Reply to comments on “Technical note: Characterization of a single-beam gradient force aerosol optical tweezer for droplet trapping, phase transitions monitoring, and morphology studies” by Xiangyu Pei et al.

Reply to Anonymous Referee #2

Regrarding my major comment, I would recomend to include the data of high RH (86% to 99%) to Figure 4 or SI, with proper discussion of the uncertains.

Response: Thank you for the comment. We have added the following sentence in line 269 in the modified version of the manuscript:

“In this specific experiment, droplets were generated using a 0.4 g/mL NaCl aqueous solution, and the results are presented in Figure 4(a), and the results of another droplet at higher RH are given in the supplement, Figure S1.”

And we add the following contents in the supplement:

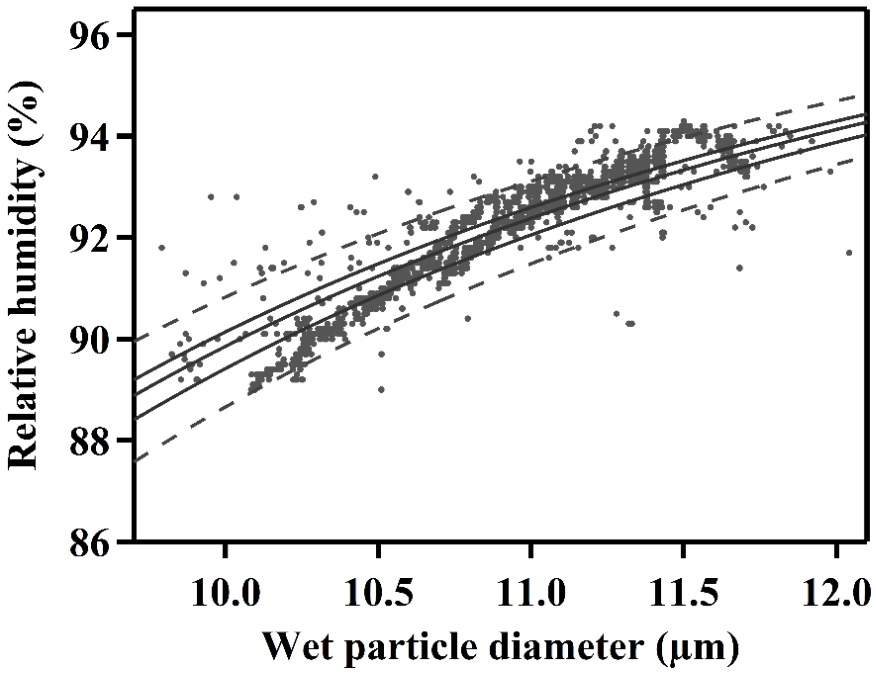

Figure S1. Comparison between experimental measurements and theoretical calculations of the relationship between wet particle diameter and relative humidity at higher RH compare to Figure 4(a). The lines represent Köhler curves calculated for particles with different diameters: 4.10 μm, 4.20 μm, 4.24 μm, 4.30 μm, and 4.40 μm from left to right, respectively.

Figure S1 shows the comparison between experimental measurements and theoretical calculations of the relationship between wet particle diameter and relative humidity of another droplet at higher RH compare to Figure 4(a). In Figure S1, measured values are generally consistent with the theoretical calculations. In both Figure S1 and Figure 4(a), the RH was measured with the RH sensor at the exit of the chamber, while wet particle diameters were retrieved from the spectra with the Mie fitting program MRFIT. The

typical and maximal tolerances for the RH sensor are ±1.5% and ±1.8% when RH is lower than 80%, respectively. When RH increases from 80% to 100%, the typical and maximal tolerances for the RH sensor also increase linearly until ±2% and ±3%, respectively (Sensirion SHT85 datasheet). As a result, the measured RH values at high RH have more uncertainty. In Figure 4(a) and Figure S1, we think that the experiment deviation from theory is due to the increasing measurement uncertainty of the RH sensor. In Figure 4, when RH is higher than 85% during this experiment, the wet particle diameters retrived from the program MRFIT represents hysteresis. For example, when RH is about 86%, the wet particle diameters are in the range of 11.8-12.2 μm, and the range (0.4 μm) is much larger than the value (~0.01 μm) when RH is lower than 86%, which is shown in Figure 4(b). This hysteresis can be explained by that when RH is high, more WGMs peaks represent in each spectrum, the assignment of WGMs labels may have differences since different combination of WGMs labels can lead to the same WGM positions. In Figure S1, the RH values are in the higher range of 88-94% compare to Figure 4(a), which means the measurement uncertainty of the RH sensor is even higher. Considering all the factors above, we still think that the measured values and theoretical values are generally consistent.

References

Sensirion SHT 85 datasheet,
https://sensirion.com/media/documents/4B40CEF3/61642381/Sensirion_Humidity_Sensors_SHT85_Datasheet.pdf