

Comments by referees are in blue.

Our replies are in black.

Changes to the manuscript are highlighted in red both in here and in the revised manuscript.

The manuscript “A review of experimental techniques for aerosol hygroscopicity studies” presents a comprehensive and systematic review of the techniques used to study hygroscopicity of aerosols. The experimental techniques are classified into four types, according to how samples are prepared. For each method, besides experimental techniques, typical applications of this method to aerosol hygroscopicity study are provided. Finally, the future direction to improve these techniques are suggested, including improving these methods to use in more variable ambient environment (high RH, low pressure, low T), conducting more instrument inter-comparisons and investigating other physicochemical properties of aerosol together with hygroscopicity. A comprehensive review of the techniques used to study aerosol hygroscopicity is lacking up to now, to the best of my knowledge, although previous papers well summarizes some techniques, especially the HTDMA techniques (Duplissy et al., 2009) and techniques to study physicochemical properties in general (Ault and Axson, 2017). Therefore, this manuscript would be beneficial to ACP readers. The manuscript is well written and clearly organized. I recommend publication of this manuscript in ACP after a few minor comments are addressed.

Reply: We would like to thank ref #2 for his/her insightful comments as well as recommending our manuscript for final publication. We have addressed all the comments adequately in the revised manuscript, as detailed below.

1. The authors discussed the advantages and disadvantages/problem of each technique. In the summary part, I suggest authors to add a table to summarize these features so that readers can get an overview and this could somehow work as a guideline when one reads a paper on aerosol hygroscopicity studied using a certain method and choose a suitable technique in their research.

Reply: We fully agree with the referee. In the revised manuscript (page 90-94), we have added one table and a few paragraphs to summarize key futures of major techniques for aerosol hygroscopicity measurements.

2. Some studies on other physicochemical properties are discussed this manuscript. While most of them are relevant to the topic of study, some may not be the focus of this manuscript, such as line 1102-1105, 1232-1236, 1380-1383, 1400-1403. Condensing these texts might be desirable.

Reply: We agree that these contents are not directly related to aerosol hygroscopicity; however, they are intentionally included because we want to show that these techniques can also be used to investigate other physicochemical properties besides aerosol hygroscopicity. Therefore, we would like to keep them in the manuscript.

Also the lines 1042-1051 (and Fig 15, 16) discussed the application of Raman spectroscopy to study heterogeneous reaction. Since the application of Raman spectroscopy to hygroscopicity has been demonstrated earlier in the manuscript, I suggest omitting this part, especially considering the figures are not considered to be officially published yet.

Reply: As requested, in the revised manuscript we have removed Figs. 15-16 and related text, since this part has not yet been officially published.

3. Line 1575, it might be worth noting that “Aerosol Time-of-Flight mass spectrometer” is a single particle mass spectrometer, e.g. specify it by adding the abbreviation.

Reply: In the revised manuscript (page 75) we have modified this sentence to make it clear that this instrument is a single particle spectrometer: “as revealed by measurements using a single particle mass spectrometer (Aerosol Time-of –Flight mass spectrometer).” Since this term only appears once in our manuscript, it is not necessary to add its abbreviation.

4. Some texts are underlined (such as line 620 and other part). Is this a typeset problem?

Reply: Because there are ~30 figures in our manuscript, we underline the text when a figure is mentioned in the text (such as “As shown in Fig. 1,”). Underlines will be removed when we upload the document required by final publication after the manuscript is accepted.