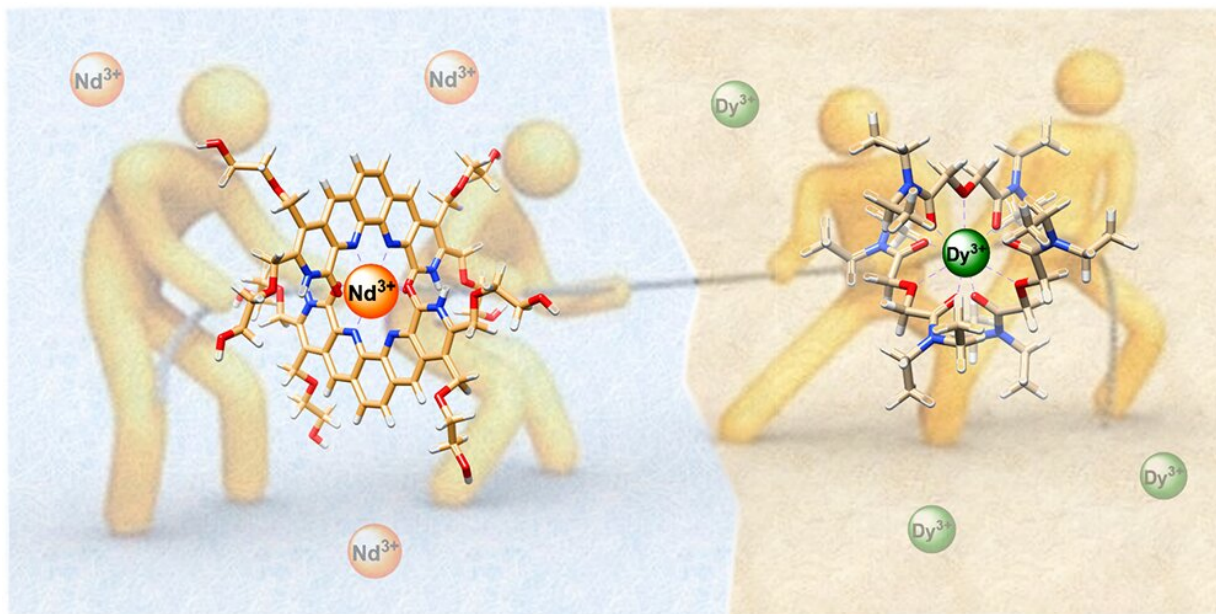


Tug-of-war strategy supercharges lanthanide separation

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Researchers at Oak Ridge National Laboratory discovered a tug-of-war strategy to enhance chemical separations needed to recover critical materials. Credit: Alex Ivanov/ORNL, U.S. Dept. of Energy

The lanthanide metals are unique resources with applications ranging from magnets and catalysts to cancer treatments. Their future availability hangs on the creation of better strategies to separate lanthanide groups into individual elements because conventional approaches are laborious, costly and generate waste.

"Our approach is flexible and can be tailored to select specific lanthanides for a faster route to separating adjacent elements," said Oak Ridge National Laboratory's Santa Jansone-Popova.

ORNL scientists combined two [ligands](#), or metal-binding molecules, to target light and heavy lanthanides simultaneously for exceptionally efficient separation.

Solvent extraction leverages the separating feature of oil-water mixtures and typically employs ligands that guide targeted materials from water to oil. The new strategy pairs an oil-loving ligand that seeks heavier lanthanides with a water-loving counterpart that targets lighter elements. The tug-of-war match-up pulls apart lanthanides that are especially difficult to divide.

"Fundamental discoveries such as this one can advance economical and environmentally responsible separations strategies," Jansone-Popova said.

The research is published in the journal *JACS Au*.

More information: Katherine R. Johnson et al, Size Selective Ligand Tug of War Strategy to Separate Rare Earth Elements, *JACS Au* (2023). [DOI: 10.1021/jacsau.2c00671](https://doi.org/10.1021/jacsau.2c00671)

Provided by Oak Ridge National Laboratory

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