Geophysical Research Abstracts
Vol. 19, EGU2017-1323, 2017
EGU General Assembly 2017

Photochemistry of iron citrates initiated by UV-VIS light

Pablo Corral Arroyo (1,2), Jing Dou (3), Peter Alpert (1), Ulrich Krieger (3), and Markus Ammann (1)

(1) Paul Scherrer Institute, Energy and Environment Research Division, Villigen PSI, Switzerland (pablo.corral-arroyo@psi.ch), (2) Department of Chemistry and Biochemistry, University of Bern, 2012 Bern, Switzerland, (3) ETH Zurich, Institute for Atmospheric and Climate Science, 8092 Zurich, Switzerland

Aerosol aging refers to the multitude of physical and chemical transformation atmospheric particles undergo, which play an important role in the impact of aerosols on climate, air quality and health. Aging processes may be started by chromophores, which act as photocatalysts that induce the oxidation of non-absorbing molecules [1]. Iron (Fe(III)) carboxylate complexes absorb light below about 500 nm, which is followed by ligand to metal charge transfer (LMCT) resulting in the reduction of iron to Fe(II) and oxidation of the carboxylate ligands, a process that represents an important sink of organic acids in the troposphere [2]. Our goal is to investigate how these photochemical processes contribute to the change of chemical and physical properties of the aerosol particles. To achieve this scope, we carry out coated wall flow tube experiments, exposing films with iron citrate to UV light, which will give information about the radical and LVOC production (connecting the CWFT to a Chemiluminescent Detector or PTR-TOF-MS respectively). From extracting and analyzing the films after irradiation with UV light, we obtain a profile of low-volatility products evolving from the photochemistry of iron citrates. By Scanning Transmission X-Ray Microspectroscopy (STXM) we analyze changes in the C K-edge and Fe L-edge in particles loaded with iron citrate upon exposure to light and follow their chemical and structural evolution upon photochemical oxidation in situ to investigate the degradation kinetics under varying environmental conditions.

[1] George G., Ammann M., D'Anna B., Donaldson D. J., Nizkorodov S. A., Heterogeneous photochemistry in the Atmosphere, Chem. Rev., 2015, 115 (10), pp 4218-4258
[2] Weller, C., Horn, S., and Herrmann, H.: Photolysis of Fe(III) carboxylate complexes: Fe(II) quantum yields and reaction mechanisms, Photochemistry and Photobiology A: Chemistry, 268, 24-36, 2013.