METALLIC

FEEDSTOCK BENEFICIATION

The Feedstock Beneficiation Center is advancing commercially scalable beneficiation solutions to address gaps and challenges with current critical mineral processing capabilities in the United States.

WHY IS FEEDSTOCK BENEFICIATION IMPORTANT?

- The practice of separating a material of interest from the host material is a key step in reducing overall mineral and feedstock processing costs, but beneficiation approaches must be tailored to an individual feedstock.
- Expensive pilot-scale testing can be required to validate performance and facilitate adoption.
- The low grade of emerging resources requires processing increasingly large tonnages of materials to generate the same amount of critical minerals.
- Adoption of new beneficiation pathways requires robust tests at pilot or greater scale.

The ORE-lab Dry Comminution Circuit at the National Energy Technology Laboratory in Albany, Oregon

WHAT ROLE AND SERVICES DOES THE METALLIC FEEDSTOCK BENEFICIATION CENTER PROVIDE?

The Beneficiation Center is focused on identifying and validating the optimal processing steps to prepare materials for critical minerals and materials (CMM) extraction. Activities are grouped in three categories:

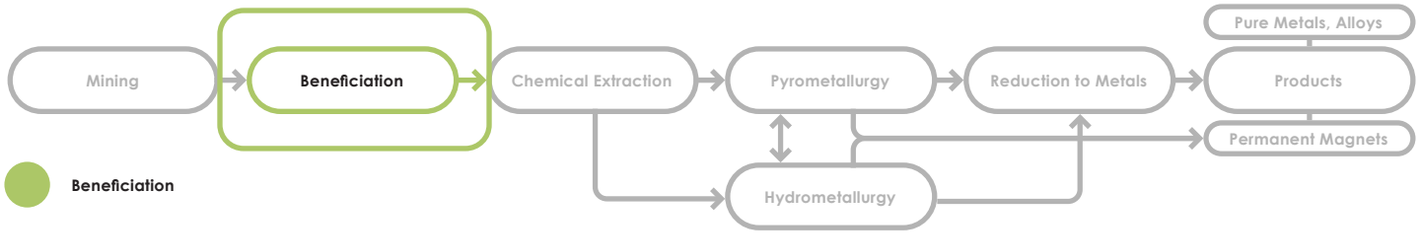
Feedstock Characterization and Liberation Analysis
Characterize, catalogue, and store feedstocks coming into METALLIC, establishing a Mineral Resource Data Library for CMM-containing feedstock characterization and beneficiation data, optimized for machine learning approaches

Ore Processing and Optimization
Test, validate, de-risk, and demonstrate emerging physical/mechanical beneficiation pathways, performing individual unit operation testing through integrated pilot-scale campaigns

Brine Testbed(s)
Mature and de-risk emerging beneficiation techniques for a diverse set of brines to reduce water consumption, chemical usage and waste, and energy intensity

OUR GOAL IS TO ACCELERATE ADOPTION OF EFFECTIVE BENEFICIATION APPROACHES BY:

- Characterizing new materials and technologies provided by users to inform processing
- Test and validating individual unit operations in integrated pilot-scale campaigns
- Demonstrating the effectiveness of new beneficiation pathways to facilitate adoption



U.S. DEPARTMENT of ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY

CHARACTERIZATION AND LIBERATION ANALYSIS

Focus
High-precision analytical techniques to support rapid chemical, molecular, and atomic characterization of critical mineral feedstocks

Processing Scale
Full geologic core assessment and individual batches up to 1 kilogram (kg)

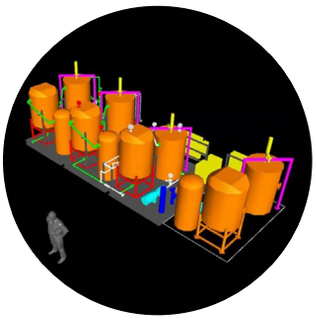
Outcomes
- Accelerated identification of optimal (CMM) processing pathways through rapid and precise material evaluation
- Produce artificial intelligence–ready (AI-ready) datasets to inform and strengthen applied R&D for programs at the U.S. Department of Energy and the U.S. Department of the Interior, accelerating resource discovery

ORE PROCESSING AND OPTIMIZATION

Focus
Integrated mineral processing, separation, and analysis capabilities to optimize recovery and scalability of CMM production pathways

Processing Scale
Up to 100s kg/hour (kg/hr) solids, 10s liters per hour (L/hr) brines and other liquids

Outcomes
- Integrated, bench- and pilot-scale capability facilitates adoption of cutting-edge comminution and floatation circuits
- Bulk material production capability to generate up to tonnes of material for further processing in other centers and battery materials



BRINE TESTBED(S)

Focus
- Pilot-scale systems advancing critical mineral extraction from brines and wastewater
- Field deployable units to further de-risk industry adoption

Processing Scale
Existing laboratory facilities can process up to ~2,500-gallon batches of liquids at up to 10s L/hr (0.044+ gallons per minute [gpm]). Existing field transportable facilities can process up to 10 gpm. A 100-gpm capability is being commissioned.

Outcomes
- Robust laboratory-based facilities for process identification and optimization
- Configurable, deployable units provide “real-world” validation in the field and can be tailored to the feedstock

DIRECTOR
Thomas Tarka
National Energy Technology Laboratory
Work-With-METALLIC@netl.doe.gov

For info about METALLIC

LEAD
Scott Montross
National Energy Technology Laboratory
scott.montross@netl.doe.gov

CO-LEADS
Robert Fox
Idaho National Laboratory
robert.fox@inl.gov

Mike Whittaker
Lawrence Berkeley National Laboratory
mwhittaker@lbl.gov