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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Exploring the chemical fate of the sulfate radical anion by reaction with sulfur dioxide in the gas phase" *by* N. T. Tsona et al.

Anonymous Referee #1

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The paper calculates bond strengths of SO2 and H2O to SO4- species. The calculations seem fine. However, the kinetics discussion is simplistic, outdated, and sometimes conflicting. Some of the more obvious points are. 1) R1 is an association reaction. They assume it goes at the collision rate. Most association reactions do not. There are detailed kinetics approaches to that type of reaction. That could only happen if the reaction is in the high pressure limit. No estimate of why they think it is in the high pressure limit is given. Even if in the high pressure limit, Sometimes the reaction saturates at the collision rate and sometimes it doesn't. See the work of Troe on how anisotropy affects the limiting behavior. 2) No mention of other chemistry is

discussed. Whether the steady state of equation 2 holds will depend greatly on that. 3) All hydrates are sometime lumped into one species and other times they are not. 4) Reaction 3 is not included in the steady state calculations. 5) Barriers of ∼10 kcal/mol for isomerization are ok, but prevent SO3 from dissociating. This is inconsistent.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 12863, 2014.