

Shen et al. explored the effects of multi-charge on aerosol hygroscopicity measured by H-TDMA, and developed an algorithm to do the correction for size-resolved aerosol hygroscopicity. Due to a large proportion of multi-charge particles in the aerosol flow (especially for 100-300 nm) selected by differential mobility analyzer, the author's efforts are essential and beneficial to the hygroscopicity measurements of submicrometer particles, especially for multi-mode ambient aerosols. The manuscript is easy to follow and presents a contribution to the scientific community of aerosol measurements, so should be acceptable for publication after addressing the following comments.

#### Major comments:

One major comment arises from the lacking descriptions about the measurement techniques, H-TDMA. I could not get any information about the experimental protocols and technical details about the study methods, such as the configuration of HTDMA used in this study, how aerosols were generated and dried, how aerosols get charged (soft X-ray ionization or corona discharge), the number concentration of aerosols, etc. Elaborating these points would put this study in better context.

Page 1, line 21-26: This paragraph needs improvements. The authors tried to describe the significance of aerosol's hygroscopicity to state their motivations to study the effects of multi-charge on aerosols. However, the current version was too short and brief to state the environmental, climate as well as the health effects of atmospheric aerosols. Furthermore, citing more classical and recent references.

Section 3.2: For ambient aerosols, there are different mixing states, e.g., internal, external and core-shell structures, whether this factor has an impact on the multi-charge correction results and has been considered in the algorithm?

#### Minor comments:

Authors should fix the typo and format mistakes of references through the whole manuscript, especially in the References section.

Page 1, line 28: I notice that aerosol hygroscopicity measurement techniques have been reviewed in a recent study (Tang et al., 2019, ACP), please cite it.

Page 1, line 29, 30: Swietlicki et al., 2017 should be Swietlicki et al., 2008.

Page 4, line 100: The results are summarized in Fig. 3b and Table 1.

Page 6, line 171: Please give some information about the sampling site.

Page 7, line 195: How large? I suggest that authors provide more discussions based on their field measurement results.