Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.18280

Microbial impacts on colloid-radionuclide interactions in legacy spent nuclear fuel ponds

CHLOE MORGAN[1], NATALIE BYRD[1], CALLUM ROBINSON[1], LAURA LOPEZ-ODRIOZOLA[1], SEAN WOODALL[2], SAM SHAW[1], LOUISE NATRAJAN[1], KATHERINE MORRIS[1] AND JONATHAN RICHARD LLOYD[1]

[1]University of Manchester

[2]National nuclear laboratory

Presenting Author: chloe.morgan@manchester.ac.uk

The legacy spent nuclear fuel ponds (SNFPs) at Sellafield house a diverse inventory of waste from the early Magnox reactors. These reactors used uranium metal as a fuel encased in a magnesium non-oxide cladding. Corrosion of the cladding results in the release of radionuclides, primarily uranium, and the formation of brucite ($Mg(OH)_2$) phases which are present both in the corroded Magnox sludge at the base of the pond and suspended in the water column as colloids[1]. Colloids have the potential to mobilise insoluble phases providing an important pathway for radionuclide migration. The SNFPs are maintained at high pH to minimise corrosion of the cladding, however significant corrosion has still occurred.

Despite the seemingly inhospitable conditions in SNFPs, numerous studies have found microorganisms capable of surviving in SNFPs[2,3,4]. Previous work has demonstrated increased abiotic sorption of strontium to brucite in the presence of organic matter derived from *Pseudanabaena catenata*[5], which dominates algal blooms in the ponds. In this study we focus on uranium interactions with colloidal brucite in the presence of microbes adapted to high pH environments under conditions relevant to the SNFPs at Sellafield.

Legacy spent fuel pond, alkaliphile, colloid

References:

[1] Gregson C et al. (2011) J. Nucl. Mater. 412: 145-156

[2] Foster L et al. (2020) Sci. Total Environ. 720: 137515

[3] Dekker L et al. (2014) FEMS Microbiol. Lett. 359: 81-84

[4] Ruiz-Lopez S et al. (2020) Front. Microbiol. 11: 587556

[5] Ashworth H et al. (2018) Environ. Sci. Process Impacts 20: 956