

[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  
4.865

ISI  
indexed

[Volumes and Issues](#) [Contents of Issue 14](#)

Atmos. Chem. Phys., 8, 4117-4140, 2008

[www.atmos-chem-phys.net/8/4117/2008/](http://www.atmos-chem-phys.net/8/4117/2008/)

© Author(s) 2008. This work is distributed under the Creative Commons Attribution 3.0 License.

## Secondary organic aerosol (SOA) formation from reaction of isoprene with nitrate radicals (NO<sub>3</sub>)

N. L. Ng<sup>1</sup>, A. J. Kwan<sup>2</sup>, J. D. Surratt<sup>1</sup>, A. W. H. Chan<sup>1</sup>, P. S. Chhabra<sup>1</sup>, A. Sorooshian<sup>1</sup>, H. O. T. Pye<sup>1</sup>, J. D. Crouse<sup>1</sup>, P. O. Wennberg<sup>2,3</sup>, R. C. Flagan<sup>1,2</sup>, and J. H. Seinfeld<sup>1,2</sup>

<sup>1</sup>Division of Chemistry and Chemical Engineering, California Institute of Technology, Pasadena, CA 91125, USA

<sup>2</sup>Division of Engineering and Applied Science, California Institute of Technology, Pasadena, CA 91125, USA

<sup>3</sup>Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91125, USA

**Abstract.** Secondary organic aerosol (SOA) formation from the reaction of isoprene with nitrate radicals (NO<sub>3</sub>) is investigated in the Caltech indoor chambers. Experiments are performed in the dark and under dry conditions (RH<10%) using N<sub>2</sub>O<sub>5</sub> as a source of NO<sub>3</sub> radicals. For an initial isoprene concentration of 18.4 to 101.6 ppb, the SOA yield (defined as the ratio of the mass of organic aerosol formed to the mass of parent hydrocarbon reacted) ranges from 4.3% to 23.8%. By examining the time evolutions of gas-phase intermediate products and aerosol volume in real time, we are able to constrain the chemistry that leads to the formation of low-volatility products. Although the formation of ROOR from the reaction of two peroxy radicals (RO<sub>2</sub>) has generally been considered as a minor channel, based on the gas-phase and aerosol-phase data it appears that RO<sub>2</sub>+RO<sub>2</sub> reaction (self reaction or cross-reaction) in the gas phase yielding ROOR products is a dominant SOA formation pathway. A wide array of organic nitrates and peroxides are identified in the aerosol formed and mechanisms for SOA formation are proposed. Using a uniform SOA yield of 10% (corresponding to M<sub>0</sub>≈10 μg m<sup>-3</sup>), it is estimated that ~2 to 3 Tg yr<sup>-1</sup> of SOA results from isoprene+NO<sub>3</sub>. The extent to which the results from this study can be applied to conditions in the atmosphere depends on the fate of peroxy radicals in the nighttime troposphere.

[Final Revised Paper](#) (PDF, 2046 KB) [Discussion Paper](#) (ACPD)

Citation: Ng, N. L., Kwan, A. J., Surratt, J. D., Chan, A. W. H., Chhabra, P. S., Sorooshian, A., Pye, H. O. T., Crouse, J. D., Wennberg, P. O., Flagan, R. C., and Seinfeld, J. H.: Secondary organic aerosol (SOA) formation from reaction of isoprene with nitrate radicals (NO<sub>3</sub>), Atmos. Chem. Phys., 8, 4117-4140, 2008. [Bibtex](#) [EndNote](#) [Reference Manager](#)

[Search ACP](#)

Library Search

Author Search

[News](#)

- [Sister Journals AMT & GMD](#)
- [Financial Support for Authors](#)
- [Journal Impact Factor](#)
- [Public Relations & Background Information](#)

[Recent Papers](#)

01 | ACPD, 14 Nov 2008: SCIAMACHY formaldehyde observations: constraint for isoprene emissions over Europe?

02 | ACPD, 14 Nov 2008: Observation of nitrate coatings on atmospheric mineral dust particles

03 | ACP, 14 Nov 2008: FRESKO+: an improved O<sub>2</sub> A-band cloud retrieval algorithm for tropospheric trace gas retrievals

04 | ACPD, 14 Nov 2008: