

National Energy Technology Laboratory (NETL)

OPPORTUNITY: SEEKING U.S. GRADUATES FOR NATIONAL-LAB RESEARCH ON CRITICAL MINERALS AND MATERIALS (CMMs) FROM DOMESTIC SOURCES

NETL is seeking a cohort of postdoctoral fellows and other interns with a passion for conducting foundational R&D that will revolutionize and secure the Nation's energy future. NETL is conducting research to enable domestic sources for CMMs – strengthening our energy and national security and providing new domestic opportunities in regions across the Nation. Our focus is on low-grade, abundant feedstocks tied to fossil-energy and carbon management (more details below).

NETL's R&D mission in critical minerals and materials requires expertise across its broad range of [core R&D competencies](#), including specific needs in:

- **Chemical/Environmental/Industrial Engineering:** Quantification of costs and environmental performance of concepts and processes associated with material supply chains for critical minerals derived from unconventional feedstocks. R&D spans from optimization to advanced computational methods.
- **Process/Chemical/Civil/Environmental Engineering:** Design, control, and scale-up of modular processes to extract multiple critical minerals and value-added coproducts from unconventional feedstocks. Processes of interest include (but are not limited to) coal graphitization reactions, membrane filtration, ion-exchange resins, column leaching, solvent extraction, and selective precipitation. R&D spans from system analysis to computational engineering to laboratory experiments and analysis.
- **Economic Geology; Resource/Mineral/Environmental Economics:** Apply conventional-mining approaches to recovery from potential unconventional feedstocks. Develop/apply models for material supply and demand scenarios for critical minerals derived from unconventional feedstocks. R&D includes assessment of unconventional feedstocks as potential ores, as well as scenario analysis to investigate the drivers that promote supply-chain development (e.g., incentives, community priorities, etc.).
- **Organic, Inorganic, Physical, and Analytical Chemistry; Geochemistry/Biogeochemistry:** Synthesis of graphitic materials from coal; Characterization of coal feedstocks and graphitic materials. Use of coal-derived graphite for batteries. Synthesis and design of small organic chelators to extract critical minerals from unconventional feedstocks. R&D spans from computational modeling for chelator discovery/design to lab-scale experiments. Characterization of critical-minerals in complex geomaterials—spanning produced waters/brines to fossil-energy related materials like coal refuse and shale cuttings (and their subsurface equivalents). Development of (bio)geochemically informed strategies to extract/recover critical minerals from these types of geomaterials, using theory, experiment/analysis, simulation, and field studies. R&D targets modular recovery from above-ground feedstocks and precision subsurface recovery.
- **Extractive Metallurgy:** Development of hydrometallurgical and/or pyrometallurgical methods to extract metals from complex unconventional feedstocks.

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NETL has a vibrant, multi-year R&D portfolio in CMMs spanning from fundamental properties of materials to scale-up of processes. This R&D portfolio supports efforts by the Department of Energy's Office of Fossil Energy and Carbon Management in three areas:

- **Expanding the options for domestic sources of critical minerals through resource characterization via innovations in data analysis, systems analysis, and geomaterials analysis.** This broad research area targets methods to assess coal-based and other secondary and unconventional prospective feedstocks. It includes development and application of novel analytical and data-analysis methods to characterize the nature of complex materials in the lab and in the field coupled with system-level analysis of potential processes and strategies (e.g., using technoeconomic analysis and life-cycle analysis).
- **Developing innovations in science-based extraction and remediation technologies to recover critical minerals from these unconventional sources efficiently.** This broad research area spans from multicriteria optimization of existing and modified technologies to next-generation extraction technologies (including novel strategies for targeted and minimally invasive *in situ* extraction in the subsurface). The goal is to accelerate concepts from lab-scale to deployment scale using NETL facilities that span this range and strategic partnerships with other R&D organizations.
- **Advancing innovations in responsible processing and manufacturing of graphite from coal-based feedstocks.** This research area focuses on developing methods to produce high quality graphite from coal-derived carbon feedstocks. This R&D involves characterizing coal feedstocks, developing methods to convert coal to graphite, using analytical instruments to characterize graphite, and utilizing graphite for lithium-ion battery performance testing. This area seeks to accelerate scale up of new manufacturing strategies using computational engineering and pilot-scale testing.

Who is NETL?

[NETL](#) is a government-owned and government-operated national laboratory within the U.S. Department of Energy, with a [mission](#) to drive innovation and deliver solutions for a clean and secure energy future by advancing carbon management and resource sustainability technologies. Its R&D in CMMs is part of its Minerals Sustainability research, which is one of several research programs at NETL. NETL has three research campuses located in Albany, OR; Morgantown, WV; and Pittsburgh PA.

Apply Today!

Interested participants should apply to our [Professional Internship Program \(PIP\) Opportunity](#) or our [Postgraduate Research Program \(PGRP\) Opportunity](#) and email a cover letter and resume to RIC-Careers@netl.doe.gov with the subject line "CMM R&D Fellow Opportunity."