Geophysical Research Abstracts
Vol. 21, EGU2019-5547, 2019
EGU General Assembly 2019

Impact of tetrabutylammonium on the oxidation of bromide by ozone

Shuzhen Chen (1,2), Luca Artiglia (1), Jacinta Edebeli (1,2), Xiangrui Kong (1,3), Huanyu Yang (1,2), Pablo Corral-Arroyo (1), and Markus Ammann (1)

(1) Paul Scherrer Institut, Energy and Environment, villigen PSI, Switzerland, (2) ETH Zurich, Zurich, Switzerland, (3) University of Gothenburg, Gothenburg, Sweden

Oxidation of bromide by ozone in the dark is one of the mechanisms by which bromine activation may be initiated and subsequent ozone depletion events be triggered. Ocean surface water and sea spray aerosol deriving from there often contain complex mixtures of organics with variable surface affinity and functionalities. Surface active organics may affect multiphase chemical reactions by exposing a physical barrier to gases coming in from the gas-side, by changing acid-base equilibria and thus the rate of acid catalyzed reactions (as e.g., for the reaction of bromide with ozone), or by changing the interfacial activity of the halide ions. In this laboratory work, we demonstrate the effect of tetrabutylammonium (TBA) on the interfacial abundance of bromide, compare it to the behavior of other surfactants, and report the effect of TBA on the uptake kinetics of ozone to bromide containing solutions. The abundance of bromide and TBA on the surface is assessed by liquid jet X-ray photoelectron spectroscopy. The ozone uptake kinetics are addressed in a trough flow reactor setup. The results clearly indicate that the positively charged nitrogen group in TBA, along with its surface activity, is leading to enhanced interfacial concentration of bromide, and along with that, enhanced oxidation rates of bromide by ozone.