NRC·CNRC

ENVIRONMENTAL ADVANCES IN MINING

Energy, Mining and Environment Research Centre

BACKGROUND

The cost of managing mining waste streams (water, waste rock and tailings) to reduce environmental impact with increasingly complex regulatory, social and financial pressures, is a current and future threat to the Canadian mining industry viability.

In 2016, the National Research Council of Canada's (NRC) Energy, Mining and Environment Research Centre (EME) launched the new Environmental Advances in Mining program to help reduce the liability costs of managing environmental impact and reduce mining's environmental footprint.

The program assists Canadian mining companies by applying unique R&D capabilities to develop, demonstrate, validate, and improve innovative technologies to manage mine waste, and by developing knowledge on mining's environmental issues that currently drive liability costs.

We bring together some of Canada's top scientific and technical expertise to tackle complex challenges throughout the mining life cycle, and work with key players along the mining supply chain, including mining companies, environmental service providers, and private and public organizations.

RESEARCH AREAS

The program aims to support regulatory decisions by providing cutting-edge science on selenium, and improving market access and competitiveness of mining SMEs in the critical minerals sector, and in environmental mining.

ACID ROCK DRAINAGE AND METAL LEACHING PREDICTION

Accurate acid rock drainage and metal leaching (ARD-ML) prediction is the most cost-effective method of reducing their impact on the environment and costs.

By understanding the biogeochemical mechanisms of metal sulfide oxidation via data analysis and laboratory essays, our team develops pile-scale models and uses machine learning to predict ARD-ML from waste rock piles and dry-stacking of mine waste. Our researchers also work to scale up ARD-ML laboratory testing to enable full-scale prediction.

In 2020, our modeling work assisted a Canadian critical mineral mining company with its Environmental Public Hearing.

National Research Council Canada | Conseil national de recherches Canada

Canada

SELENIUM DETECTION

Selenium contamination affects aquatic ecosystems and with selenium taking several forms in water – known as speciation, discharging mining effluents within regulatory limits is challenging.

The program develops cutting-edge science on selenium speciation, works to improve the detection of selenium concentrations in real-time using various technologies, and supports technology developers of innovative water treatment solutions.

The program assisted a Canadian mining company in testing a technology for onsite analysis of total, dissolved, and species of selenium concentration in mine water.

ECO-EFFICIENT PROCESSES

The program offers research services to add value to mine waste, and render mining activities more eco-efficient, by optimizing biological processes for mining waste, and developing bio-mining technologies and more ecological alternatives for mineral separation.

More specifically, the program develops bio-extraction processes for the leaching of gold ores based on cyanide-producing bacteria as an alternative to the chemical leaching of gold.

The program is currently assisting a Canadian mining company in developing a new revenue stream by adding value to their gold ore residues as additives into cement and concrete formulations.

SENSING AND MONITORING

The program uses optical and bioelectrochemical technologies to develop sensors to detect toxicity in water.

NRC experts developed a self-powered toxicity sensor based on microbial fuel cell technology that tests water at remote sites in real-time and at a low cost.

TEAM EXPERTISE

Spread across unique and specialized facilities in Boucherville, Montreal, Ottawa and Vancouver, the program's multidisciplinary researchers have expertise in materials engineering and characterization, separation technologies, electrochemistry, mathematical modeling, machine learning, material characterization, metal speciation, and microbiology.

CONTACT

Serge Delisle, Program Leader
Energy, Mining and Environment
514-912-3136 • Serge.Delisle@cnrc-nrc.gc.ca

Mireille Goulet, Client Relationship Leader
Energy, Mining and Environment
514-546-1892 • Mireille.Goulet@nrc-cnrc.gc.ca

canada.ca/nrc-energy-mining-environment

© 2021 Her Majesty the Queen in Right of Canada,
as represented by the National Research Council of Canada.

Paper: Cat. No. NR16-356/2021E • ISBN 978-0-660-38857-1
PDF: Cat. No. NR16-356/2021E-PDF • ISBN 978-0-660-38856-4
05•2021 • Également disponible en français