. There is substantial evidence that shows that small particles do have adverse health effects, but it is still not clear what causes issues. The authors recognize this, and do a good job of presenting the problem and previous research (with one notable exception, which will be discussed below). They focus on different carbon-based nanoparticles, including engineered ones. Their results are generally in agreement with previous work, but their major new contribution is the identification of epoxide groups on graphene oxide surfaces having a significantly larger effect on DTT

decay rates.

I have no major issues with how the experiments were performed (including the analytical methods used), and why the different nanomaterials were used. However, I have some issues with the interpretation and implications stated. The title states "implication for toxicological evolution during atmospheric relevant aging of soot" but most of the results are for engineered nanomaterials, not atmospheric soot, which is a very different type of particle. While it is important to learn about the toxicity of engineered nanomaterials, those results should not be applied to atmospheric soot particles (which have very few engineered nanoparticles). The results themselves are interesting and important enough without the atmospheric extrapolation, and I suggest revising the title and the Conclusions section.

In the discussion section, reasons for the observed effects are given with very little evidence (though there are some references stated). For example, line 248 states: This means the cell membrane might be intact when exposed to SB4A. Another is line 293: For example, adhesions and/or covering on cells could be the main MOA for graphene/graphene oxide (2-D structure), while for carbon nanotubes (1-D structure), piercing and/or internalization by cells could be the main MOA. I suggest moving these types of sentences to the Discussion section and providing more references or information about these assumptions.

Specific Comments:As the authors correctly state, the particles studied have very different chemistry and morphology, making it almost impossible to discern the mechanisms or chemicals responsible for the observed results. While most of the particles have similar DTT decay rates, this could be a coincidence or the result of a similar mode of action. I do not think the authors have clearly identified which it is.

The authors should reference the many works from the Prof. Barry Dellinger group at LSU (he is deceased, but the work continues). They have identified a new type of radical, called Environmentally Persistent Free Radicals, that produce cell damage in a

catalytic cycle involving metals, nanoparticles, and quinones (they have many papers in ES&T). The catalytic cycle upsets the notion that it is simply the concentration of an active species that is important.

Technical Corrections: The paper, in general, is well written. However, there are several awkward sentences, missing or unnecessary words that should be corrected (as a native English speaker, I cannot imagine writing a paper in a different language). These are all minor and did not affect my review.

Some examples are: Line 21 were investigated for understanding - change to "were investigated to understand" Line 63 Change NO3 to NOx Line 94 Functionalized does not to be capitalized Line 348 Do you mean bonded? Line 388 awkward sentence Line 447 add "the" Line 487 don't need this sentence Line 505 explain the difference between BC and CB. They are not the same type of particle

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