



## **Kinetic and mechanistic studies on the atmospheric degradation of dimethylphenols and tolualdehydes**

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Aromatic compounds are emitted to the atmosphere from their use in automobile fuels and solvents. In addition to being important primary pollutants, many aromatics, including the xylenes, possess high photochemical reactivity and make a major contribution to the formation of oxidants, such as ozone and nitrates, in the troposphere. The atmospheric oxidation of aromatics produces a wide variety of products and the atmospheric reactivity of many of these species is unknown. The aim of this work was to study the atmospheric degradation processes for dimethylphenols and tolualdehydes which are produced from the hydroxyl radical initiated oxidation of the xylenes.

Experiments on the hydroxyl (OH) and nitrate (NO<sub>3</sub>) radical initiated oxidation of dimethylphenols and tolualdehydes have been performed in a 3910 L atmospheric simulation chamber made of FEP foil. The chamber is equipped with gas chromatography, GC-MS, and *in situ* FTIR spectroscopy for chemical analysis and a scanning mobility particle sizer for aerosol measurements. Relative rate coefficients have been determined for the reactions of hydroxyl and nitrate radicals with dimethylphenols and tolualdehydes. The results indicate that both reaction with OH and NO<sub>3</sub> are important atmospheric loss processes for the dimethylphenols, whilst for the tolualdehydes, reaction with the nitrate radical is too slow to be of any significance.

The gas-phase products and the yield of secondary organic aerosol have also been determined for the OH-initiated oxidation of some of the dimethylphenols and tolualdehydes. Mechanisms for the formation of the products are proposed and the atmospheric implications are discussed. It is envisaged that the data obtained in this work will help to improve the predictive capabilities of photochemical models (e.g.

Master Chemical Mechanism) that are used to assess the pollution forming potential of the xylenes.