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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ozone decomposition kinetics on alumina: effects of ozone partial pressure, relative humidity and state of film oxidation" *by* R. C. Sullivan et al.

Anonymous Referee #2

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General Comments

This manuscript reports studies of ozone loss on powdered alpha-alumina surfaces as a model for mineral dust in the atmosphere. These results complement previous studies on alumina and other surrogate and natural dusts, and the present work includes an explicit examination of the effect of relative humidity, so that "dry" results can be applied to the atmosphere. In addition, the effect of repeated ozone exposures, regeneration cycles, and variation in initial ozone concentrations are addressed. The manuscript is clearly written, and the authors have done an excellent job in providing information about their experimental procedures (wall passivation, diffusion tests, sample preparation, etc.).

Specific Comments

An expanded discussion of the absence of a relative humidity effect would be appreciated. How could the (ozone + surface) reaction exothermicity prevent physisorbed water from blocking the surface sites? Are you suggesting that during reaction the surface is actually slightly warmer than its surroundings, preventing adsorption of water?

Do traces of the methanol solvent remain behind after film preparation? How might traces of solvent affect your observations of ozone loss? Might that be the source of some of the film-to-film scatter you see in Figure 6? Did you explore other film preparation methods?

Does each data point in Figures 5 & 6 represent only the first 10 seconds of the first exposure of a fresh film? That is, does each symbol represent a tube which has never before been exposed to ozone?

The last sentence of section 3.3 (BET surface areas measured in situ) seems to contradict the paragraph which begins in line 15 on pg. 1984 (small sample sizes in kinetics experiments prevented direct measurement of surface area). Is the last sentence of section 3.3 is meant to imply that each sample's surface area was measured in-situ? Please clarify.

Please provide a citation for the cross section at 254 nm used for quantifying ozone. (I presume this is how you established the ozone concentrations, since your flow of ozone was always mixed with oxygen.)

Your title includes the phrase "state of film oxidation," yet there is no investigation or quantification of that property. Please consider changing the title to something a bit more representative of your work, perhaps "film exposure history" or "repeated oxidation cycles."

Technical Corrections

The sentence which follows (R1) is awkward and could benefit from being rewritten.

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Figure 4: The symbols for the Control experiments are a bit tricky to identify when viewed / printed in black & white. Is this likely to be a problem for some readers? Figure 6: The axis labels are awkward and difficult to read. The symbols for the N2 experiments look odd in my browser, as if two are overlain?

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 1977, 2004.