

The Department of Energy's Advances Towards a Sustainable CM/REE Supply Chain

Savannah L. Rice¹, Anna Wendt², Grant Bromhal², Evan Granite², and Maryanne Alvin³

¹Oak Ridge Institute for Science and Education (US Department of Energy)

²Department of Energy

³National Energy Technology Laboratory

Abstract

The US is import-dependent (>50% from foreign source) on 32 of the 35 critical minerals and import-reliant (100% from foreign source) for at least 14 critical minerals. The DOE established the Division of Minerals Sustainability to help address this problem as we move into a future with an increasing mix of clean energy technologies. The Division of Minerals Sustainability's vision and mission are focused on producing unconventional and secondary feedstocks containing critical minerals and carbon ore derived from previous mining operations, as well as other fossil energy-related byproduct streams, such as produced water from natural gas and oil operations. This approach will augment recycling efforts, which are projected to relieve the pressure on primary critical mineral supply but will not be sufficient to meet the demand required for electric vehicle and battery materials. Since 2014, the U.S. Department of Energy (DOE) Office of Fossil Energy and Carbon Management (FECM) and its national lab, National Energy Technology Laboratory (NETL), have been developing technologies to diversify the domestic supply and enable the reuse of coal waste and byproducts, particularly in the manufacturing of high value carbon products. These carbon products may include graphene, graphite, and carbon fibers. FECM and NETL launched the CORE-CM (Carbon Ore, Rare Earth, and Critical Minerals) initiative last year, aimed at catalyzing regional economic growth and job creation by addressing the upstream and midstream CM supply chain and downstream manufacturing of nonfuel, carbon-based products, to accelerate the realization of full potential for carbon ores and CMs within the U.S basins. 13 CORE-CM awardees across the US are currently working in their respective basins to regionally characterize their CM resource potential. FECM's RDD&D program activities for critical mineral production have demonstrated successful recovery of CMs from unconventional and secondary sources. Researchers have identified localities across the United States where coal by-products yield concentrations of rare earth elements deemed to be economically producible. The RDD&D program has identified opportunities for creating new critical mineral supply chains through upgrades to feedstock extraction, concentration, extractive metallurgy, reduction, and alloying. This includes three pilot-scale REE separation facilities that are producing kilograms of high-purity (~98%) Mixed Rare Earth Oxides (MREO). It also includes the pre-FEED studies for facilities designed to produce 1-3 metric tons/day of high-purity MREO. Over the next several years FECM will focus its efforts on building and strengthening sustainable critical mineral supply chains through unconventional and secondary sources that contain CMs and carbon ore. These efforts will work synchronously with strategies to support the commercialization of high-value carbon ore products to advance domestic clean energy manufacturing.

Professional Posters Monday, July 25