



Rare Earth Elements

Office of Fossil Energy and Carbon Management

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Rare earth oxides of gadolinium, praseodymium, cerium, samarium, lanthanum, and neodymium.
Photo courtesy of USDA ARS.

Rare earth elements (REEs), which comprise of only 17 elements from the entire periodic table, play a critical role to our national security, energy independence, environmental future, and economic growth. Many advanced technologies have components made from REEs such as magnets, batteries, phosphors, and catalysts. These components are used in various sectors of the US economy including health care, transportation, power generation, petroleum refining, and consumer electronics. Because of this critical role, interest and research into the recovery of REEs from end-of-life products and secondary sources such as coal and coal byproducts has recently increased.

In January 2017, the U.S. DOE delivered a [report](#) to congress detailing this potential to obtain REEs from coal and coal byproducts. The DOE Office of Fossil Energy, along with the [National Energy Technology Laboratory](#), is conducting research to overcome key obstacles in the pursuit of economic and commercial scale recovery of REEs. There is continued identification of domestic sources of coal and coal byproducts containing high amounts of REEs. Furthermore, there is progress to understand the form of REEs within the sources and designing alternative separation technology which would drive down environmental impacts, economic costs, and resources consumption. Finally, purification methods of individual elements and recovery technology of mixed REEs in coal and coal byproducts are being improved.

Advancements in this program could provide a secure supply of critical minerals used throughout the economy, mitigate environmental impacts of conventional resource extraction, and diversify the job portfolio of the domestic fossil fuel industry.

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