

Experimental report

23/01/2024

Proposal: 9-10-1773

Council: 4/2023

Title: Night-time atmospheric oxidation for real organic films on atmospheric aerosol using real samples from the atmosphere

Research area: Chemistry

This proposal is a new proposal

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Samples: Linoleic acid: C18H32O2
Atmospheric Wood Smoke sample

Instrument	Requested days	Allocated days	From	To
FIGARO	3	3	17/11/2023	20/11/2023

Abstract:

Oxidation of organic films on atmospheric aerosol for climate change studies has previously concentrated on daytime oxidants (OH and O₃).¹ The behavior of real organic films extracted from the atmosphere at air-water interface of aerosol and cloud droplets with night-time oxidants (NO₃ radical) has not been studied. Our proposed experiment will characterize (film thickness) and study the reactivity (kinetics) to atmospheric oxidation (NO₃ radical) of surface-active films extracted from wood smoke and the model compound, linoleic acid. The kinetics requires a high flux horizontal Neutron reflectometer for success. If the oxidation kinetics demonstrate a film lifetime (with respect to oxidation by night-time NO₃ radical) of less than 4 days the reaction must be included in atmospheric process modeling.

Night-time atmospheric oxidation for real organic films on atmospheric aerosol using real samples from the atmosphere 9-10-1773

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Unfortunately, this experiment was unsuccessful. The ozoniser used in the experiment had recently been repaired and supposedly calibrated. However, it had been repaired badly with the reaction chamber made from the wrong materials. It produced a small amount of ozone to confirm it was working, but not enough to successfully perform any reactions. This means no chemistry was successfully performed and is incredibly embarrassing for the PI and the team. This is the first time this has happened. The fault was isolated by the PI a few weeks after the experiment as the wrong type of glass used in the photolysis cell. It should have been quartz and was not. The time at the ILL was used trying to find the fault and incrementally more reactive samples were offered to the reaction to try and diagnose the problem.

The PI and team are embarrassed, but keen to repeat the experiment with the ILL willing.