

Sustainable alkali-activated cements for nuclear-grade spent resin immobilization

It's a formulation of an alkali-activated cementitious material with a low carbon footprint for the immobilisation of spent nuclear-grade ion exchange resins and a kit to implement the immobilisation method.

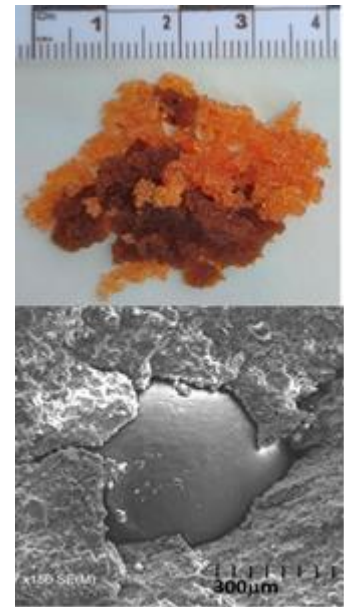
Industrial partners from the electric and nuclear sectors, such as companies involved in radioactive waste management, are being sought to collaborate through a patent license agreement.

An offer for Patent Licensing

Advanced cements for nuclear waste management: safety and sustainability

Spent nuclear grade ion exchange resins are a low and intermediate nuclear waste that entails problems associated with their handling and adequate treatment and which represent the greatest contribution in terms of volume and radiological inventory to wastes of this category in Spain. For these reasons, their management is of great importance. These resins are currently managed by their immobilization in Portland cement-based matrices.

The advanced formulations replace Portland cement by blast furnace slag, an industrial by-product. This achieves significant benefits in terms of energy demand, carbon footprint, and mining resource consumption. The use of sodium carbonate and sodium silicate-activated slag cements also allows to safely increase the proportion of ion exchange resin in the conditioning system, thus reducing both the volume and the costs associated with its management. These formulations have also shown good performance in the immobilization of nuclear decontamination sludge.



Spent ion exchange resins and resin immobilized in alkali-activated cement

Main innovations and advantages

- Alkali-activated slag cement exhibits better mechanical performance, lower porosity, and lower oxygen permeability in the presence of immobilised nuclear waste than traditional Portland-based formulations.
- Alkali-activated slag matrices show good chemical stability with lower strontium leaching rates.
- Alkali-activated slag cement allows an increase in the resin/cement ratio of the system, thus decreasing the total volume of waste to be disposed in the repository.
- Lower ecological impact in terms of carbon footprint and energy consumption is achieved by the use of alkali-activated formulations.

Patent Status

PCT application filed

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