

RADER

RADioactive waste management and Environmental Remediation

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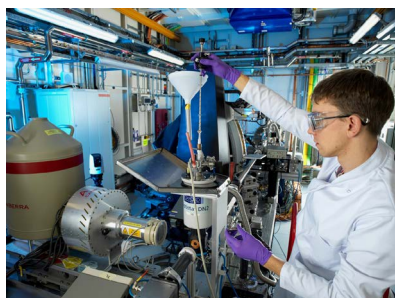
MANCHESTER
1824

The University of Manchester



Sediment column set up in the environmental radioactivity lab

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University of Manchester PhD student demonstrating the loading of a sample containing uranium onto Diamond's I20-scanning beamline

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The NNUF RADioactive waste management and Environmental Remediation (RADER) user facility will support research into characterising and understanding the behaviour of radioactive species in engineered and natural environments. This science base is crucial for underpinning large parts of the UK's >100 year, >£130 billion nuclear decommissioning, clean-up and waste management programmes.

To support this work, the RADER user facility will deliver a suite of laboratories designed to handle and analyse radioactive samples from engineered and natural environments. The facility will be co-located with Manchester University's Research Centre for Radwaste Disposal (RCRD) and embedded within the NERC-funded Williamson Research Centre for Molecular Environmental Science (WRC), drawing on established complementary skills and expertise.

Uniquely in the UK, RADER will offer dedicated laboratories enabling users to undertake Low Level Radiometrics, Environmental Characterisation of Solids (inorganic and biological), Environmental Characterisation of Solutions and Sample Preparation, all in one location and with dedicated Experimental Officer support. Combined, these integrated state-of-the-art facilities will enable low level separations and microbiological, mineralogical and molecular-scale environmental research with a wide range of environmentally relevant radionuclides. RADER will support experiments across realistic radionuclide concentration ranges, and offer comprehensive authentic sample analyses.

Relevant topics for investigation within RADER will include radioactive waste disposal, decontamination, land management, effluent treatment and radionuclide transport in the biosphere, especially where radioactive sample handling and characterisation are required.

The new infrastructure being delivered to the RADER user facility is summarised in key areas below, and augments the already strong infrastructure in the **WRC**. Support is also provided from '**NNUF@CRR**' (Centre for Radiochemistry Research) on aspects of spectroscopy, magnetism, reprocessing and computational modelling. This will create a suite of RADER laboratories able to handle low-level radiochemical separations and environmental chemistry/biogeochemistry experimental work with radioactive samples.

RADER facility development was informed by experience of working with radioactive, environmental samples and devised in close consultation with the UK and international academic and industrial user community.

Low level radiometric counting

- Low level scintillation counting for environmental samples
- Alpha spectroscopy
- Autoradiography to identify radioactive regions in samples

(with access facilitated to existing ORTEC Profile S low-level gamma spectrometer)

Environmental characterisation - solutions

- ICP-MS/MS. Ultra-dilute element concentrations, isotopic information.
- Capillary IC. Small volume anion analyses.
- Zetasizer. Colloid molecular particle size, zeta potential, and molecular weight
- Nanoparticle Tracking Analysis (NTA). Nanoparticle size distribution and concentration

(with access facilitated to existing WRC HPLC for ICPMS speciation and ICP-AES)

Environmental characterisation - solids

- Powder X-ray diffraction
 - Surface Area Analyzer
 - Fourier Transform Infra-Red Spectrometer
 - UV Visible Near Infra-Red Spectrometer
- (with access facilitated to existing WRC Quanta 650FEG Environmental Scanning electron microscope)*

Environmental characterisation - biological

- Real-Time PCR & Homogenizer for DNA extraction

(with access facilitated to existing Illumina Next Generation Sequencing Platform. DNA sequencing and bioinformatics platforms)

Sample preparation

- Chemostat. Controlled reaction vessel
- Isocratic / Peristaltic Pumps for flow-through Column experiments
- Sectioning saw and polisher/grinder
- Anaerobic Cabinets. O₂ / CO₂ control.

Contact details

Please email Jon.lloyd@manchester.ac.uk and katherine.morris@manchester.ac.uk to discuss your potential project.

Availability

RADER is currently under development. Please consult <https://www.nnuf.ac.uk/rader> for the latest information.