# 74-5 - CRITICAL MINERAL RESOURCE ASSESSMENT OF COALS FROM THE POWDER RIVER BASIN, WYOMING, USA

Monday, 16 October 2023

9:10 AM - 9:25 AM

*324 (3, David L Lawrence Convention Center)*


## Abstract

Coal and associated sediments are potential sources of Rare Earth Elements (REE) and other critical minerals necessary for many consumer and defense-related products and development of energy technologies. For this study, 15 samples were sourced from Dry Fork Mine within the Powder River Basin near Gillette, Wyoming, to determine REE content along with select transition metals (t-metals) of interest in non-combusted coals and associated sediments. An excavator collected samples along a mine highwall, within benched intervals representing a foot to a few feet of coal strata. Homogenized sample subsets were crushed in an aluminum-ceramic vial, then passed through a 106-micron sieve. Sieved samples were pyrolyzed by a LECO TGA-108, which concurrently measured sample moisture, volatile, and ash content. Residual ash was then fused into a glass bead with lithium metaborate at a 6:1 Li-metaborate to sample ratio and then dissolved in 20% nitric acid. The nitric acid solutions containing digested beads were then diluted and passed through a 0.45 micron syringe filter. Filtered samples were analyzed by ICP-MS for REE and select t-metals. Reagent blanks were analyzed to assess for any potential contamination.

Total REE plus Y (REE+Y) concentrations across the 15 samples range from 52 ppm to 1015 ppm with an average of 477 ppm on a dry ash basis. When normalized to upper continental crust (UCC; Taylor and McLennan, 1985) values, 13 of the 15 samples show average enrichment factors (EF) for REE+Y greater than 1. EF values indicate M-type enrichment (Sm through Er), as opposed to distinct preferential enrichment of light or heavy REE. T-metals with the highest average concentrations are V, Cu, Ni, and Zr at 215, 243, 123, and 118 ppm, respectively. Multiple t-metals had EF>1; however, Cu, Ge, and Sb have the highest average EF relative to UCC for t-metals, at 9.7, 8.0, and 17.0, respectively.



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