

Uranium coordination chemistry in magnesium-rich systems

Nuclear Decommissioning Agency Supported PhD Special Project available at the University of Manchester through the DIAMOND Nuclear Consortium

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Sludge wastes from nuclear power production are a world-wide problem. In the United Kingdom, some thousands of m³ of radioactive sludge derived from Magnox (a fuel rod cladding composed of an Mg/Al alloy) fuel cans that have been stored underwater at high pH is currently kept at the Sellafield facility. Indeed, "current ponds ... for (the) UK's Magnox programme now pose one of the most difficult cleanup challenges in the world" (Topping and Bruce, 2006). The total uranium inventory is unknown, but retrieved material has contained up to 60 kg U m⁻³. Sludge volumes are estimated at several thousand cubic metres so the total uranium inventory is probably some tens of tonnes and could be over 100 tonnes. The British government has designated sludge removal and processing as a top priority.

This PhD project will complete a matrix of experiments that will determine the quantities and the coordination chemistry of uranium adsorbed onto or co-precipitated with magnesium hydroxide and magnesium carbonate phases from aqueous solutions. Access to beamline 11-2 at the Stanford Synchrotron Radiation Lightsource (SSRL) is already assigned via a related beam allocation proposal and this guarantees access to state-of-the-art spectroscopic analysis which will directly determine how uranyl is bonded at surfaces and within the bulk of these critically important high-Mg phases.

This post is available for a student to start IMMEDIATELY. Applicants are encouraged to contact Dr. Wogelius directly at: roy.wogelius@manchester.ac.uk Suitable qualification would be a strong undergraduate background in Physics, Chemistry, Mineralogy, or Environmental Science.