

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



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



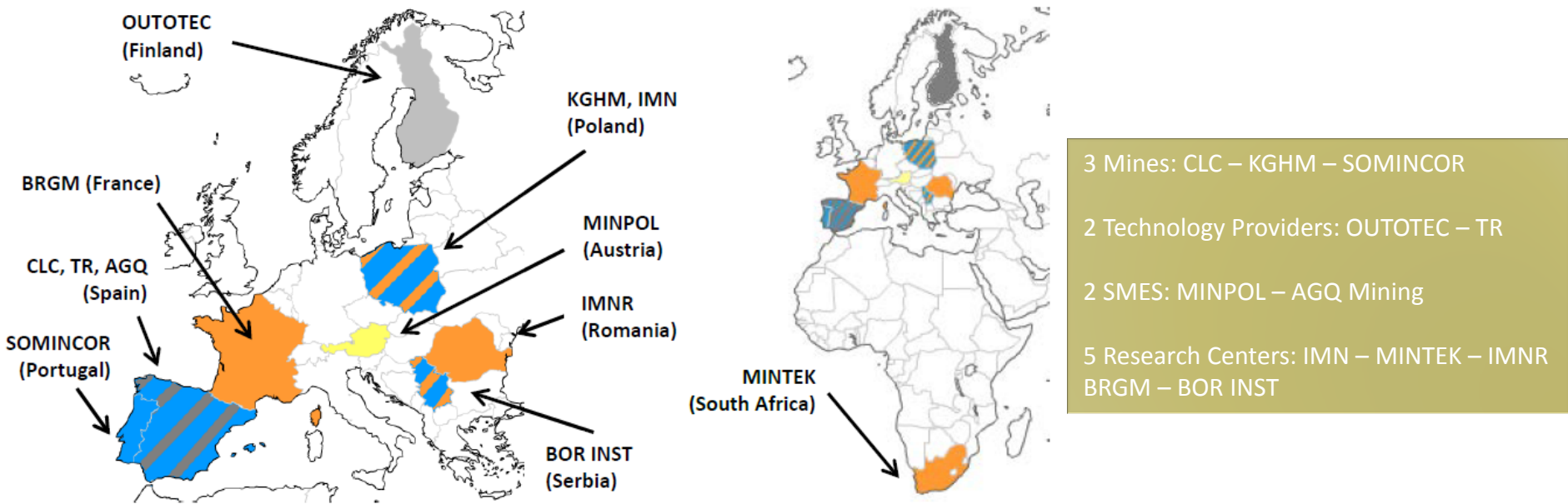
THE OBJECTIVES

- 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

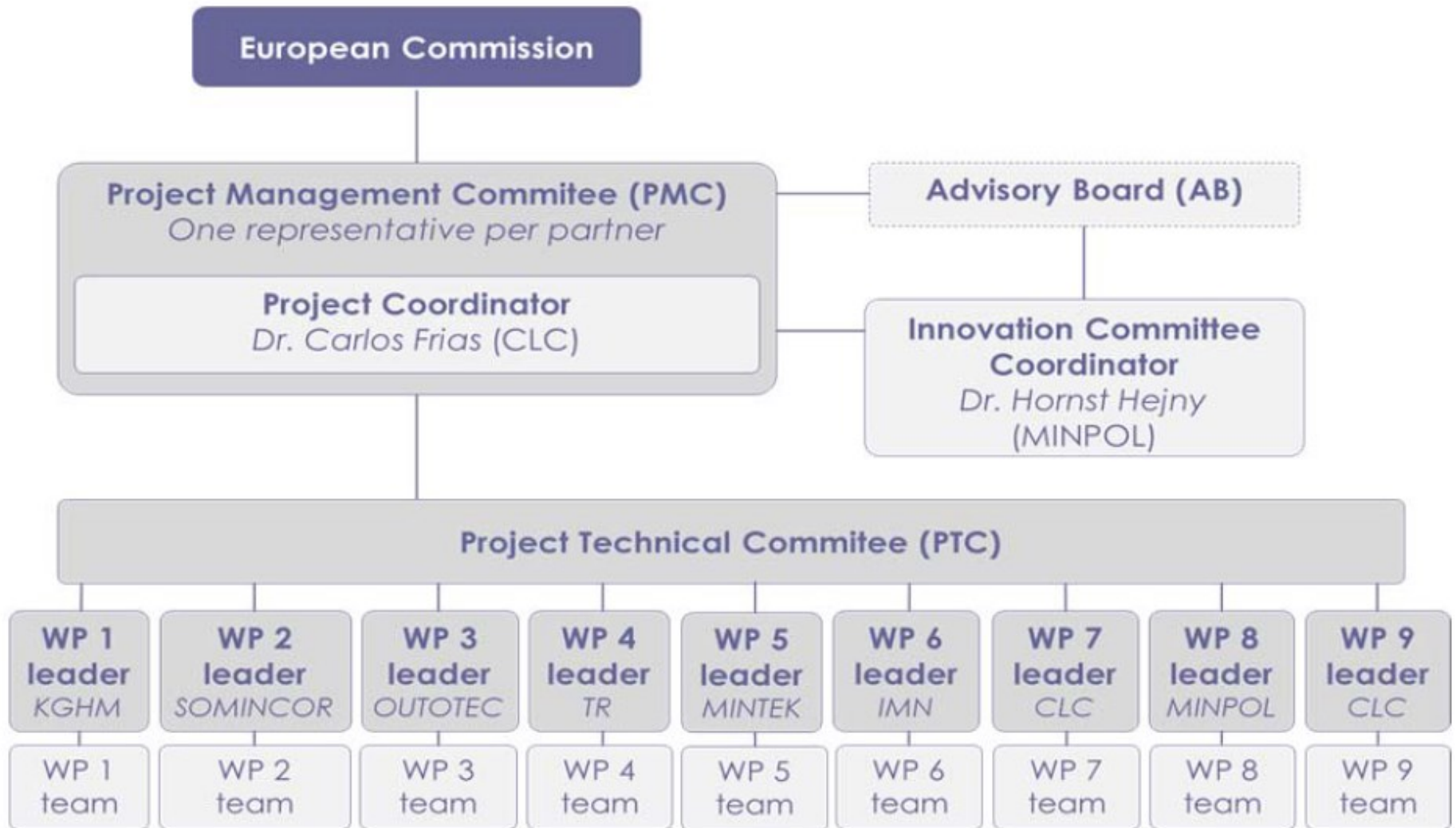
The project is being developed by a distributed consortium with 10 partners from 7 different EU member states (Spain, Portugal, Poland, France, Finland, Netherland and Austria) and 2 for 2 non-EU eligible countries 24 (Serbia and South Africa).



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).



PROJECT MANAGEMENT



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

WP1. Raw Materials sampling and characterization



Task 1.1 Ores, concentrates and middlings samples collection and characterisation

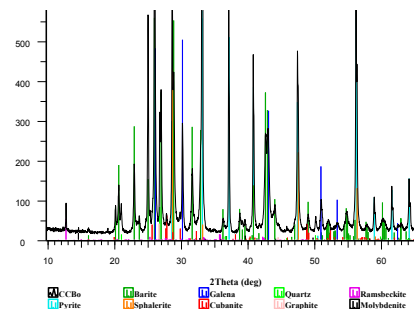
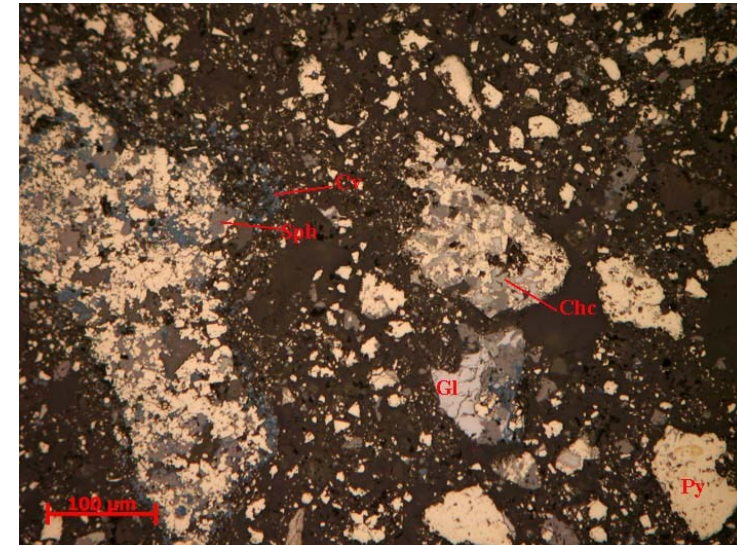
Collection and characterisation of primary raw materials samples:

- ✓ 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)

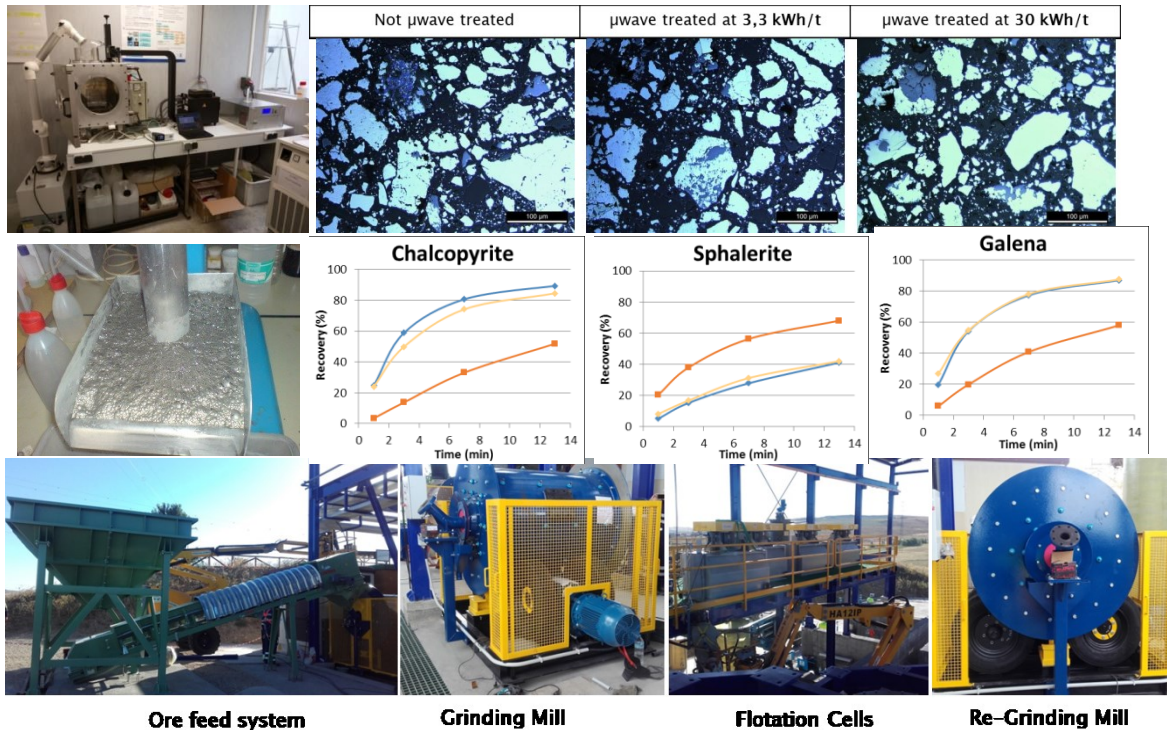
Collection and characterisation of samples:

- ✓ Samples from flotation test
- ✓ Samples from leaching test
- ✓ Samples from pre- concentration test



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

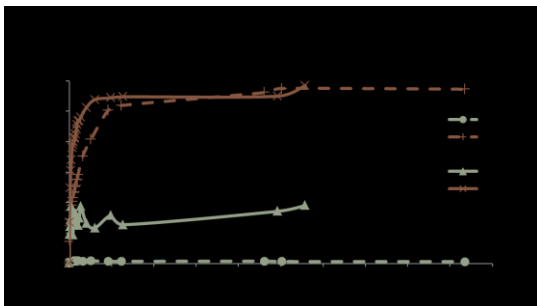


WP3. Development of Integrative Atmospheric Leaching Process

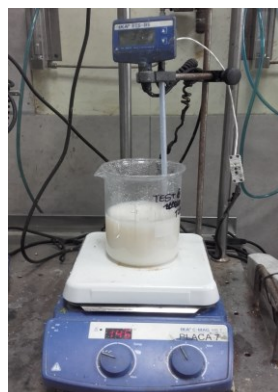


- ✓ Task 3.1 LAB SCALE METALS RECOVERY AND REFINING
- ✓ SubTask 3.1.1 Cu and Zn winning
- ✓ Subtask 3.1.2 Ag & Pb and other metals recovery

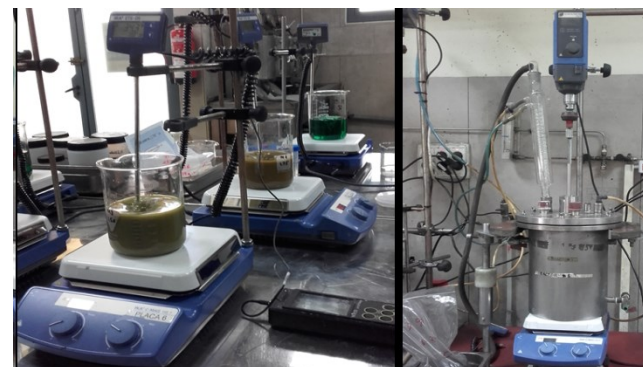
Task 3.2 Pilot Plant Arrangement and Testing (Partially done).



LEACHING KINETICS



LEAD RECOVERY USING MSA



ATMOSPHERIC LEACHING LAB TESTING



SX COUNTER CURRENT LAB TESTING



PILOT PLANT LEACHING REACTORS



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WP4. Development of integrative pressure leaching process



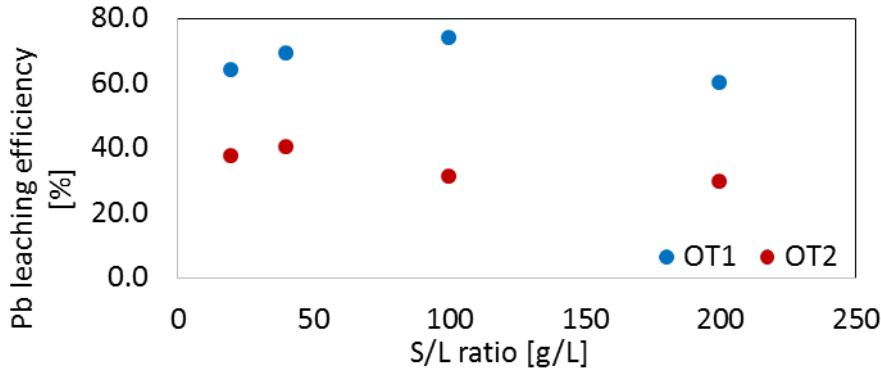
- ✓ TASK 4.1. Lab scale metals recovery and refining (Partially done)
- ✓ Subtask 4.1.1 Cu & Zn winning.
- ✓ Subtask 4.1.2 Ag & Pb and Other Metals Recovery (Partially done)
- ❑ TASK 4.2. Pilot Plant arrangement and testing (On progress)



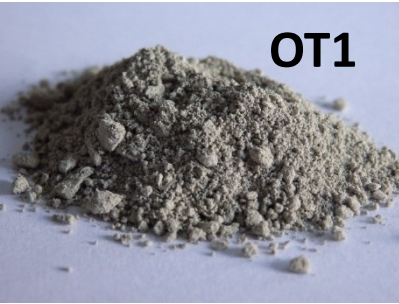
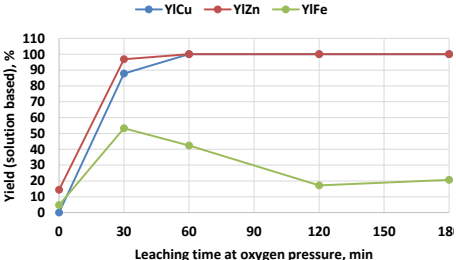
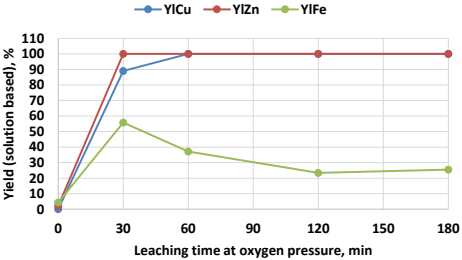
Pressure leaching reactor (autoclave)



Cu-Zn SX small scale pilot plant



OT1, OT2 – samples from leaching



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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

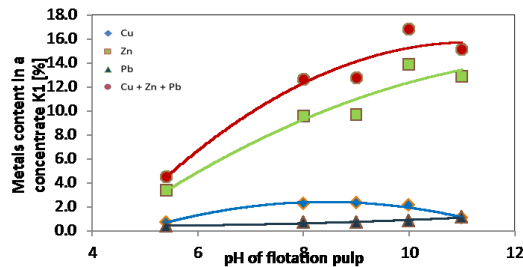


Pilot Plant Arrangements



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)



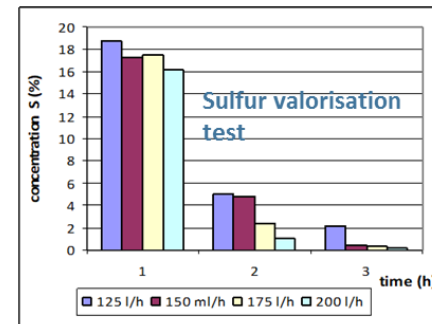
Tailings treatment



Rotary evaporator



Spray Drier



Iron recovery products



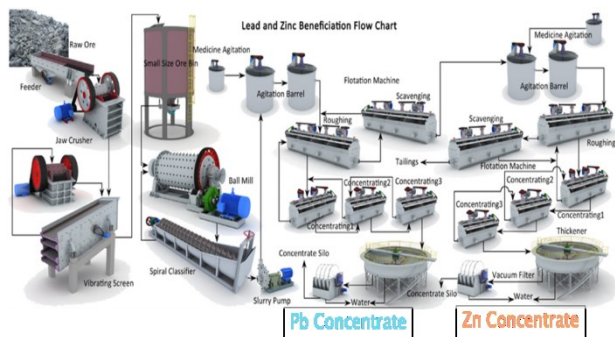
Gypsum crystals produced from acidic solution



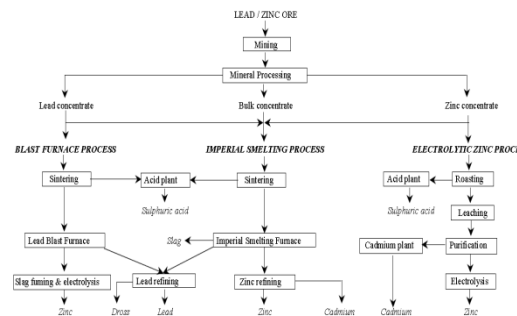
WP7. Technologies Assessment and Project Evaluation



- 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)



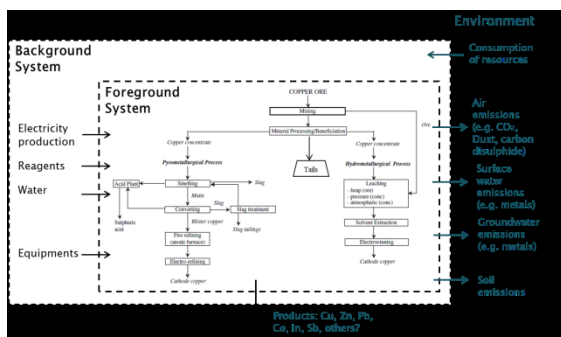
Selective Flotation Conventional Process



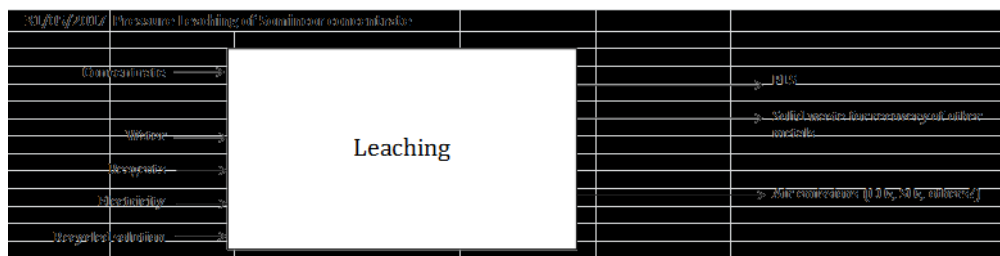
Zn/Pb metal production Conventional Process

Descripción del peligro	Descripción de consecuencias más severas sin controles	C	P	R	Controles existentes
Planta Piloto PMS					
Agentes químicos					
Agentes Químicos: exposición a vapores de concentrados de Cu, Zn, Ag (debidos a flotación selectiva o global).	Enfermedades profesionales: exposición de vapores de Reagentes para salvavidas.	4	4	16	Formación e información: exposición de vapores de Reagentes para salvavidas. Calendario anual de mantenimiento del puesto de ope

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



“The EU INTMET Project may help to exploit more efficiently and sustainably the Iberian Pyrite Belt polymetallic ores”

Francisco Sanchez, Eero Kolehmainen, Marielke Gericke, Horst Hejny
COBRE LAS CRUCES, S.A. – www.cobrelascruces.com – francisco.sanchez.r@qm1.com

ABSTRACT

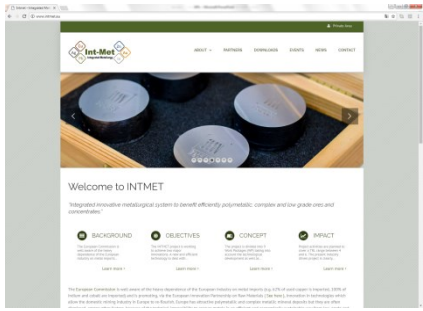
Within Horizon-2020 EU Programme, the INTMET Project was awarded in 2016 to a consortium led by Cobre Las Cruces and composed by twelve partners from seven EU countries, and including Serbia and South Africa as well.

The INTMET technological approach represents an unique breakthrough to overcome the

Mettalic Mining Hall: Inmet Project Presentation 19th October 2017



Social Media News



Website: WWW.INTMET.EU



Meeting with Bor (Serbia) Major (Feb-2018)



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WP9. Management



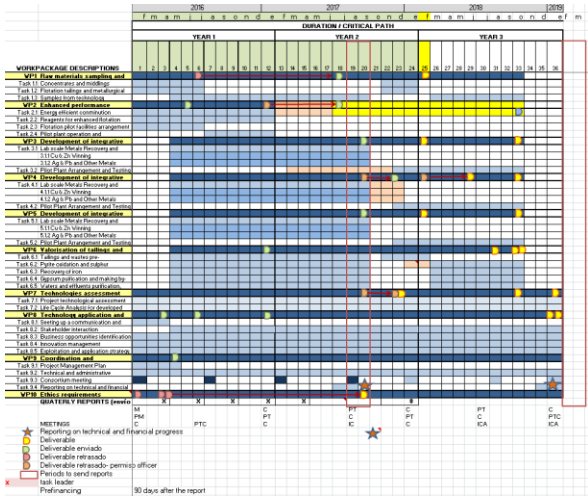
- ✓ Task 9.1 Project Management Plan
- ❑ Task 9.2 Technical and administrative assistance to project partners (ongoing)
- ❑ Task 9.3. Consortium meetings (ongoing)
- ❑ Task 9.4 Reporting on technical and financial progress (ongoing)



RESEARCH & INNOVATION
HORIZON 2020

PERIODIC REPORT

Grant Agreement number:	689515
Project acronym:	INTMET
Project title:	Integrated innovative metallurgical system to benefit efficiently polymetallic, complex and low grade ores and concentrates
Start date of the project:	1 February 2016
Duration of the project:	36 months
Period covered by the report:	from 1 February 2016 to 31 July 2017
Periodic report:	1st
Date of submission of the periodic report:	10 November 2017
Version:	1
Project website address:	http://www.intmet.eu
The report is elaborated on the basis of the:	Original Grant Agreement



Our project INTMET was made possible thanks to #H2020 funding

€30 billion is still available in the 2018-20 Work Programme!

#InvestEUresearch



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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 assesment 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 Assesstment and Life Cycle Assesstment of the developed technologies .
- ❑ In WP8: Stakeholder interaction, Business opportunities identification, Exploitation strategy
- ❑ In WP9: Project Management



