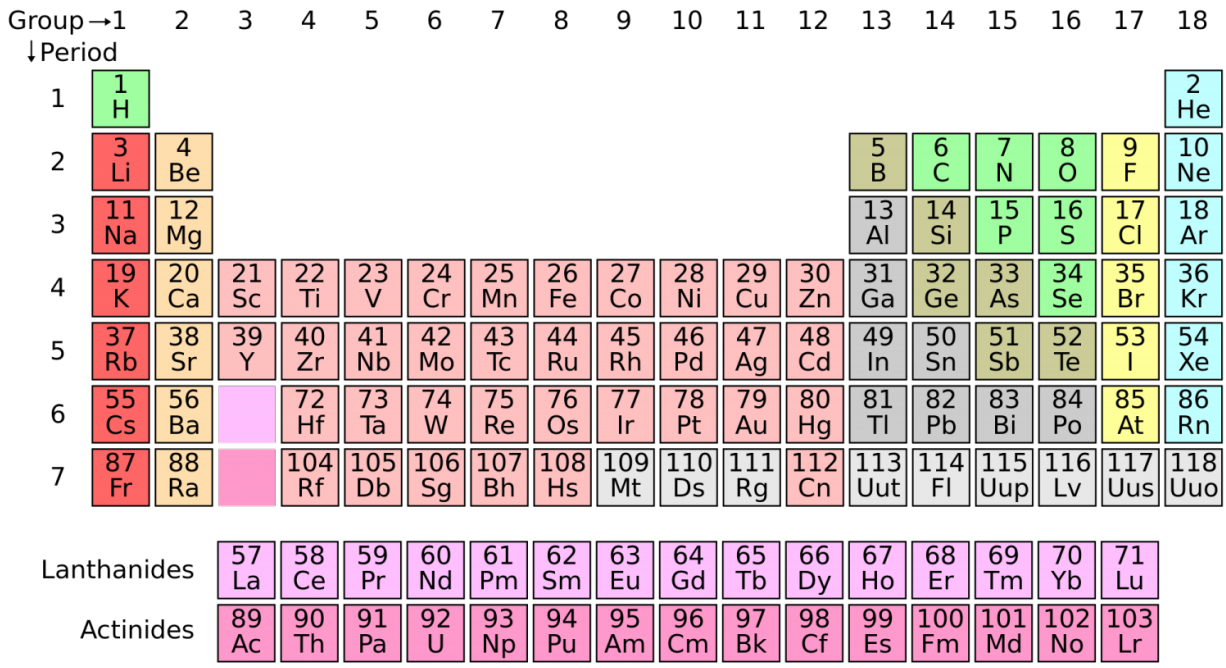
Ambitious experiments cast light on far reaches of periodic table

May 23 2016



Credit: CC0 Public Domain

A study of newly made chemical compounds is giving scientists a fresh understanding of an elusive element.

Researchers made compounds of neptunium—which is difficult to work with owing to its high radioactivity—and examined them to learn more about its properties and behaviour.

These challenging experiments, carried out in a specialised lab, were designed to give insight into the fundamental structure and bonding properties of elements in parts of the periodic table that have not been studied in detail.

Their fundamental discoveries may aid research into the management of nuclear waste, by helping scientists understand how chemicals can be used to separate the most radioactive elements. This could reduce the time taken for stored waste's radiation levels to decay to safe levels from hundreds of thousands to a few hundred years. It could also help a greater amount of nuclear waste to be recycled.

A global team led by University of Edinburgh chemists made a series of metallo-carbon neptunium compounds and carried out in-depth analyses to determine their molecular and electronic structures.

Studying such compounds in the lab also helps computational researchers to improve their predictions about the more highly radioactive elements present in nuclear waste that are even more difficult to study.

The work, published in *Nature Chemistry*, was carried out in collaboration with the European Commission's Institute for Transuranium Elements, the University of Manchester, and the University of Tasmania. It was funded by the Engineering and Physical Sciences Research Council and the European Commission.

Professor Polly Arnold, of the University of Edinburgh's School of Chemistry, who led the team, said: "These new results open avenues for improving our understanding of this most elusive area of the periodic table, and how we may be better able to manage these elements safely."

More information: Organometallic neptunium(III) complexes, *Nature*

Chemistry, DOI: 10.1038/nchem.2520