

Response to Comment of Dwayne Heard

We thank Professor Heard a lot for the critical comments on the Leeds data of Figure 2 especially those related to the unpublished data from the Moon PhD thesis which we took previously from an online website. Since his comment was submitted, we have then made personal communications with Prof. Dwayne Heard. So now the finalized data from Moon's PhD thesis for RH=43% are provided directly from Prof. Dwayne Heard and we will add the Leeds providers of the data as co-authors on the paper.

In the following, detailed responses are given so now both the data and the citation of both Figure 2 and Table 1 are up to date according to the comments.

Comment:

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. 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.

Response:

Figure 2 is now updated based on the Leeds data provided by Prof. Heard on 3rd April 2020 for the new data at RH=43% and the published data at RH=65% from Lakey et al., 2016. Since the simulation results only show the copper ion concentration from 10⁻⁵ M to 1M concentration, the first point of the uptake coefficient at 65% RH measured by Lakey et al (2016) at 10⁻⁶ M is not shown in the picture, and so there are six data points shown from Lakey et al., (2016). The five data points for 43% RH are all new in Figure 2 and were measured by aerosol flow tube experiments and provided by Leeds. These data are now labelled "This work" in Figure 2 and Table 1 as the providers of the data from the University of Leeds will now be added to the paper as co-authors".

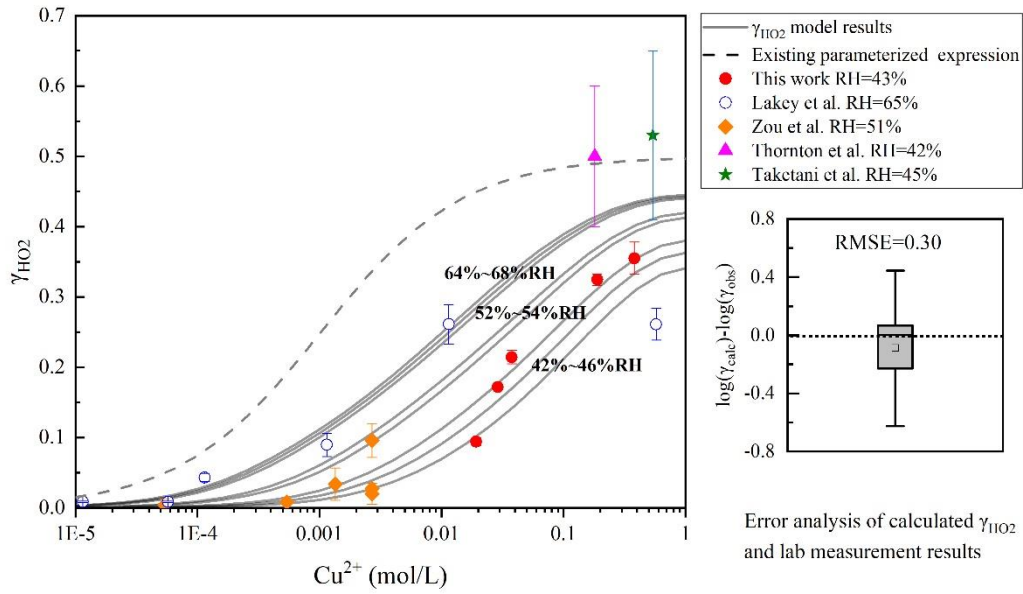


Figure 2: Dependence of γ_{HO_2} on aerosol copper ion concentration. Red circles denote the results at 43% RH measured at the University of Leeds using an aerosol flow tube experiment. Blue hollow circles at 65% RH were measured by Lakey et al., (2016). Yellow diamonds denote results at 51% RH measured by Zou et al., (2019). Pink triangle at 42% RH was measured by Thornton and Abbatt, (2005). Green star at 45% RH was measured by Taketani et al.(2008). The grey dotted line denotes the current parameterized equation of which the influence of RH was not considered (e.g. Hanson et al., (1994)) and the grey solid lines represent the model results of MARK model in this study for a range of RH. The root mean square error (RMSE) between the modeled values and the full dataset in the figure is 0.30 indicating a modest deviation in MARK model calculations.

And in Table 1, the citations are also corrected:

Table 1: γ_{HO_2} under lab conditions for Cu(II)-doped inorganic aerosols.

Aerosol type	RH/%	Estimation of [Cu] in aerosol/M	α	Ref.
NH ₄ HSO ₄	75%	0.0059–0.067*	0.40±0.21	(Mozurkewich et al., 1987)
(NH ₄) ₂ SO ₄	45%	0.5	0.53±0.13	(Taketani et al., 2008)
(NH ₄) ₂ SO ₄	42%	0.16	0.5±0.1	(Thornton and Abbatt, 2005)
(NH ₄) ₂ SO ₄	53–65%	0.5–0.7*	0.4±0.3	(George et al., 2013)
(NH ₄) ₂ SO ₄	65%	0.57	0.26±0.02	(Lakey et al., 2016)
(NH ₄) ₂ SO ₄	51%	0.0027	0.096±0.024	(Zou et al., 2019)
(NH ₄) ₂ SO ₄	43%	0.38	0.355±0.023	This work
NaCl	53%	~0.5	0.65±0.17	(Taketani et al., 2008)
KCl	75%	5% of KCl solution	0.55±0.19	(Taketani et al., 2009)
LiNO ₃	75%	0.03–0.0063*	0.94±0.5	(Mozurkewich et al., 1987)

*Cu concentration is in molal (Mol kg⁻¹).

Comment:

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).

Response:

The units and the uncertainty are corrected accordingly. Please see Table 1 above. The measurements of Mozurkewich et al., 1987 are also in Molal units, and this is also now indicated in the Table.

References

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