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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Influence of aerosol copper on $HO_2$ uptake: A novel parameterized equation" *by* Huan Song et al.

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A comment on the paper:

Song, H., Chen, X., Lu, K., Zou, Q., Tan, Z., Fuchs, H., Wiedensohler, A., Zheng, M., Wahner, A., Kiendler-Scharr, A., and Zhang, Y, Influence of aerosol copper on HO2 uptake: A novel parameterized equation, Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-218, in review, 2020.

The paper uses laboratory measurements of HO2 uptake coefficients experimentally obtained by the University of Leeds for copper ion doped ammonium sulphate (AS) aerosols, and data from other groups. However, the origin of the data from the University of Leeds is not clear and the citation for the data is not correct. In Figure 2 for



example, the reference Moon et al. 2018 is used to cite both sets of measurements at 43% and 65% RH. Moon et al. (2018) as cited by the paper does not contain any data for the uptake of HO2 onto copper doped aerosols, rather Moon et al 2018 concerns the uptake of HO2 onto TiO2 aerosols. Song et al. (2020), reference this paper as:

Moon, D. R., Taverna, G. S., Anduix-Canto, C., Ingham, T., Chipperfield, M. P., Seakins, P. W., Baeza-Romero, M.-T., and Heard, D. E.: Heterogeneous reaction of HO2 with airborne TiO2 particles and its implication for climate change mitigation strategies, Atmos. Chem. Phys., 18, 327-338, 10.5194/acp-18-327-2018, 2018.

but this is clearly not relevant to Figure 2 or the data shown in Table 1.

So it is not clear what the source of the data are from the University of Leeds for this figure and also that used in Table 1 that are cited incorrectly as Moon et al. 2018.

In a previous paper:

Qi Zou, Huan Song, Mingjin Tang, Keding Lu, Measurements of HO2 uptake coefficient on aqueous (NH4)2SO4 aerosol using aerosol flow tube with LIF system, Chinese Chemical Letters 30 (2019) 2236–2240.

the authors also show in Figure 3 of that paper some University of Leeds data for HO2 uptake onto copper doped AS aerosols at RH=43% and RH=65%. However, in that paper (Zou et al., 2019), two PhD theses from the University of Leeds are cited as the source of data, namely Matthews PhD thesis (2014) for RH=65%, and Moon PhD thesis (2018) for RH=43%.

For the current paper (Song et al. ACPD, 2020), it seems that PhD theses have been used again for the data used in Figure 2. These two PhD theses are not mentioned in the paper, rather Moon et al (ACP, 2018) is cited, which cannot be correct.

There is also another issue regarding the University of Leeds data used in Song et al. 2020.

The Leeds data shown for RH=65% in Song et al. (ACPD, 2020) and in Zou et al. (CCL 2019) seem to be different for the 2 papers? In Figure 2 of Song et al (2020) the RH=65% HO2 uptake coefficient levels out at around 0.4 at high copper ion concentrations. However, in Zou et al al. (2019), the RH=65% data seem to level out around 0.25. These are clearly two different data sets, one of which is cited in Song et al. (ACPD, 2020) as coming from Moon et al (2018), which is incorrect, and one of which in Zou et al. (CCL, 2019) is cited as coming from the PhD Thesis of Matthews (2014).

The Leeds data in the Matthews thesis, the HO2 uptake coefficient as a function of copper ion concentration for AS aerosols at RH=65% have been published in Lakey et al (JPCA 2016) (see Figure 5 of that paper) and resemble the data shown in Zou et al (2019), but do not resemble the data for RH=65% that are shown in Song et al.. (2020), which appears to be from a different dataset.

Pascale S. J. Lakey, Ingrid J. George, Maria T. Baeza-Romero, Lisa K. Whalley and Dwayne E. Heard, Organics Substantially Reduce HO2 Uptake Onto Aerosols Containing Transition Metal ions, J. Phys. Chem. A, 2016, 120, 9, 1421-1430.

We can only think that the data shown in Fig 2 of Song et al (2020) for RH=65% have come from the PhD Thesis of D Moon (Leeds, 2018), data which have not been published, and these data may have been taken using different experimental conditions (e.g. HO2 concentration, aerosol-HO2 interaction time in the flow-tube, different liquid samples used etc.), and may require final analysis/checks etc. before publication.

Now turning to the Leeds HO2 uptake data at RH=43% shown in Figure 2 of Song et al (2020) and also in Zou et al (2019) as a function of copper ion concentration. These data have not been published, and as mentioned above, Moon et al., (ACP, 2018) which is cited by Song et al 2020 is an incorrect citation. These data appear to come from the PhD thesis of D Moon, and again these data have not been subject to the same final analysis/ checks etc. for journal publication.

The Song et al 2020 paper contains data from the University of Leeds PhD theses, and



although uptake data at RH=65 % have been published in Lakey et al (2016), these are not the data shown in Fig 2 of Song et al (2020). Use seems to have been made in Song et al (2020) at both RH=43% and RH=65% of data from the thesis of D Moon. The data used by Song et al. (2020) at RH=65% should be those from Lakey et al., (2016), and not from the Moon PhD thesis, and also it would be sensible for the data at RH=43% to be used following consultation with Leeds, as final analysis and checks on these data may need to be performed for publication. Indeed, manuscripts are in preparation which will use these data.

Finally, on an unrelated point, the value given in Table 1 for the uptake coefficient of HO2 onto (NH4)2SO4 by George et al 2013 is correct in the table at 0.4, but the uncertainty given in Table 1 is +/-0.2 whereas in George et al the uncertainty reported is +/-0.3. The concentration of copper is as well reported in George et al. as molal (Mol kg-1) rather than in molar, M (Mol litre-1).

I. J. George, P. S. J. Matthews, L. K. Whalley, B. Brooks, A. Goddard, M. T. Baeza-Romero and D. E. Heard, Measurements of uptake coefficients for heterogeneous loss of HO2 onto submicron inorganic salt aerosols, Phys. Chem. Chem. Phys., 2013, 15, 12829.

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