

TECHNICAL SPECIFICATION SHEET

MALLET™ - MIDAR®-Augmented Lower-cost Lower-carbon Encapsulation Technique for Ion Exchange Resins

Background

- NUVIA and Lucideon have worked on the development of MALLET™, a novel geopolymer formulation for the encapsulation of radiologically contaminated problematic wastes
- One waste stream that has been a focus of the study is ion exchange resins, and in particular AW500 zeolite
- Over 700m³ of ion exchange resins require treatment and disposal (UK Radioactive Waste Inventory, 2019), with 90% of this based on Magnox sites
- The baseline method of waste conditioning for ion exchange resin wastes has not yet been firmly established, though the final destination for the waste is considered to be a Geological Disposal Facility

Problem

- Baseline encapsulation methods using OPC based grouts are problematic, with poor adhesion to the zeolite and activity level limits on mobile radionuclides causing ion exchange resins to be difficult to encapsulate and dispose
- Storage of ion exchange resin wastes following retrieval is forecast to cost up to £1,000 per m³ per year
- Disposal of ion exchange resin in a geological disposal facility is forecast to cost up to £50,000 per m³
- It is anticipated that ion exchange resins will cost £167.2M to dispose of, and cost £3.5M per annum to store



AW500 pre-treated zeolite with Caesium and Strontium

Solution

- NUVIA and Lucideon's MALLETT™ geopolymer has been developed to form a strong bond with AW500 zeolites
- Strong bonding offers the potential of reducing the mobility of particular radionuclides, which could enable near-ground disposal
- A 'pour-on' technique has been developed, in which MALLETT™ is poured on top of pre-treated AW500

Benefits

- Lower disposal costs
- Lower interim storage costs
- Lower carbon emissions than OPC
- Simple batch process
- Potential to be used in retrofits of existing encapsulation plants
- Potential to be used as a 'pour on' solution for existing zeolite storage skips



*MALLETT™ encapsulated AW500 zeolite,
encapsulated with pour-on technique and
vibrated for 5 minutes*