4.038 Oxidative Potential Evolution of Particulate Trimethylamine during Ozonolysis.

Early Career Scientist

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Abstract:

ABSTRACT
Amines in the atmosphere have attracted widespread attention because they contribute to the nitrogen cycle\(^1\), new particle formation\(^2-4\), and brown carbon\(^5\), as well as having their own inherent toxicity\(^6\). In this study, the ozonolysis of particulate trimethylamine (TMA), which was produced via heterogeneous uptake of TMA onto (NH\(_4\))\(_2\)SO\(_4\), NH\(_4\)HSO\(_4\), NH\(_4\)NO\(_3\) and NH\(_4\)Cl or neutralization of TMA and H\(_2\)SO\(_4\), was investigated using in situ attenuated total reflection Fourier transform infrared spectroscopy (ATR-FTIR) and proton transfer reaction mass spectrometry (PTR-MS). DTT assay tests were performed to assess oxidative potential changes due to O\(_3\) oxidation. Products including HCOOH, HCHO, CH\(_3\)N=CH\(_2\), (CH\(_3\))\(_2\)NCHO, CH\(_3\)NO\(_2\), CH\(_3\)N(OH)CHO, CH\(_3\)NHOH and H\(_2\)O were identified on all the substrates exposed to ppbv level of O\(_3\). Compared with ammonium and aminium salts, the oxidation potential of particulate aminium after ozone oxidation increased significantly, with a DTT loss rate that increased from 0±4.14×10\(^{-6}\) to 5.92±2.80×10\(^{-3}\) pmol-min\(^{-1}\)-μg\(^{-1}\). Our results reveal that the oxidation of particulate amines is a potential degradation pathway for amines in the atmosphere and that the oxidation products in the particle phase are associated with modification of the adverse health impacts of aerosol particles.

REFERENCES