

Chemical research could help solve radioactive waste concerns

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The controversial problem of storing some of the most radioactive elements of nuclear waste could be close to being solved thanks to experts from the University of Reading.

Researchers in the Department of Chemistry have discovered a class of [molecules](#) that can selectively extract extremely radioactive components - 'minor actinides' - that remain after spent fuel has been reprocessed, making the eventual waste far less radiotoxic. The minor actinides can potentially be fed back into nuclear reactors, providing extra energy and, in turn, be converted to non-radioactive products.

The UK nuclear power industry produces about 10,000 megawatts of power each year. Although the vast bulk of the spent fuel from a reactor can be reprocessed and fed back into the fuel cycle, a residue, consisting of corrosion products, lanthanides and minor actinides, must be sent to storage.

For every 500kg of spent fuel, there is 15kg of waste, of which the minor actinides, such as americium, curium and neptunium, constitute less than 1kg. However, these present an extreme hazard as they are intensely radioactive and long-lived nuclides that cause serious concern when it comes to storing them for more than 100,000 years.

Professor Laurence Harwood, who led the research at Reading, said: "The minor actinides are highly radioactive and have half lives up to millions of years. If these can be removed they could be used as fuel in

the new generation of nuclear reactors that will come on-stream around 2025 and converted to non-radioactive material. Being able to separate out the minor actinides even now already makes storage simpler and reduces the security risk as well.

"Our research has produced molecules capable of removing 99.9% of the minor actinides left after reprocessing [spent fuel](#), ensuring much smaller levels of radioactive waste would accrue and remain hazardous for a much shorter period of time; a few hundred years, rather than effectively forever."

More information: The research, 'Highly efficient separation of actinides from lanthanides by a phenanthroline-derived bis-triazine ligand', can be viewed at centaur.reading.ac.uk/view/creators/90000170.html

Provided by University of Reading

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