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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Measurements of the timescales for the mass transfer of water in glassy aerosol at low relative humidity and ambient temperature" *by* H.-J. Tong et al.

Anonymous Referee #3

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This manuscript presents measurement and modeling results on the mass transfer of water in aqueous droplets of sucrose, raffinose and mixed sucrose/sodium chloride during changes in relative humidity at ambient temperature. Conditions above and below the glass transition relative humidity have been studied. The manuscript contains a lot of valuable experimental data and information. The results provide new insight into the mass transfer of water in glassy aerosol. The experimental data have been modeled carefully and the results are discussed in detail. Overall, this is a very interesting manuscript which I recommend for publication in ACP after the comments below have been addressed.

Abstract: Line 7: it should be explained what kind of "environmental conditions" the authors refer to here (relative humidity and temperature).

Figures in general: It would be helpful to show legends even if the lines and symbols are explained in the figure caption.

Page 4849 and figure 1: I cannot see data for raffinose although the text says that there are data shown – only a parameterized fit is shown – why?

Figure 2b: In the figure caption it says "and the present data" – does this refer to data obtained in this work – and what is the symbol for these?

Page 4849 line 25: the wording in the figure caption and the text should be consistent: Text: volume weighted mixing rule, figure caption: volume fraction mixing rule.

Also it would be helpful if the time in the text was given in seconds as well as hours. Currently seconds are used in the figures and mainly hours in the text.

Page 4852: I suggest the authors write explicitly in the text what the glass transition RH is at room temperature early in the text. Although it can be read from figure 2b it does not say 24% in the text until page 4858. Also it does not say the temperature until page 4858 - this should also be stated earlier in the text.

Page 4853: The authors show that the Zobrist treatment deviates from the experimental data at water activities lower than 50% - this corresponds to relative humidities below the glass transition – what are the implications of this deviation? Could that explain some of the deviations discussed at low relative humidities later in the text?

Page 4853: It says that the Norrish and Zobrist models are the most accurate - the Starzak and Pecock (dashed blue line in figure 2a) seems to be doing as good or better that the Zobrist model?

Also some of the text on page 4859 seem to explain the same thing?

Figure 4a: The first two hours are hard to see in the figure as are the timescale of

decay mentioned in the text (25 seconds) . I think it would be informative to show the first 2 hours and the rapid change in a separate figure or to add another insert.

Page 4855 lines 13-21: this text is hard to follow, for example, it could be explained better what is meant “at the lowest relative humidities” (in figure 4a they look constant a large part of the time).

Page 4856: what are spectra 3, 4 and 5?

Figure 5: it would be helpful if the glass transition was indicated in the figure.

Page 4857: The text is a bit hard to follow. I would suggest avoid writing “ for the first RH change” and “at this relatively high RH” and be more precise, maybe indicate with arrows or similar in the figure.

Page 4863: “bulk accommodation” this term has not been used before in the manuscript and could be explained.

Atmospheric relevance: The particles studied in this work are large (micrometer sized) but in the atmosphere many particles are sub-micron sized. Some discussion on expected behavior of smaller particles and droplets could be relevant.

What are the relevant timescales for changes in environmental conditions in the atmosphere compared to those applied in this work? This could be addressed briefly in the text.

Minor: Page 4854 line to: can modeled -> can be modeled Page 4861, line 12: “balance sucrose” – what does this mean?

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 4843, 2011.