

RSO Discipline Update: Materials Science

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Introduction

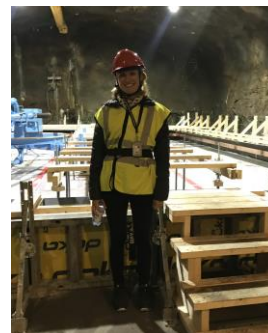
Simfuel PhDs and PDRAs (£2M)



Glass and Pu-ceramics PhDs and PDRAs (£2.5M)

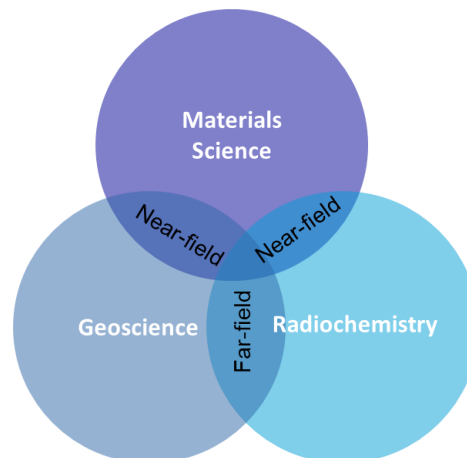
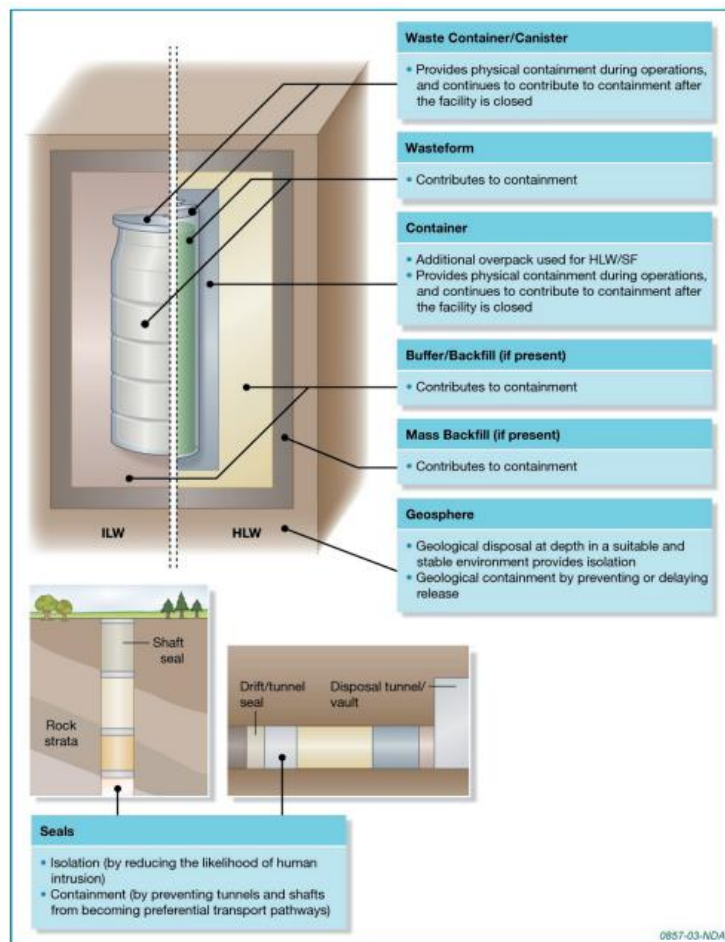


11 years research experience in long-term durability of radioactive waste materials



9 years experience working on the scientific underpinning of geological disposal.

The Materials Science Theme



All of the materials within the engineered barrier, plus more!

containment

sustainability

spent-fuel

buffer

ceramic

engineered-barrier

concrete

backfill

metal

durability

corrosion

cement

clay

container

construction

degradation

glass

radiation-damage

Update: Live projects

17 projects as
of June 2021
£2.9M



Pre-treatment
for Magnox and
exotic wastes

Corrosion of
carbide fuels in
a GDF

Characterisation
of aged cement

High
temperatures
and cement
backfill

Natural
analogues
for glass
corrosion

Durability of Pu
glass-ceramic
materials

Metallic U
corrosion in a
GDF

Managing
gas using
novel EBS
materials

Sealing
performance of
bentonite
barriers

Dissolution
of Butex
glass

Plutonium
disposability

Glass rate
resumption

Glass durability
as a function of
groundwater

Modelling
bentonite at
high
temperature

Update: Monthly RSO webinars

June

Reducing uncertainty in spent nuclear fuel disposal

1300: Welcome and introduction

([Dr. Claire Corkhill](#), RSO and [Dr. Rosie Hibberd](#), RWM)

1315: Spent fuel studies at NNL ([Dr. David Hambley](#), NNL)

1350: Tea / coffee / comfort break

1400: Modern spent fuel dissolution: The effects of Cr on the long-term durability of UO_2 [simfuel](#) (Hannah Smith, U. Sheffield)

1415: [Topotactic](#) phase transition in uranium-oxygen systems ([Dr. Jacek Wasik](#), U. Bristol).

1430: Close

60 attendees!

July

Understanding the long-term durability of radioactive waste glasses

1300: Welcome and introduction

([Dr. Claire Corkhill](#), RSO and [Dr. Michelle Cowley](#), RWM)

1315: Surface characteristics of ancient glass analogues for long-term disposal of vitrified radioactive waste ([Dr. Carolyn Pearce](#), PNNL)

1350: Tea / coffee / comfort break

1400: Isotopic mass balance models for glass dissolution mechanisms (Tom Gout, U. Cambridge)

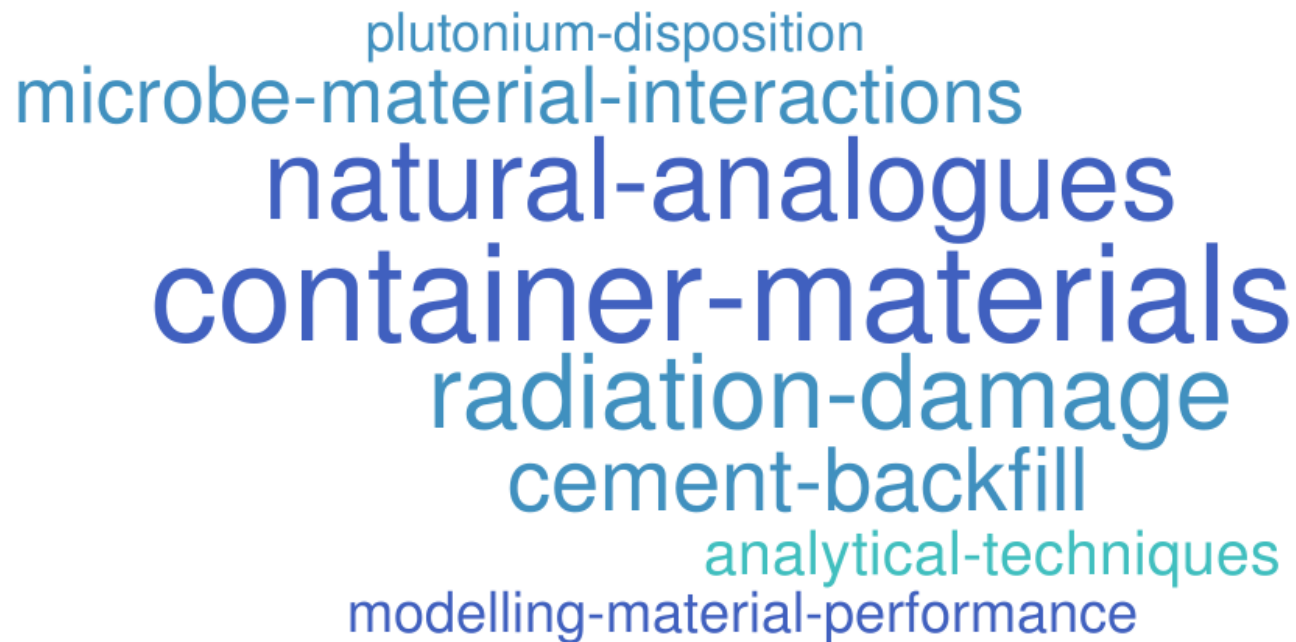
1415: Dissolution of [CaZn](#) MW HLW glass: Insight into rate resumption ([Dr. Adam Fisher](#), U. Sheffield).

1430: Close

40 attendees!

September webinar = Bentonite in geo-disposal systems

Future materials webinars



A word cloud of future materials webinar topics. The words are arranged in a cluster, with 'container-materials' being the largest and most central. Other prominent words include 'natural-analogues', 'radiation-damage', 'cement-backfill', and 'modelling-material-performance'. Smaller words include 'plutonium-disposition', 'microbe-material-interactions', and 'analytical-techniques'. The colors of the words range from light blue to dark blue, with 'analytical-techniques' being a distinct teal color.

plutonium-disposition
microbe-material-interactions
natural-analogues
container-materials
radiation-damage
cement-backfill
analytical-techniques
modelling-material-performance

Forward vision



Many academics already active in materials science of GDF

Others who have relevant experience but maybe not already working on GDF

Few UKRI responsive mode grants / programme grants in GDF materials

GDF Materials Community:

Support RWM in identifying areas of research

Work together to identify / develop opportunities for funding

Open forum for early career researchers

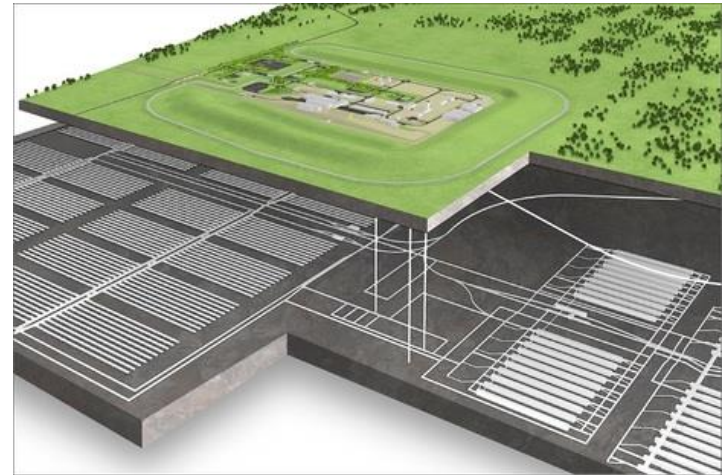
Upcoming opportunities

PhD bursaries available for funding (for Oct 2022 start):

- ❖ Interaction of cement backfill with LSSR groundwater solutes and geological host
- ❖ Behaviour of Magnox Fuel Cladding under Geological Disposal Facility Conditions
- ❖ Impacts of EBS on groundwater influx to waste disposal containers

Forward vision: sustainability

- Climate Change Act 2008 (2050 Target Amendment)
 - *The target will require the UK to bring all greenhouse gas emissions to net zero by 2050, compared with the previous target of at least 80% reduction from 1990 levels.*
- NDA/RWM Sustainability Goals
 - *“Safe, secure, sustainable”*
- GDF National Policy Statement
 - *Carbon Footprint ALARP*
- Addressing the GDF Carbon Footprint



Thank you for your attention.