

## Proposed NERC CASE Studentship



### Oxidation of *real* atmospheric organic matter on interfaces of atmospheric aerosol: does it activate to cloud droplets

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#### Project Summary

Modern climate change is strongly influenced by clouds. The oxidative processing of pollutants in clouds affects droplet size and optical properties of the cloud. Clouds droplets contain naturally occurring organic lipids forming organic films on the droplet. Atmospheric oxidation and removal of this film can cause new cloud formation. Previous work has studied the oxidation reactions with proxy or model compounds. In this proposal we wish to use our prior expertise in this field to study organic matter extracted from real rain water and the sea-surface micro-layer in more advanced oxidation experiments with four STFC facilities to conclusively demonstrate that interfacial chemistry can effect cloud and rainfall.

In work using STFC facilities: neutron reflection on interfaces and laser spectroscopy of micron sized particles held by laser tweezers, we have shown that oxidation reactions can activate aerosol and CCN to form cloud droplets. However, we have concentrated on laboratory proxies for real atmospheric aerosol. *In this studentship we wish to investigate for the first time whether the oxidation of real surface-active organic material collected from rainwater or sea-surface micro-layer can activate aerosol to form cloud droplets, reduce cloud reflectivity and retard rainfall.* By measuring the kinetics of the oxidation, we can calculate the atmospheric lifetime of the organic layer at the air-water interface and compare to typical aerosol lifetime of 1-3 days. Thus if the chemical lifetime of the organic film to oxidation is less than 1-3 days the reaction is atmospherically important and be included in cloud modeling. The oxidation kinetics and products of the organic material at the air-water interface will be quantified by neutron (and x-ray) reflection at ISIS, ILL and Diamond. CCN activation on oxidation will be probed in experiments at the Laser for Science facility using the laser tweezers technique. The chemical systems investigated by neutrons will be studied on 2–10  $\mu\text{m}$  droplets trapped and sized in the focus of a laser using Mie spectroscopy. The neutron data will give the molecular interpretation, kinetics and lifetime and the laser results give the potential impact of these parameters on cloud formation.

The student will be placed at Rutherford-Appleton Laboratory for the first two years and RHUL for year three. The student will use neutron, X-ray, and laser facilities here and in France to study the above science.

Eligibility for this studentship is restricted to UK citizens and applicants who have been ordinarily resident in the UK throughout the 3-year period preceding the date of application for an award, and has settled status in the UK within the meaning of the Immigration Act 1971 (ie is not subject to any restriction on the period for which he/she may stay). Further information can be found from the National Environmental Research council website <http://www.nerc.ac.uk>.

*Please contact the Postgraduate Programmes Co-ordinator, if you have additional questions about the department or application procedures (email: [pgadmin@es.rhul.ac.uk](mailto:pgadmin@es.rhul.ac.uk) ; fax: 01784-471780; tel: 01784-443581).*

*An application form can be found here [www.rhul.ac.uk/studyhere/postgraduate/applying](http://www.rhul.ac.uk/studyhere/postgraduate/applying)*

*Applicants are requested to send an additional copy of their CV directly to the lead supervisor of the project in which they are interested. Please also contact the supervisor if you have any questions about the project itself.*