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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Nanoparticle Growth by Particle Phase Chemistry" *by* Michael J. Apsokardu and Murray V. Johnston

Anonymous Referee #2

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The Apsokardu and Johnston manuscript presents a modeling analysis of nanoparticle growth by two pathways involving organic compounds. One pathway is the irreversible condensation of low-volatility organic compounds (NVOCs) and the other is the reactive uptake of semi-volatile organic compounds (SVOCs). In this study, reactive uptake is driven by the particle-phase formation of a non-volatile dimer from a model SVOC. While not particularly complex or novel, the study nicely illustrates the differences in modeled particle-phase composition and growth rates (including the dependencies on particle diameter and volume) when an accretion reaction is considered. It should be a useful study for interpretation of past and future field measurements of growth rates of 10-100 nm particles, particularly when coupled with composition data. The paper is logically written and includes appropriate figures and references. It is suitable for

publication in ACP. Minor comments are provided below.

1. What was the motivation for choosing the reaction rate constant? Dimerization of glyoxal into a bulk aqueous solution does not seem to be a particularly relevant reaction for considering accretion reactions in small particles. Measured and calculated rate constants for various accretion reactions, likely more relevant, have been reported by the Johnston group (De Palma et al.) and Ziemann and Atkinson (Chem. Soc. Rev. 2012). At a minimum, it is suggested that this value be placed in some context and a reference be made to the latter sensitivity studies (section 3.3). 2. The authors may wish to review a recent publication by Mohr et al. (GRL 2017) that models the contribution of dimers to new particle formation. The dimers are formed in the gas-phase, but the paper may nonetheless have some relevance for this work.

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