Science News

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Date: March 12, 2012
Source: University of Edinburgh
Summary: Scientists have produced a previously unseen uranium molecule, in a development that could help improve clean-up processes for nuclear waste.

FULL STORY

Scientists have produced a previously unseen uranium molecule, in a move that could improve clean-up of nuclear waste.

The distinctive butterfly-shaped compound is similar to radioactive molecules that scientists had proposed to be key components of nuclear waste.

However, these were thought too unstable to exist for long.

Researchers have shown the compound to be robust, which implies that molecules with a similar structure may be present in radioactive waste.

Better clean-up

University scientists, who carried out the study, say their findings suggest the molecule may play a role in forming clusters of radioactive material in waste.

These are difficult to separate during clean-up.

Improving treatment processes for nuclear waste, including targeting this type of molecule, could help the nuclear industry move towards cleaner power generation.

Ideally, all the radioactive materials from spent fuel can be recovered and made safe or used again.

This would reduce the amount of waste and curb risks to the environment.

Distinctive shape

The Edinburgh team worked in collaboration with scientists in the United States and Canada to verify the structure of the uranium compound.

They made the molecule by reacting a common uranium compound with a nitrogen and carbon-based material.

Scientists used chemical and mathematical analyses to confirm the structure of the molecule's distinctive butterfly shape.

The study, funded by the Engineering and Physical Sciences Research Council, the EaStCHEM partnership and the University of Edinburgh, was published in *Nature Chemistry.*

"We have made a molecule that, in theory, should not exist, because its bridge-shaped structure suggests it would quickly react with other chemicals. This discovery that this particular form of uranium is so stable could help optimise processes to recycle valuable radioactive materials and so help manage the UK's nuclear legacy," said Professor Polly Arnold of the School of Chemistry.

Story Source:

Materials provided by **University of Edinburgh**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Polly L. Arnold, Guy M. Jones, Samuel O. Odoh, Georg Schreckenbach, Nicola Magnani, Jason B. Love. **Strongly coupled binuclear uranium–oxo complexes from uranyl oxo rearrangement and reductive silylation**. *Nature Chemistry*, 2012; 4 (3): 221 DOI: 10.1038/nchem.1270

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