

[Home](#)[Online Library ACP](#)

- Recent Final Revised Papers
- [Volumes and Issues](#)
- Special Issues
- Library Search
- Title and Author Search

[Online Library ACPD](#)[Alerts & RSS Feeds](#)[General Information](#)[Submission](#)[Review](#)[Production](#)[Subscription](#)[Comment on a Paper](#)

Impact
Factor
4.927

ISI
indexed

[Volumes and Issues](#) [Contents of Issue 3](#)

Atmos. Chem. Phys., 10, 997-1016, 2010

www.atmos-chem-phys.net/10/997/2010/

© Author(s) 2010. This work is distributed under the Creative Commons Attribution 3.0 License.

Secondary organic material formed by methylglyoxal in aqueous aerosol mimics

N. Sareen, A. N. Schwier, E. L. Shapiro, D. Mitroo, and V. F. McNeill
Department of Chemical Engineering, Columbia University, New York, NY, USA

Abstract. We show that methylglyoxal forms light-absorbing secondary organic material in aqueous ammonium sulfate and ammonium nitrate solutions mimicking tropospheric aerosol particles. The kinetics were characterized using UV-Vis spectrophotometry. The results suggest that the bimolecular reaction of methylglyoxal with an ammonium or hydronium ion is the rate-limiting step for the formation of light-absorbing species, with $k_{\text{NH}_4^+}^{\text{II}} = 5 \times 10^{-6} \text{ M}^{-1} \text{ min}^{-1}$ and $k_{\text{H}_3\text{O}^+}^{\text{II}} \leq 10^{-3} \text{ M}^{-1} \text{ min}^{-1}$. Evidence of aldol condensation products and oligomeric species up to 759 amu was found using chemical ionization mass spectrometry with a volatilization flow tube inlet (Aerosol-CIMS). Tentative identifications of carbon-nitrogen species and a sulfur-containing compound were also made using Aerosol-CIMS. Aqueous solutions of methylglyoxal, with and without inorganic salts, exhibit significant surface tension depression. These observations add to the growing body of evidence that dicarbonyl compounds may form secondary organic material in the aerosol aqueous phase, and that secondary organic aerosol formation via heterogeneous processes may affect seed aerosol properties.

[Final Revised Paper](#) (PDF, 2873 KB) [Supplement](#) (147 KB) [Discussion Paper \(ACPD\) - Part 1](#) [Discussion Paper \(ACPD\) - Part 2](#)

Citation: Sareen, N., Schwier, A. N., Shapiro, E. L., Mitroo, D., and McNeill, V. F.: Secondary organic material formed by methylglyoxal in aqueous aerosol mimics, Atmos. Chem. Phys., 10, 997-1016, 2010. [Bibtex](#) [EndNote](#) [Reference Manager](#)

[Search ACP](#)

Library Search

Author Search

[News](#)

- [Bringing Down Geoscientific Barriers](#)
- [New Tax Regulation for Service Charges](#)
- [Sister Journals AMT & GMD](#)
- [Public Relations & Background Information](#)

[Recent Papers](#)

01 | ACP, 19 Feb 2010:
Tropospheric photooxidation of $\text{CF}_3\text{CH}_2\text{CHO}$ and $\text{CF}_3(\text{CH}_2)_2\text{CHO}$ initiated by Cl atoms and OH radicals

02 | ACP, 19 Feb 2010:
Estimations of climate sensitivity based on top-of-atmosphere radiation imbalance

03 | ACP, 19 Feb 2010:
Numerical simulations of contrail-to-cirrus transition – Part 2: Impact of initial ice crystal number, radiation, stratification, secondary nucleation and layer depth