



CHALLENGE TITLE

Mineral Selectivity in Transport Processes.

CHALLENGE DESCRIPTION

During material transport in mining operations, large volumes of gangue are moved along with valuable ore, causing overload in crushing, grinding, and leaching processes, which increases energy consumption, water usage, and operational costs. This challenge seeks to develop technological solutions that enable real-time discrimination between valuable ore and gangue during transport, reducing unnecessary processing volumes and optimizing metallurgical efficiency from the source. Priority will be given to automated classification technologies, smart sensors, and decision-making systems that can be integrated into mining operations without disrupting continuity.

GENERAL OBJECTIVE

Contribute to the optimization of metallurgical processes through the development and validation of technologies that enable material selectivity during transport, reducing gangue processing and improving efficiency from the source.

SPECIFIC OBJECTIVES

1. Co-develop real-time classification technologies that can discriminate valuable ore from gangue during transport.
2. Integrate smart sensors and automated decision-making systems to enhance operational selectivity.
3. Validate the technical, metallurgical, and energy performance of the solutions in real operational environments.

4. Generate technical guidelines for integrating these technologies with transport systems, process control, and environmental management.

EXPECTED RESULTS

- Technical reports with results on gangue reduction and improved metallurgical recovery.
- Pilot systems for real-time classification and smart sensors at semi-industrial and operational scale.
- Technical guideline document for industrial adoption.

SCOPE

Includes:

- Technologies with $TRL \geq 4$ applicable to mining transport processes.
- Demonstrations in controlled relevant environments, semi-industrial and operational piloting and validation.
- Evaluation of technical, economic, energy, and environmental performance.
- Studies on integration with transport systems, process control, and environmental management.

Does not include:

- Proof-of-concept and/or laboratory-scale tests with $TRL < 4$.
- Solutions that pose additional risks to worker, equipment, or environmental safety.
- Technologies that increase consumption of strategic resources such as water or energy.
- Interventions that negatively interfere with the continuity of the production process.



KEY PERFORMANCE INDICATORS (KPIs)

1. Reduction in processed gangue volume (%).
2. Improvement in metallurgical recovery (% per ton processed).
3. Accuracy of real-time classification (% correct discrimination).
4. Average response time of the decision-making system.

DESIRABLE CONTRIBUTION TO ITL CAPACITY BUILDING

- Infrastructure for pilot testing of real-time classification and smart sensors.
- Development of validation and technological certification protocols for material selectivity.
- Technology package (software + hardware) for real-time monitoring, analysis, and decision-making.