

Interactive comment on “Enhanced heterogeneous uptake of sulfur dioxide on mineral particles through modification of iron speciation during simulated cloud processing” by Zhenzhen Wang et al.

Anonymous Referee #1

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The authors focused on the heterogeneous transformation of SO₂ on mineral dust during cloud processing by the simulated experiment. They characterized Fe morphology using the combined methods including TEM, Mossbauer, and CBD extraction method. The iron mobilized from mineral particle was also measured. Generally, heterogeneous transformation on the surface of mineral particle play a vital role on second particle formation. The result shown in this manuscript shed a light on heterogeneous chemistry, and it is helpful to further understand the fog and haze formation in China. Thus, this manuscript made some new contribution to atmosphere chemistry. The

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manuscript was well written and organized. The topic is of interest to the journal's readers. I thus recommended that this manuscript could be published on ACP. However, the manuscript also suffered from some flaws, and I listed as follows.

General questions/comments/suggestions: 1 The four examined clays were purchased from the clay mineral depository. The author should discuss why they were selected, particularly why they are representative of clays in aerosols.

2 Line 159: "TEM observation". The methods of TEM sample preparation will change the aggregation state of such aggregates. Some researchers have extensively worked on this and gave detailed information how they did it. Nothing is reported here on sample preparation. Therefore, please supply the detail about TEM sample.

3 The FeA and FeD content of Arizona Test Dust was " $0.067 \pm 0.005\%$ for FeA and $0.41 \pm 0.04\%$ for FeD" in Shi et al. (2011), which was not completely in accordance with the values in Table S5. The author should try to explain the discrepancy of FeA and FeD content.

Further specific comments/suggestions: In Figure 3, please change the label "2 cycle" and "3 cycle" to "2 cycles" and "3 cycles", respectively.

Remove some "the", such as in Line 151.

Line 149, please comment on the rationale of the 1 g/L concentrations used in this experiment.

Table 1 can be reported by both confirmation of sulfate ions origin (uptake vs H₂SO₄) and uptake coefficient (before vs after cloud processing).

Line 381: Please replace "were" by "was".

Line 376-377: This sentence contains partly the same data with the above sentences.

Line 539: Please replace "during" by "by".

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Line 550-552: Is this a new result? or already known from other studies (then provide proper references)?

In the References, Please exchange “Global Biogeochem, Cycles” by “Global Biogeochem. Cycles”.

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