PROJECT TITLE: Biomagnetism & biogeochemical batteries for improving water quality

Project Science Theme: Science for Environmental Solutions
Project keywords: Water; iron; nanotechnology; spectroscopy; sustainability

Lead Institution: Bristol
Lead Supervisor: James Byrne, Bristol, School of Earth sciences
Co-Supervisor: Devin Sapsford, Cardiff University, School of Engineering

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Webpage: https://envmin.github.io/bristolbiogeochem/

Project aims and methods:

This project aims to develop sustainable, biogenic materials as innovative solutions for improving water quality across diverse environments. These materials, produced by bacteria contain both Fe(II) and Fe(III), function as biogeochemical batteries capable of adsorbing and transforming a wide range of inorganic contaminants such as arsenic, cadmium, nickel, and lead. The student will be trained in a wide range of skills in an interdisciplinary research environment. This includes biomineral synthesis, geochemical investigation of their interactions with pollutants under varying environmental conditions, application of advanced analytical and spectroscopic techniques, data interpretation and modelling, through to real-world application. Laboratory experiments will be complemented by column studies to model reactive transport and optimise the materials for real-world water treatment applications. A key focus will be on scaling up these systems for broader implementation. The core objectives are: (1) to determine the sorption capacity of mixed valent iron minerals for different contaminants; (2) to evaluate the fate and kinetics of these contaminants in both simulated and natural groundwater; and (3) to design scalable systems for treating contaminated water. This project explores the underutilised potential of biogenic magnetic based materials, offering a transformative approach to contaminant removal that aligns with global sustainability goals.

Useful recruitment links:

For information relating to the research project please contact the lead Supervisor via: james.byrne@bristol.ac.uk

Bristol NERC GW4+ DTP Prospectus:
https://www.bristol.ac.uk/study/postgraduate/research/great-western-four-doctoral-training-partnership-nerc/

How to apply to the University of Bristol:
http://www.bristol.ac.uk/study/postgraduate/apply/

The application deadline is Thursday 8 January 2026 at 2359 GMT