

Gas-phase reactivity of 3-methoxyphenol with OH radicals, Cl atoms and Ozone

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The use of biomass for energy production is being promoted to decrease the dependence on fossil fuels. Nevertheless, it has been shown that biomass burning is one of the major sources of atmospheric particle matter, which has significant impacts on human health, regional and global air quality¹ and climate². Methoxyphenols are low molecular weight semi-volatile polar aromatic compounds produced from the pyrolysis of wood lignin³. They are major biomass combustion components and are considered potential tracers for wood smoke emissions.⁴

An atmospheric simulation chamber has been utilized for both kinetic (relative to a reference compound) and product study of the gas-phase reaction of the main oxidants in the troposphere (Cl atoms, OH radicals and O₃) with 3-methoxyphenol at 298 ± 2 K and 720 ± 5 Torr of air. Fourier Transform Infrared spectroscopy (FTIR) and Gas Chromatography – Mass Spectrometry coupled to Solid-Phase Microextraction (GC-MS/SPME) were employed as detection techniques of the methoxyphenol and the reference compound in the kinetic measurements and the methoxyphenol and reaction products in the product study.⁵ The rate coefficients obtained for the reaction of 3-methoxyphenol with Cl and OH are consistent with previous studies by a relative technique^{6,7}, and the rate coefficient with O₃ is the first research to date along with reaction products of 3-MP oxidation. In the different reactions we found products from the addition of the oxidant to studied compound. Furthermore, the atmospheric implications of the degradation methoxyphenols by reaction with the mentioned tropospheric oxidants will be discussed.

References

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