Geophysical Research Abstracts
Vol. 18, EGU2016-13247, 2016
EGU General Assembly 2016

Hydroxyl radicals from secondary organic aerosol decomposition in water

Haijie Tong (1), Andrea M. Arangio (1), Pascale S. J. Lakey (1), Thomas Berkemeier (1), Fobang Liu (1), Christopher. J. Kampf (1,2), Ulrich Pöschl (1), and Manabu Shiraiwa (1)

(1) Multiphase Chemistry Department, Max Planck Institute for Chemistry, Mainz, Germany , (2) Institute for Inorganic and Analytical Chemistry, Johannes Gutenberg University, Mainz, Germany

We found that ambient and laboratory-generated secondary organic aerosols (SOA) form substantial amounts of OH radicals upon interaction with liquid water, which can be explained by the decomposition of organic hydroperoxides. The molar OH yield from SOA formed by ozonolysis of terpenes (α-pinene, β-pinene, and limonene) is $\sim$ 0.1% upon extraction with pure water, and which increases to $\sim$ 1.5% in the presence of iron ions due to Fenton-like reactions. Our findings imply that the chemical reactivity and aging of SOA particles is strongly enhanced upon interaction with water and iron. In cloud droplets under dark conditions, SOA decomposition can compete with the classical hydrogen peroxide Fenton reaction as the source of OH radicals. Also in the human respiratory tract, the inhalation and deposition of SOA particles may lead to a substantial release of OH radicals, which may contribute to oxidative stress and play an important role in the adverse health effects of atmospheric aerosols.