INTMET PROJECT

SUCCESSFUL DEVELOPMENTS DURING THE FIRST 18 MONTHS

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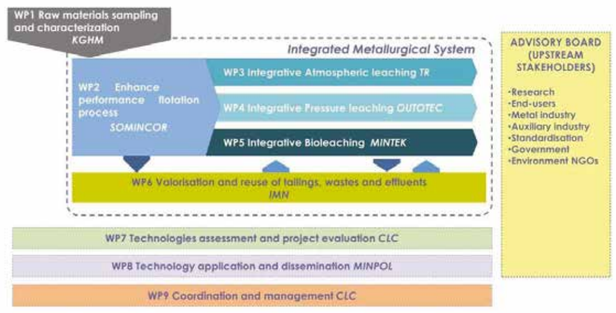
Currently there is no economical and viable process for on-site metal extraction from Low Grade, Complex or Poly-metallic deposits, and even more, there is not any industrial process or technology able to deal with polymetallic or bulk concentrates containing Cu+Zn+Pb base metals and also precious metals.

Main objective of INTMET is applying an **on-site M2M and integrated treatment of the produced concentrates**, combining innovative **hydrometallurgical processes** (atmospheric, pressure and bioleaching), and **novel more effective metals extraction techniques** (e.g. Cu/Zn-SX-EW, chloride media, MSA, etc). Additionally, **secondary materials** like mining (tailings) and metallurgical wastes will be added to the process for valorisation and metal recovery.

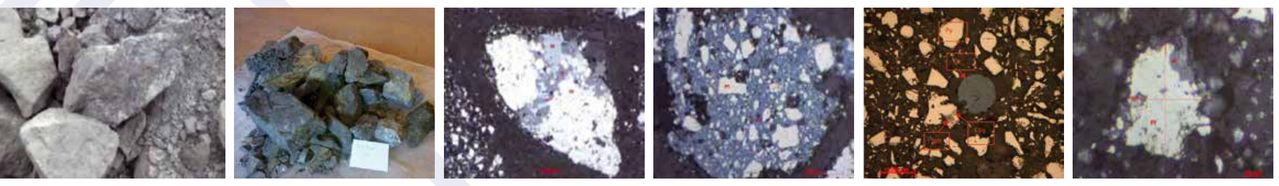


The technical, environmental and economic feasibility of the entire approaches will be integrated to offer a real business solution. The final goal will be to ensure the economic viability of the entire INTMET process.

In this poster we are presenting a brief summary of the project status after 18 months of experimental works.

WP 1: RAW MATERIALS SAMPLING AND CHARACTERIZATION

Four materials obtained from mineral deposits from CLC, KGHM, BOR and Somincor were sampled and characterized. These included polymetallic ores and concentrates, complex or low grade copper ores and concentrates and pyrite concentrates. In this work package the delivery of samples for experimental testing was also coordinated.



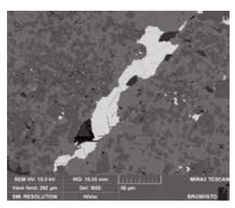
Pictures of samples to be characterized and metallographic image analysis

WP 2: ENHANCED PERFORMANCE FLOTATION PROCESS

WP2 is devoted to developing the necessary technology for bulk concentrate production, and at the same time providing samples for lab scale and pilot testing to be done in work packages 3, 4, 5 and 6. Main areas of activity within this work package are devoted to comminution and flotation improvements and finally production of samples from the developed processes.

Newly developed flotation reagents and microwave techniques have also been applied during experimental work period. In addition to the lab scale experiments to optimise the flotation process, pilot plants have been developed and used to confirm results and produce samples for further testing activities.

Sulphide Flotation



Microwave affection to mineral

Ore feed system

Grinding mill

Flotation Pilot plant arrangement and Testing

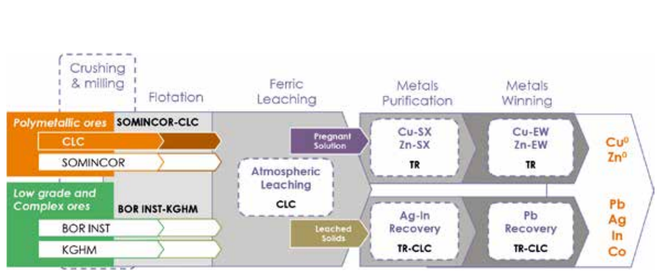
WP 3: DEVELOPMENT OF INTEGRATIVE ATMOSPHERIC LEACHING PROCESS

Atmospheric leaching applied on bulk concentrates or middlings is one of the key technologies proposed in the INTMET project as one of the promising technology for efficient metals recovery of deposits that contains low grade, complex and poly-metallic ores. Obtained results at lab and pilot scale have showed high recoveries as expected at the beginning of the project.

TR: Countercurrent test for copper SX al lab

CLC: Atmospheric leaching test al lab

CLC: Atmospheric leaching pilot plant design, commissioning, start up, running & fine tunning. PLS & leaching residue samples produced

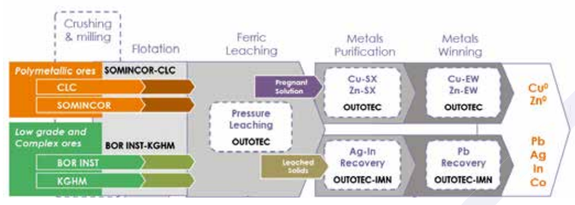


ATMOSPHERIC LEACHING PROCESS FOR LAB SCALE METALS RECOVERY AND REFINING AND PILOT TESTING

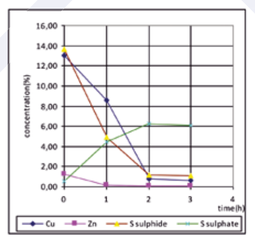
WP 4: DEVELOPMENT OF INTEGRATIVE PRESSURE LEACHING PROCESS

High temperature pressure oxidation is a well proven process for Ni, Au and Zn production; in addition to that currently different semi-commercial plants are developing an alternative process for Cu. In this process, the extreme conditions of pressure oxidation in an autoclave at a temperature from 135°C up to 210°C that destroy sulphides rapidly (leach time as low as 60 min) releasing base metals into solution for further recovery. INTMET project propose the use of this technology as an efficient way to recover base metals from bulk concentrates and middlings from ore. Lab results obtained during first 18M have provided very good results and are being used for the development of the future piloting research acivities.

Lab equipment used by Outotec for INTMET project



PRESSURE LEACHING PROCESS FOR LAB SCALE METALS RECOVERY AND REFINING AND PILOT TESTING



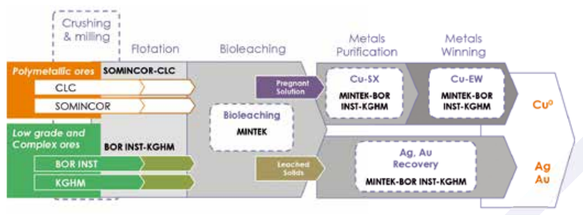
IMNR: Leaching experiments, at moderate temperatures and pressures of polymetallic concentrate from SOMINCOR, KGHM and CLC

WP 5: DEVELOPMENT OF INTEGRATIVE BIOLEACHING PROCESS

In general, bioleaching is a process described as being "the dissolution of metals from their mineral source by certain naturally occurring microorganisms". This technology is considered very promising to the project and a detailed research works have been done.

Bioleaching performance on the four polymetallic samples was assessed by means of testing and detailed steady-state mass balances.

Results indicated that thermophilic bioleach conditions would be required to achieve acceptable Cu and Zn recoveries on three of the samples, whereas high Cu extractions could be achieved on the other sample at moderate temperatures.



BIOLEACHING PROCESS FOR LAB SCALE METALS RECOVERY AND REFINING AND PILOT TESTING

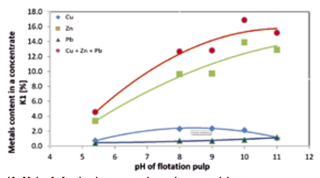
Continuous bioleaching at Mintek of the IRM-Bor, Somincor, KGHM (Lubin) and CLC feed materials

Cultivation of local bacterial cultures at BOR

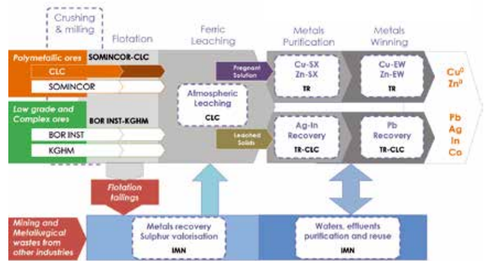
WP 6: VALORISATION OF TAILINGS, WASTES AND EFFLUENTS

The project states to limit the amount of wastes and effluents by valorising these streams using best tailored techniques. Flotation tailings are processed to produce a new collective concentrate that can be used in hydrometallurgical industry. Pyrite is oxidized to valorise sulphur in form of potassium sulphate and produce iron that meets requirements of ferrous metallurgy. Wash sulphuric acids are planned to be converted into gypsum of a commercial grade. Other effluents will be purified, recycled and reused using fractional precipitation, adsorption and ion exchange techniques to fulfil restricted environmental standards of EU and satisfy project assumptions.

AGQ: Samples before and after treatment



IMN: Metals content vs pH



VALORISATION OF TAILINGS, WASTES AND EFFLUENTS

IMNR: Potassium sulphate obtained from mining wates

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