Pan et al., investigated the chemical composition and depolarization ratios of aerosol particles at an urban site in Beijing between November 2016 and February 2017. One important finding is that the depolarization ratio decreased for coarse particles when the mass fraction of nitrate increased. The work presented in this paper can be important for understanding the evolution of physicochemical properties of mineral dust. Nevertheless, the discussion should be further enhanced; in addition, the language should be improved. I can recommend it for publication after my comments have been addressed.

Major comments:

Major comment #1, Line 143-145, page 5: Since the aerosol flow was further diluted by zero air (920 ccm, 38% RH), what was the RH of the flow after dilution? I assume that the POPC measured the depolarization ratios at ~38% RH since the dilution factor by the zero air was >10. This information is critical because the morphology and measured depolarization ratios of aerosol particles depend on RH. Please clarify it.

Major comment #2: Section 3.5: I consider this section as the most important part of this manuscript. However, the discussion is far too short and rather descriptive. A number of previous studies have investigated the hygroscopic properties of $Ca(NO_3)_2$ aerosol particles, and I would refer the authors to these papers (Gibson et al., 2006; Guo et al., 2018). I can understand depolarization ratio depended on nitrate fraction (as shown in Figure 8), but what was it also affected by RH? It is related to dependence of aerosol liquid water content on RH? This question is also related to my first major comment: did the author measured the depolarization ratio at ambient RH or at the RH after the aerosol flow was diluted by zero air?

Minor comments:

Line 24-25, page 1: When depolarization ratio decreases, does the particle become more spherical or more non-spherical? In the abstract a short introduction to this parameter should be included, though more information of this parameter can be found in page 3.

Line 53-54, page 2: A number of seminal papers (Krueger et al., 2003; Laskin et al., 2005; Tang et al., 2016) on HNO_3-$CaCO_3$ reactions should be cited here.

Line 55, page 2: For dust-cloud interactions, two studies (Sullivan et al., 2010; Tang et al., 2015) measured the CCN activity of $CaCO_3$ and its aging products and should be cited here.

Line 361, page 12: please include proper literature.

Line 363, page 12: To support their claim, the author should cite previous studies (Sullivan et al., 2009; Ma et al., 2013; Gu et al., 2018) which showed the hygroscopicity of CaSO4 is very low.

Line 347-349, page 11-12: A recent study (Wu et al., 2018) which explored the aerosol liquid water content and its impact on secondary particle formation should be cited and discussed here.

Technical comments:

The language should be further improved, and here I only list a few (but there are more):

Line 42, page 2: change “emit” to “emitted” or “have emitted”.

Line 99, page 4: change “was consecutively suffered from” to “consecutively suffered from”.

Line 152, page 5: change “note” to “noted”.

Line 175, page 6: please change “in consistent well” to “in good consistence”.

Line 210, page 6: please change “Number of” to “A number of”.

Line 211, page 6: change “was” to “were”.

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