

Characterization of Rare-Earth Elements in Lignite Coal of the Williston Basin: Past Efforts and Ongoing Work

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Abstract

Rare-earth elements (REEs) have been a subject area of high interest for their unique properties. REEs are crucial materials used in an incredible array of consumer goods, energy system components, and military defense applications. While the United States has one operating REE mine, the product is sent overseas for refining into usable metals, making the United States 100% import-reliant on these critical materials. This has led the federal government to declare the REE market an issue of national security. The Energy & Environmental Research Center (EERC), under funding provided by the U.S. Department of Energy (DOE), has undertaken efforts to determine if the lignite coal found in the Williston Basin has the potential to be an ore body containing sufficient quantities of REEs and critical minerals (CMs) for extraction and processing. In one such effort, the EERC collected over 400 samples from the Williston Basin lignite coal seams, including outcrops as well as active mines. Those efforts have been followed up with ongoing work under DOE's Carbon Ore, Rare Earth, and Critical Minerals Initiative (CORE-CM) currently ongoing in the Williston Basin as well as other basins in the United States. This ongoing work in the Williston Basin characterizing REEs in coal has focused on the collection of new sampling and analysis of REEs in coal and building upon previous characterization work. This information is being used to understand the spatial distribution of REEs through mapping and 3D modeling. The goals of these efforts are to better understand the mechanisms for distribution of the REEs in lignite coal as well as their concentration, to determine knowledge gaps in characterization, and to start to build the database required to understand the potential resource in the Williston Basin.