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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Secondary organic aerosol formation from photooxidation of furan: effects of NOx and humidity" *by* X. Jiang et al.

Anonymous Referee #3

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General Comments:

This paper presents results from a series of simulation chamber experiments on the formation of secondary organic aerosol (SOA) from the photooxidation of furan. SOA yield was found to vary with both VOC/NOx ratio and relative humidity. Some information on the chemical composition of the SOA is presented, along with possible chemical mechanisms for the generation of several of the identified species. The experiments appear to have been conducted appropriately, however there are some aspects of the data interpretation that need to be clarified and/or improved prior to publication.

1. The effect of relative humidity in increasing SOA yield seems to be very similar to that reported for p-xylene by Healy et al. (2009), who proposed that the increase in relative humidity results in higher levels of HONO formation in the chamber which leads

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to increased OH concentration, a faster p-xylene decay rate, and higher aerosol mass yields. Could the same effect be happening here? Was there a change in the rate of decay of furan as the relative humidity was increased through experiments 6-12?

2. A similar kinetic effect may also be occurring in experiments 1-5 where the VOC/NOx ratio was varied. Nitrous acid (HONO) is the main source of OH produced by heterogeneous reaction of nitrogen dioxide with water at the walls of the reactor. When NOx is increased, it is mainly in the form of NO2 and this may result in more OH formation, faster furan oxidation and more SOA formation. The authors should check the rate of furan decay in this subset of experiments and report/interpret accordingly.

Minor Comments:

1. The abstract is written in a generic manner and should be re-written to contain information specific to this work. For example, it is stated that the reaction conditions affected SOA yields. But it should state something like "varying VOC/NOx ratios over the range 48 to 8 cause SOA yields to increase from 0.04% to 0.5% under dry conditions". Some similar statements should be used to report the influence of relative humidity.

2. On page 2 (line 27), it is mentioned that several studies have previously investigated SOA formation from furan, but they appear to focus only on kinetic and mechanistic aspects.

3. On page 3 (line 26), it is mentioned that sea salt particles are the second most abundant particles in the atmosphere. This statement is seemingly used to justify the use of NaCl as seed particles, while it is more common to use ammonium sulfate as seeds in SOA formation experiments. Given that furan is a product of biomass burning and is also more likely to be released in urban environments than marine environments, the use of NaCl as seeds seems rather odd. The authors should provide some more reasons why NaCl particles were used as seeds.

References:

Robert M Healy, Brice Temime, Kristina Kuprovskyte, John C Wenger; Effect of Relative Humidity on Gas/Particle Partitioning and Aerosol Mass Yield in the Photooxidation of p-Xylene; Environ. Sci. Technol., 43, 1884-1889, 2009.

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