A new method to help solve the problem of nuclear waste

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In the last decades, nanomaterials have gained broad scientific and technological interest due to their unusual properties compared to micrometre-sized materials. At this scale, matter shows properties governed by size. At the present time, nanomaterials are studied to be employed in many different fields, including the nuclear one. Thus, nuclear fuels production, structural materials, separation techniques and waste management, all may benefit from an excellent knowledge in the nano-nuclear technology. No wonder researchers are on the constant lookout for better ways to improve their production.

Scientists from Joint Research Center have come up with a way to do just that. Olaf Walter, Karin Popa and Oliver Dieste Blanco, have devised a simple access to produce highly crystalline, reactive actinide oxide nanocrystals. The shape of the crystals, together with their increased reactivity, enables the consolidation of homogeneous nanostructured mixed oxides as intermediates towards very dense nuclear fuels for advanced reactors. Moreover, such materials can be used as precursors for the production of compounds with special properties, which mimic structures those are found in spent nuclear fuel, and will also be of great use in the study of how such radioactive material migrates in nearby geological environments.

This new process could enable scientists further research on the properties of these types of materials. Surprisingly, this new route proved uncomplicated, fast, and reproducible. It contains fewer procedural steps than typical oxalate precipitation-decomposition

processes, allowing for production using a single vessel and under continuous flow.

The article, published recently in *Open Chemistry* may lead to the development of a process to remove uranium from wastewater at the front-end of the nuclear fuel cycle, or even extracting natural uranium from sea water.

This process could help scientists and governments comply with the European Council Directive 2011/70/EURATOM on the "responsible and safe management of spent fuel and radioactive waste" which requires EU Member States to establish a dedicated policy, including the implementation of national programmes for the management of spent fuel and radioactive waste.

This also may help make the future brighter for nuclear, as a carbon-free energy source.

More information: Olaf Walter et al, Hydrothermal decomposition of actinide(IV) oxalates: a new aqueous route towards reactive actinide oxide nanocrystals, *Open Chemistry* (2016). DOI: 10.1515/chem-2016-0018

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