INTMET

INTEGRATED METALLURGY FOR POLYMETALLIC, COMPLEX AND LOW GRADE ORES AND CONCENTRATES

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WORK PACKAGE 1: RAW MATERIALS SAMPLING AND CHARACTERIZATION

OBJECTIVES

The main objective of WP1 is to collect and characterize primary and secondary raw materials samples to be studied and tested.

The primary raw materials include ores, concentrates and middling materials and are provided by the mining partners:

- polymetallic ores and concentrates by SOMINCOR, CLC and BOR INST;
- complex or low-grade ores, concentrates and middlings by KGHM and BOR INST.
- The secondary raw materials include flotation tailings and metallurgical wastes provide by the mining partners.

1: MAIN RESULTS

TASK 1.1 ORES, CONCENTRATES AND MIDDLINGS SAMPLES COLLECTION AND CHARACTERIZATION

The collected primary raw materials were characterized by next techniques:

- Chemical analysis (XRF, ICP- OES, ICP-MS)
- Mineralogical analysis (optical microscopy)
- Model analysis (Optical mineralogy QEMSCAN)
- Mineral geochemistry (SEM and EMPA)

TASK 1.2 FLOTATION TAILINGS AND METELLURGICAL WASTES COLLECTION AND CHARACTERISATION

The characterisation of those secondary raw materials mainly included the techniques:

- Chemical analysis
- Mineralogical analysis

TASK 1.3 SAMPLES FROM TECHNOLOGY DEVELOPMENTS

In order to facilitate understanding, learning and right process of the diverse technologies development within IntMet project, it is necessary to make characterisation of some samples produced in specific tests, for example:

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

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The characterisation of those secondary raw materials will mainly included the techniques:

- Chemical analysis
- Mineralogical analysis
- SEM analysis

FIGURE 1 - THE OVERVIEW OF CLC DEPOSIT AND SAMPLE COLLECTION.

FIGURE 2 - OVERVIEW OF BOBIJA MINE AND USED SAMPLING METHOD

As a result of the work performed in WP1, materials delivered by CLC, KGHM, BOR and Somincor were collected, tested and characterized. The results show that similar level of copper can be found in CLC ROM (~1%) and KGHM ROM (~1.2%) the amount of other metals is varied. Lead content in CLC material is ca. 15 time higher (2.4% instead of 0.16% for KGHM), zinc content is 3.35% and lower than 0.05% for CLC and KGHM, respectively. Almost 20 times higher antimony content can be observed in CLC material and only 3 times bigger value of cobalt. In both materials the same silver amount was observed i.e. 0.0057%.

All concentrates, i.e. the polymetallic from CLC, Somincor and BOR as well as low grade from KGHM, were thoroughly analyzed to determine their elemental composition. Mostly, 15 elements were analyzed, which was sufficient for further research. In one case analysis covered more than 30 elements to show the precision of assumed methodologies. X-ray powder diffraction with microscopic techniques allowed to evaluate differences between materials with respect to their mineralogy. BOR and CLC have very similar Cu content (~1.8%), tripled value was obtained for Somincor (5.2%), while the highest (13%) for material from KGHM. The highest Fe content was found in CLC (38%), also in Somincor (29%) and BOR concentrate (23%) these value were high. On the contrary KGHM concentrate has about 8% Fe. Zn and Pb content were as follows: 5.8% and 3.6%; 4.6% and 4.6%; 9.1% and 14.8%; 1.1% and 4.6%, respectively for CLC, BOR, Somincor and KGHM. The highest Ag content was found in KGHM material circa 640 ppm and only 85 ppm in the CLC one.

CLC material was mainly composed of pyrite (80%) with some sphalerite and chalcopyrite. BOR consisted of 45% pyrite, 25% barite and also sphalerite, galena and waste (11%). Somincor cointained 54% pyrite and almost equal (~15%) galena, sphalerite and chalcopyrite. Analysis of KGHM material showed 10% pyrite, ~20% bornite, ~20%dolomite, 9% rectorite and 14% quartz.