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*Supplement of*

# Secondary organic aerosol formation from photochemical aging of light-duty gasoline vehicle exhausts in a smog chamber

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**Table S1.** The initial number and surface concentrations of particles at t = 0 h (since lights on) in each experiment.

| Experiment # | Number ($cm^{-3}$) | Surface ($\mu m^2$ $cm^{-3}$) |
|---|---|---|
| 1 | 114 | 2.23 |
| 2 | 82 | 2.9 |
| 3 | 332 | 4.7 |
| 4 | 337 | 4.2 |
| 5 | 18948 | 25.8 |

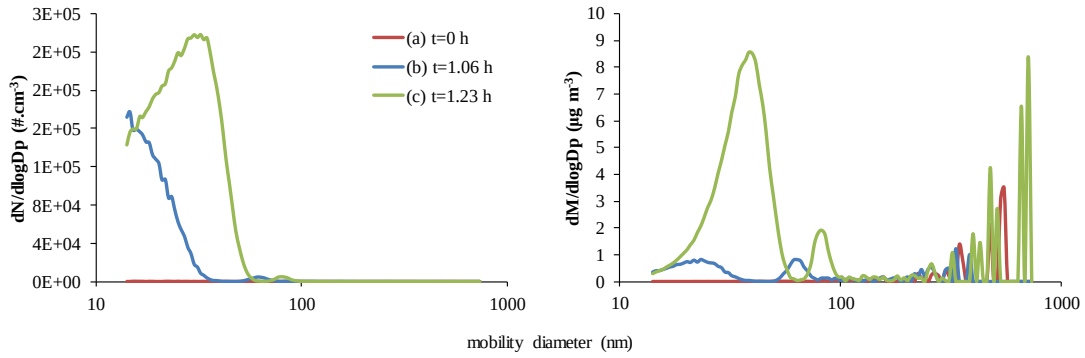


**Fig. S1**. Particle number (left) and mass (right) distributions for a typical smog chamber experiment (experiment 2). (a) just before black lamps were turned on, (b) at the beginning of a nucleation event about 1 h after black lamps were turned on, (c) 10 min after the nucleation.

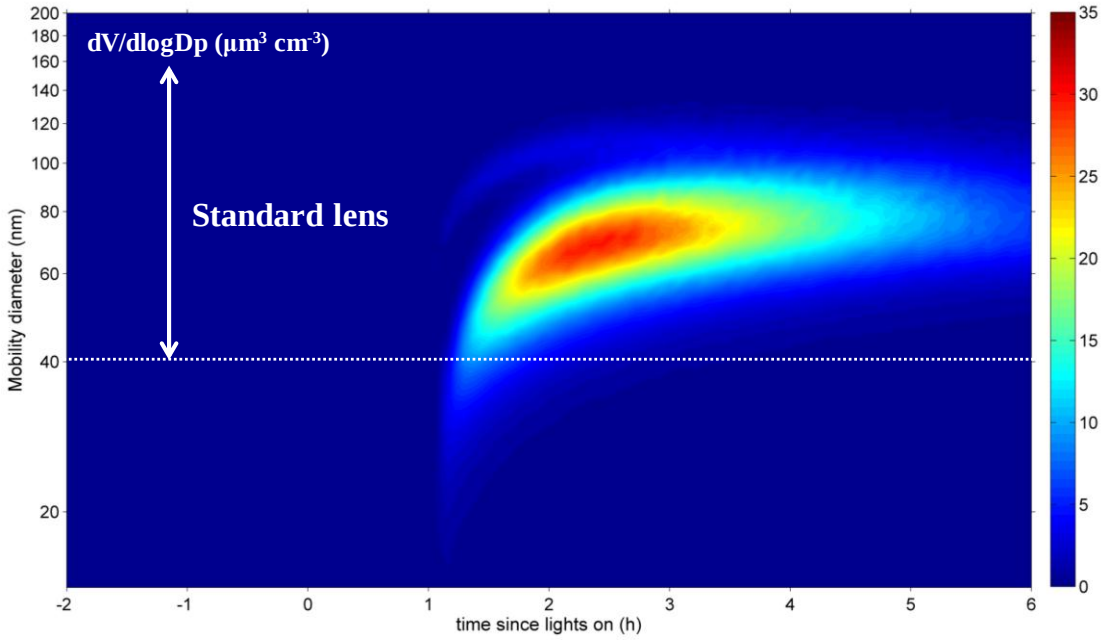


**Fig. S2.** Particle volume distribution measured by SMPS for a typical smog chamber experiment (experiment 2).

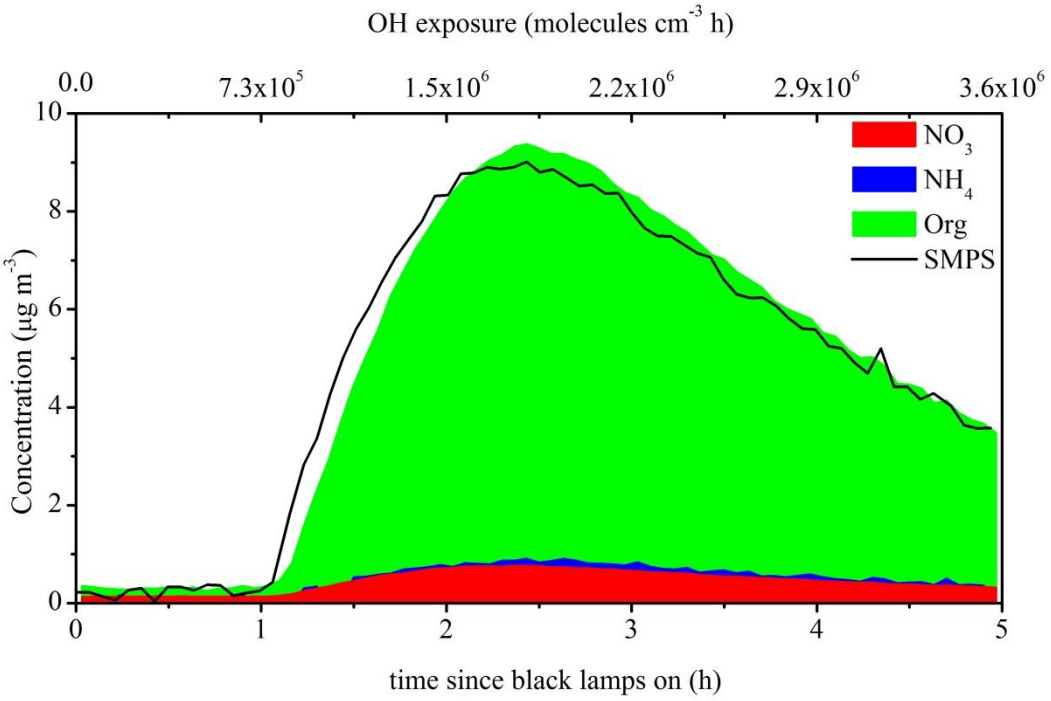


**Fig. S3.** Comparison of the sum of organics, nitrate and ammonium (measured by AMS) against the total particle mass measured by the SMPS for experiment 2. Data are not wall-loss corrected.

**Table S2.** The predicted SOA production from each aromatic hydrocarbon (measured by GC-MSD) in all experiments.

| | | Experiment | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| | Species | Predicted SOA (μg $m^{-3}$) | | | | |
| | benzene | 1.6 | 0.1 | 1.5 | 1.9 | 0.0 |
| | toluene | 7.7 | 0.5 | 7.3 | 7.6 | 0.2 |
| C2–benzene | ethyl-benzene | 1.3 | 0.4 | 0.5 | 3.0 | 0.0 |
| | m-, p-xylene | 2.9 | 1.7 | 2.8 | 7.6 | 0.2 |
| | styrene | 1.0 | 0.3 | 2.8 | 2.2 | 0.0 |
| | o-xylene | 0.9 | 0.7 | 1.1 | 2.9 | 0.0 |
| C3–benzene | isopropylbenzene | 0.1 | 0.1 | 0.1 | 0.2 | 0.0 |
| | n-propylbenzene | 0.2 | 0.3 | 0.0 | 0.6 | 0.0 |
| | m-ethyltoluene | 1.4 | 1.6 | 3.1 | 7.4 | 0.2 |
| | p-ethyltoluene | 0.3 | 1.1 | 0.5 | 1.9 | 0.0 |
| | 1,3,5-trimethyl-benzene | 0.8 | 1.2 | 3.4 | 3.0 | 0.1 |
| | o-ethyltoluene | 0.5 | 0.8 | 0.6 | 2.5 | 0.0 |
| | 1,2,4-trimethylbenzene | 2.1 | 2.6 | 9.7 | 10.2 | 0.3 |
| | 1,2,3-trimethylbenzene | 0.6 | 0.9 | 3.9 | 2.4 | 0.1 |
| C4–benzene | m-diethylbenzene | 0.1 | 0.4 | 0.2 | 0.2 | 0.0 |
| | p-diethylbenzene | 0.1 | 0.6 | 0.0 | 0.7 | 0.1 |
| | o-diethylbenzene | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 |
| | naphthalene | 20.7 | 2.7 | 8.0 | 9.7 | 2.1 |
| | total predicted SOA | 42.2 | 15.9 | 45.5 | 63.9 | 3.4 |
| | total measured SOA | 51.1 | 17.6 | 77.6 | 125.4 | 4.0 |