

# ***Interactive comment on “Mixing state of oxalic acid containing particles in the rural area of Pearl River Delta, China: implication for seasonal formation mechanism of Secondary Organic Aerosol (SOA)” by Chunlei Cheng et al.***

## **Anonymous Referee #1**

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Review for “Mixing state of oxalic acid containing particles in the rural area of Pearl River Delta, China: implication for seasonal formation mechanism of secondary organic aerosol (SOA” by Chunlei Cheng et al.

General comments: This paper reports the observation results of abundances and mixing states of oxalic acid containing particles using a single particle aerosol mass spectrometer in the summer and winter of 2014 in Heshan, an atmospheric measurement supersite of PRD region, China. Based on the difference in mass spectrometry, the authors proposed two different seasonal formation mechanisms for oxalic acid. This

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work presented interesting results, which is helpful for improving our understanding on SOA formation. After addressing the questions below, this paper could be accepted for a final publication in the journal.

Detailed comments: 1. Page 3, line 84-91, these statements are confusing. On one hand, the authors claimed that primary emissions of DCA are minor. On the other hand, however, they stated that high concentrations of DCA have been observed in biomass burning plumes and the primary sources are still unclear. So, the authors should clarify if the primary source of DCA is important or not. 2. Page 7, line 189-193, what principle here is used for the particle type definitions? It is hard to understand what are the differences between the ECOC type, EC and OC. In Table S1, the authors presented the criteria for particle type identification, is there any references to support such definitions? 3. Page 7, line 201-209, as for the ISORROPIA model, which mode you used? stable mode or metastable mode? What is the basis of the mode you choose? Since this work claimed that there are at least eight types of oxalic acid-containing particles, which means that aerosols measured here can not be taken as a single phase. In other words, the ISORROPIA mode should be run as a stable mode. Did the authors run this mode for the acidity and ALWC calculation? Please clarify. 4. Page 7, line 211-216, please give the locations of Guangzhou and Foshan in Figure S4. 5. Page 8, line 239, in Figure 1a, the color of HM type particles is blue not purple? 6. Page 10, section 3.2. Zn and Pb are typical tracers for vehicle emissions. The strong associations between heavy metals and oxalic acid in summer can be ascribed to the dominant emissions from vehicle exhausts. Oxalic acid can be produced via lots of formation pathways. Do you have direct evidence on the Fenton-like reaction? In the abstract section, authors stated that during summer ozone and oxalic acid-containing particles presented a similar temporal variation pattern, which indicates that photochemical reaction is important for oxalic acid production. Thus, as for the above two formation mechanisms, which is more important for oxalic acid?

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