

Research Experience Placement (REP) Scheme Project Form 2022**Project Supervisors:**

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Host Organization and Department (if applicable):

School of Earth and Environmental Sciences, University of St Andrews

Project Title:

Ocean chemistry trapped in halite crystals

Project Description:

Evaporitic deposits are of major socio-economic importance, and provide critical geochemical archives of past environmental and climatic conditions. The chemistry of modern and ancient evaporites bears a direct link to their parent waters, enabling the interpretation of the composition of water and salinity fluctuations over geologic space and time. In addition, fluid inclusions trapped within halite crystals offer a unique sample of original seawater – a snapshot into the composition of past oceans (*Lowenstein et al., 2001*). However, secondary influences such as elemental or isotopic fractionations during crystallisation may alter their primary geochemical signals and complicate the extraction of environmental information from these minerals. Expanding our understanding of the underlying controls on the elemental and isotopic fractionations during halite formation is therefore key for unlocking the full potential of this archive.

In this REP project, the student will conduct novel laboratory-based halite precipitation experiments to investigate the incorporation of major and minor ions into halite crystal lattice and fluid inclusions, contributing critical information to understanding of this important archive mineral.

The main objectives of the project are:

- to grow halite crystals** from chemically well-constrained solution under controlled laboratory conditions (Weeks 1-4)
- to conduct mineralogical and geochemical analyses** on the grown halite crystals, including major and minor element analyses of the halite samples using latest ICP-MS (inductively coupled plasma mass spectrometer) instrument (Week 5)
- to analyse the data and summarize the findings**, including final report preparation to NERC and presentation of the results to the research group (Week 6)

References: *Lowenstein T. et al. (2001), Science 294, 1086-1088, DOI: [10.1126/science.1064280](https://doi.org/10.1126/science.1064280)*

Skills and Career-Development Opportunities:

The student will gain multidisciplinary hands-on skills and training in geological and mineralogical techniques, experimental geochemistry, clean lab chemistry and mass spectrometry, and gain broader knowledge in geology, geochemistry, oceanography, and climate science. The student will benefit experience working in state-of-the art geochemical laboratories and in a vibrant research group led by Dr Rae. The student will have the opportunity to participate in the weekly group and reading group meetings and interact with its members including several postdocs, PhD students, technicians and graduate and undergraduate project students. The student will be provided with close

supervision and mentoring, and plenty opportunities to discuss career development and paths.

Wider context of research:

This placement will be embedded within the current research carried out by Dr. Jurikova and Dr. Rae in the context of the ERC Starting Grant '100 Myr of ocean chemistry and CO₂' awarded to Dr. Rae. The data collected by the student will make direct contribution to this research.

Project Timeframe:

The placement is expected to last 6 weeks, with a flexible starting date which will be agreed upon successful appointment of the student.