pH Dependence of the Heterogeneous HO_2 Uptake onto Aerosols; An Insight into the Global HO_x Budget

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Abstract

Heterogeneous hydroperoxyl radicals (HO_2) loss via aerosol uptake is a potential process that may affect the budget of HO_x (≡OH + HO_2) radicals and the formation of oxidant, considering HO_2 is a major reservoir of hydroxyl radicals (OH). We have reported the enhanced effects of transition metal ions on HO_2 uptake by aerosols [1]. However, the uncertainty associated with acidity or alkalinity of aerosols remains since the pH of aerosols is substantial for the multiphase reaction which can affect the gas-particle partitioning and still challenging to determine. Model recommends a constant uptake coefficient of 0.2 for HO_2 onto aerosols regardless of the physical and chemical properties of aerosols [2]. Previous experimental studies have reported the uptake coefficients of HO_2 onto different aerosols span several orders of magnitude [1, 3]. We found that the uptake coefficients of HO_2 onto Na_2SO_4 can range from 0.02 to 0.67 by addition of acid or alkali. This work aims to measure the pH dependence of HO_2 uptake onto aerosols and propose parameters to evaluate HO_x budget in a wide spatiotemporal range. Currently, thermodynamic model is capable of simulating the pH of aerosols. This work combines both model and experiment to determine the aerosol pH. And HO_2 uptake onto such aerosols can be measured using laser spectroscopic techniques [1] to characterize the pH dependence of heterogeneous HO_2 loss. The result is supposed to aid the simulation of HO_x budget especially under low NOx conditions such as the ocean/air interface.

Early Career Scientist

YES, I am an early career scientist.

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