

# RARE EARTHS AND CRITICAL MINERALS PRODUCED IN FIVE FIRST-OF-A-KIND U.S. DOMESTIC SEPARATION FACILITIES

Conventional separation technologies using unconventional feedstock resources enable our Nation's independence from foreign reliance on critical minerals and rare earth elements.

## RECOVERING DOMESTIC RARE EARTH ELEMENTS AND CRITICAL MINERALS

West Virginia University's Water Research Institute (WVWRI) and the University of North Dakota Institute for Energy Studies (UND-IES) continued to design and construct two small pilot-scale facilities that utilize acid mine drainage fluids and lignite as respective feedstock materials for separation and recovery of rare earth elements (REE) and critical minerals (CM).

The two separation facilities will soon be commissioned for production of small quantities of high-purity, mixed rare earth oxides/salts, as well as CM that contain cobalt, nickel, manganese, gallium, germanium,

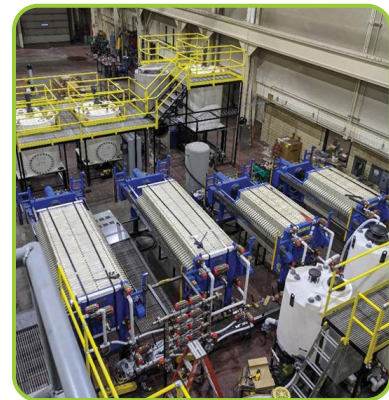
REE-CM Facility at WVWRI

Courtesy of Paul Ziemkiewicz, West Virginia University



REE-CM Facility at UND-IES

Courtesy of Nolan Theaker, University of North Dakota



These new small pilot-scale facilities follow on the heels of three, first-of-a-kind, domestic bench/small pilot-scale separation facilities operating since 2019. The existing facilities also recover REE from unconventional resources including coal wastes, acid mine drainage, and fly ash.



Pilot-Scale REE Recovery Facilities

Courtesy of Rick Honaker, University of Kentucky, Roe-Hoan Yoon, Virginia Tech

Paul Ziemkiewicz, West Virginia University

Dorin Preda, Todd Beers, Prakash Joshi, David Gamliel, Winner Water Services and Physical Sciences Inc.



## PILOT FACILITIES INCORPORATE INNOVATIVE PROCESSING

The incorporation of innovative techniques such as microbial assisted production of sulfuric acid from coal pyrite for leaching of feedstock materials, separation into individual high-purity oxides, and reduction to metals, are additional advancements being made by extramural projects within the current NETL Critical Minerals Sustainability Program portfolio.



Sulfuric Acid Bioreactors

Courtesy of Rick Honaker, University of Kentucky

## REDUCING OFFSHORE IMPORTS

The new small pilot facilities are helping to address a critical need to rebuild the domestic supply chain of REEs and CMs; regain U.S. capacity for domestic production of these materials; and potentially achieve onshore manufacturing of intermediate and end-products for clean energy and national security in the future.

## ADVANCED TECHNOLOGY DEVELOPMENT AND RESOURCE ASSESSMENT

To further advance REE-CM recovery, additional R&D efforts are being focused on advanced processing of REEs and CMs for Industrial and manufacturing applications.

Additionally, the Carbon Ore, Rare Earth and Critical Minerals Initiative for U.S. Basins is being initiated with the primary focus of catalyzing regional economic growth and job creation by realizing the full potential value of natural resources across basins throughout the U.S.

### PROGRAM NAME

**CRITICAL MINERALS SUSTAINABILITY**

### PROGRAM BUDGET

FY21 FUNDING



● DOE ..... \$23,000,000

### CONTACTS

HQ PROGRAM MANAGER  
**TRACI RODOSTA**

TECHNOLOGY MANAGER  
**MARY ANNE ALVIN**

### FECM RDD&D PRIORITY



### PARTNERS



SCAN FOR MORE INFORMATION >>>

