

Atmos. Chem. Phys. Discuss., referee comment RC2  
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## Comment on acp-2022-666

Anonymous Referee #2

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Referee comment on "Atmospheric nanoparticles hygroscopic growth measurement by a combined surface plasmon resonance microscope and hygroscopic tandem differential mobility analyzer" by Zhibo Xie et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-666-RC2>, 2022

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Review to "Atmospheric nanoparticles hygroscopic growth measurement by combined surface plasmon resonance microscope and hygroscopic-tandem differential mobility analyzer". The authors present combined measurements of aerosol hygroscopic growth using an HTDMA and a new SPRM apparatus, targeting at the hygroscopic behavior of bulk aerosols and single particles of 100, 150, and 200 nm, respectively. Combined with the classification of chemical component from SEM-EDX investigations, the authors try to link the single-particle hygroscopicity of different chemical components and the non-uniform distribution of the bulk aerosol hygroscopic growth factor. This method is novel and fits into the scope of ACP. However, the significance of this combined hygroscopic growth study needs to be furtherly clarified, and more detailed information should be provided to make it a solid work. I would like to recommend accepting this manuscript after addressing the following comments.

### Major comments:

1. What is the scientific question the authors want to address, based on the coupled SPRM and HTDMA measurement? To me, it looks like a closure study of aerosol hygroscopic properties based on the single-particle GF quantification and the bulk GF distribution for ambient aerosols. What type of additional knowledge it provides regarding the mixing state of aerosol chemical components?
2. The authors demonstrate the classification of the four groups (i.e., EC, fly ash, OC and AS+OC) in terms of ambient aerosol chemical components, based on the EDS mapping of SEM images. Please clarify the detailed approach of the classification and quantify how representative it is.

3. The low resolution of Fig. 3 makes the particle imaging at different RH levels blurred. Please provide a clear figure or equivalent statistics supporting the derivation of GF from GI intensity.