TECHNOLOGY DEVELOPMENT TO EXPLOIT MORE EFFICIENTLY AND SUSTAINABLY THE LOW GRADE, COMPLEX AND POLYMETALLIC ORES (INMET PROJECT)

INTEGRATED INNOVATIVE METALLURGICAL SYSTEM TO BENEFIT EFFICIENTLY POLYMETALLIC, COMPLEX AND LOW GRADE ORES AND CONCENTRATES

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No: 689515
INTRODUCTION

- Currently there is no economical and viable process for on-site metal extraction from Low Grade, Complex or Poly-metallic deposits (Cu, Pb & Zn).

- Traditionally, metals recovery from polymetallic sulfide deposits is performed by mining, selective flotation to separate Cu, Pb and Zn concentrates, and finally, smelting/refining of those concentrates to obtain the refined metals.

- In many cases, selective flotation of that kind of complex ores produces low metals recovery and low concentrate quality containing impurities such as Hg, As, Bi, etc., which results on high penalties in treatment and refining charges, and consequently, worsening the economy of the mining business.

- Recovery of the valuable metals could then be maximised by producing bulk concentrates or middling flotation products to feed novel hydrometallurgical processes, proposed by INTMET project.
THE OBJECTIVES

- Integrated sustainable metallurgical system: hydro-, bio-, electro-chemistry
- Maximising metal recovery yield
- Minimising energy consumption
- Minimising environmental footprint
- Ensuring the economic viability of the entire process
- Upstream (pre-processing) and down-stream (treatment/use of metallurgical wastes such as slags, dusts, effluents) interfaces should also be considered.
PARTICIPANTS & BUDGET

The project is being developed by a distributed consortium with 10 partners from 7 different EU member states (Spain, Portugal, Poland, France, Finland, Netherland and Austria) and 2 for 2 non-EU eligible countries 24 (Serbia and South Africa).

The estimated eligible costs of the action are EUR **7,838,726.25** (seven million eight hundred and thirty eight thousand seven hundred and twenty six EURO and twenty five cents).
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WP1. Raw Materials sampling and characterization

Task 1.1 Ores, concentrates and middlings samples collection and characterisation

Collection and characterisation of primary raw materials samples:
✓ Polymetallic ores and concentrates: SOMINCOR, CLC, RTB
✓ Complex or low-grade copper ores, concentrates, middlings: KGHM, RTB

Task 1.2 Samples from technology developments (ongoing)

Collection and characterisation of samples:
✓ Samples from flotation test
✓ Samples from leaching test
✓ Samples from pre-concentration test

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WP2. Enhanced Performance Flotation Process

- Task 2.1 Energy efficient comminution technology and equipment
- Task 2.2. Reagents for enhanced flotation processes
- Task 2.3. Flotation pilot facilities arrangement (CLC)
- Task 2.4. Flotation pilot plant operation and concentrates production.

- Flotation reagents: Xanthates and derivatives, dithiophosphates, thionocarbamates hydrocarbon sulphides and mercaptobenzothiazols; ...

- High intensity grinding
- Microwave Treatment
WP3. Development of Integrative Atmospheric Leaching Process

- Task 3.1 LAB SCALE METALS RECOVERY AND REFINING
- SubTask 3.1.1 Cu and Zn winning
- Subtask 3.1.2 Ag & Pb and other metals recovery

Task 3.2 Pilot Plant Arrangement and Testing (Partially done).
WP4. Development of integrative pressure leaching process

- Task 4.1. Lab scale metals recovery and refining (Partially done)
  - Subtask 4.1.1 Cu & Zn winning.
  - Subtask 4.1.2 Ag & Pb and Other Metals Recovery (Partially done)
- Task 4.2. Pilot Plant arrangement and testing (On progress)
WP5. Integrated Bioleaching Processes

- Task 5.1 Laboratory-scale bioleaching process
- Task 5.1.1 Cu and Zn winning
- Task 5.1.2 Pb, Ag, Hg, Ba (winning / stabilisation)

- Task 5.2 Pilot-scale bioleaching process (ongoing)

Bacteria Culture
Bioleaching Testing
Pilot Plant Arrangements
WP6. Valorisation of tailings, wastes and effluents

- Task 6.1 Tailings and wastes pre-concentration
- Task 6.2 Pyrite oxidation and sulfur valorisation (ongoing)
- Task 6.3 Recovery of iron (ongoing)
- Task 6.4 Gypsum purification and making byproducts (ongoing)
- Task 6.5 Waters and effluents purification, recycling and reuse (ongoing)

![Graph showing metal content in a concentrate vs pH of flotation pulp](image1)

Rotary evaporator

Spray Drier

![Graph showing sulfur valorisation test](image2)

Tailings treatment

Iron recovery products

Gypsum crystals produced from acidic solution

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WP7. Technologies Assessment and Project Evaluation

- Task 7.1 Technology Assessment and Cost Assessment (ongoing)
- Subtask 7.1.1 Safety risk review (ongoing)
- Task 7.2 Life Cycle Assessment (LCA) for developed solutions (ongoing)

Selective Flotation Conventional Process

Zn/Pb metal production Conventional Process

Pilot Plant Safety Risk Review

LCA Boundary conditions

Unitary Operation input/output

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WP8. Technology Application and Dissemination

√ Task 8.1 Setting up a communication and dissemination plan
☐ Task 8.2 Stakeholder interaction (ongoing)
☐ Task 8.3: Business opportunities identification (ongoing)
☐ Task 8.4: Innovation Management (ongoing)
☐ Task 8.5: Exploitation, application strategy and open access (ongoing)

Workshop, CIRCULAR ECONOMY held in Santiago de Chile on 25th-26th April 2016
Andalusia University Circular Economy Course Huelva 13th July 2016

Metallic Mining Hall: Innet Project Presentation 19th October 2017
Website: WWW.INTMET.EU

Social Media News

“The EU INTMET Project may help to exploit more efficiently and sustainably the Iberian Pyrite Belt polymetallic ores”
Francisco Sanchez, Eero Kolehmainen, Marielle Gericke, Horst Hepp
COBRE LAS CRUCES, S.A. – www.cobrelascruces.com – francisco.sanchez@rbiqmi.com

ABSTRACT
Within Horizon-2020 EU Programme, the INTMET Project was awarded in 2016 to a consortium led by Cobre Las Cruces and composed by twelve partners from seven EU countries, and including Serbia and South Africa as well.
The INTMET technological approach represents an unique breakthrough to overcome the
WP9. Management

- Task 9.1 Project Management Plan
- Task 9.2 Technical and administrative assistance to project partners (ongoing)
- Task 9.3. Consortium meetings (ongoing)
- Task 9.4 Reporting on technical and financial progress (ongoing)
CONCLUSIONS

- In WP1: the necessary samples for technology development has been characterised and delivered for laboratory and pilot scale testing.
- In WP2: bulk flotation process has been defined and at the same time samples for research works have been produced.
- In WP3: atmospheric leaching lab scale testing followed by running a pilot plant has produced very encouraging results achieving up to 95% of Copper and Zinc leaching efficiencies.
- In WP4: lab scale testing on pressure leaching has reported near to 100% leaching efficiency on Copper and Zinc. Pilot Plant operation is currently on progress.
- In WP5: lab scale testing on bioleaching process has showed leaching efficiencies up to 96% of Copper and 99% Zinc. Pilot Plant operation is currently on progress.
- In WP6: research studies on wastes treatment, water recycling, sulphur and iron recovery has provided relevant information to optimise the new processes in development.
- In WP7: preliminary studies on technology and environmental assessment showed very promising results.
Next up to the end of the project

- In WP1: continuous works in intermediate samples characterisation and delivery.
- In WP2: lab scale research tests in high voltage electric pulse comminution.
- In WP3: pilot plant operation to recover Lead and Zinc from atmospheric leaching residues. Metals recovery testing.
- In WP4: Pilot Plant operation in pressure leaching, lead and silver recovery from pressure leaching residues, and metals recovery testing.
- In WP5: Bioleaching Pilot Plant operation and metals recovery testing.
- In WP6: continue lab scale test on water purification, testing on pyrite oxidation at pilot scale, gypsum production from acidic intermediate process streams.
- In WP7: Techno-economical Assessment and Life Cycle Assessment of the developed technologies.
- In WP8: Stakeholder interaction, Business opportunities identification, Exploitation strategy
- In WP9: Project Management
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THANK YOU FOR YOUR TIME