MSCA-ETN SULTAN

European Training Network for the Remediation and Reprocessing of Sulfidic Mining Waste Sites

Geometallurgical characterization of Zn-Pb tailings in view of (near) zero-waste valorisation, Plombière, East Belgium

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Objectives and milestones

Objectives

1. Geometallurgical characterization of Plombières tailings
2. To determine the applicability of tailings
3. Comparison with the tailings from Neves Corvo and Münzbachtal

Milestones

1. 2D and 3D mineralogical and geochemical variability established for the base and critical metals
2. Availability of base, precious and critical metals for further processing established
3. Evaluation of economic feasibility of reprocessing established

Task	2019				2020				2021			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Geochemistry												
Mineralogy												
Geostatistics												
Geometallurgy												
Secondments												
Presentation and Reports												
Conferences												
Publications												
Finalising the PhD												

Table 1. Gantt chart illustrating the main tasks, objectives and deliverables of the PhD

Local geological setting of Plombière

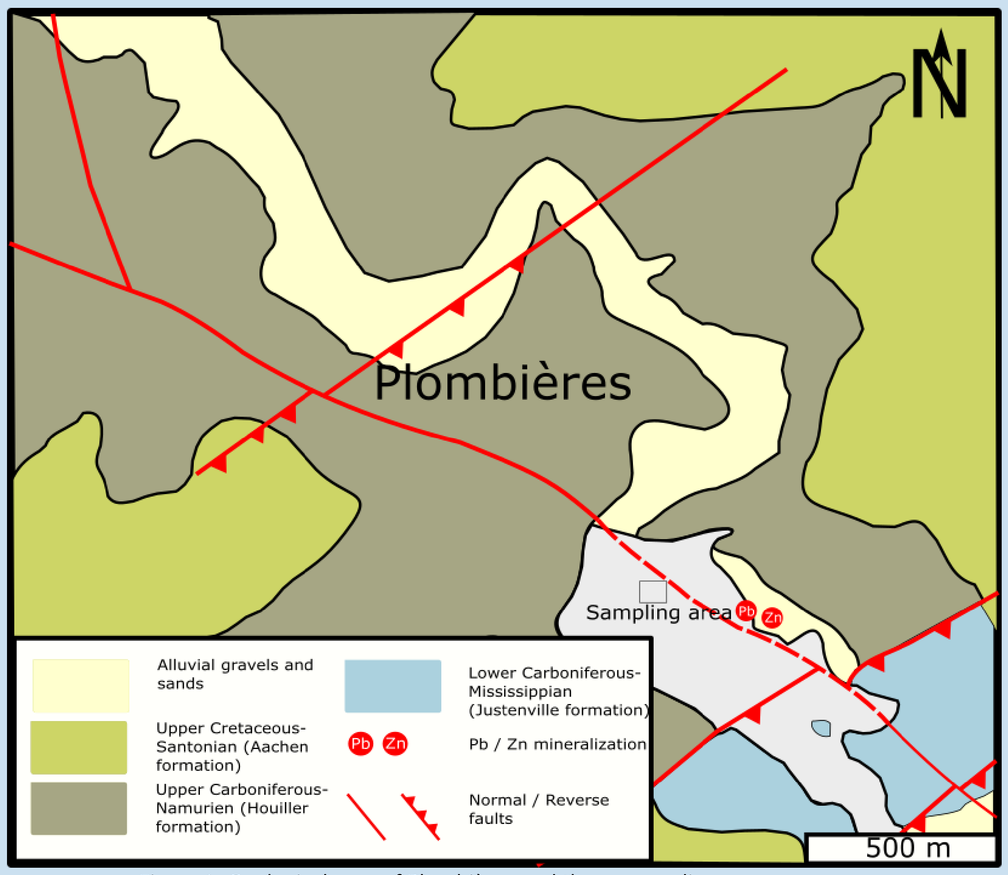

Figure 1. Geological map of Plombières and the surrounding area

Progress

1. Characterization of anthropogenic material found in Plombières is finished
2. 103 samples were measured using particle size analyzer
3. 115 samples were measured for major and trace elements, 108 are in the range of 100 ± 2%
4. 25 samples were selected for MLA analysis
5. Basic statistics data analysis on raw data is performed

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	P_2O_5	K_2O	SO_3	LOI	Pb	Zn	Ga
	%														ppm
	Soil (n = 17)														
Average	57.1	0.5	8.3	6.1	0.1	0.6	1.3	0.1	1.2	0.3	0.2	17.7	2.8	3.4	43
SD	15.1	0.1	1.7	2.0	0.1	0.2	1.1	0.2	0.3	0.2	0.2	9.9	2.6	3.8	31
	Mine waste (n = 39)														
Average	59.8	0.5	8.8	6.3	0.1	0.6	1.0	0.1	1.4	0.3	0.3	15.1	2.8	3.3	41
SD	18.2	0.1	2.5	2.8	0.1	0.2	1.0	0.2	0.3	0.1	0.3	12.3	2.6	4.7	28
	Brown tailings (n = 24)														
Average	76.0	0.6	8.4	4.4	0.1	0.5	0.7	0.3	1.7	0.2	0.2	5.2	2.0	0.8	28
SD	4.8	0.1	1.3	1.1	0.1	0.1	0.7	0.2	0.3	0.2	0.4	1.7	2.8	1.1	26
	Yellow tailings (n = 28)														
Average	77.9	0.7	8.6	3.9	0.1	0.5	0.4	0.4	1.8	0.1	0.1	4.9	0.4	0.2	20
SD	3.8	0.1	1.2	1.5	0.0	0.1	0.1	0.4	0.3	0.1	0.2	1.4	1.6	0.3	22

Table 2. Geochemical results of the different anthropogenic units identified at Plombières

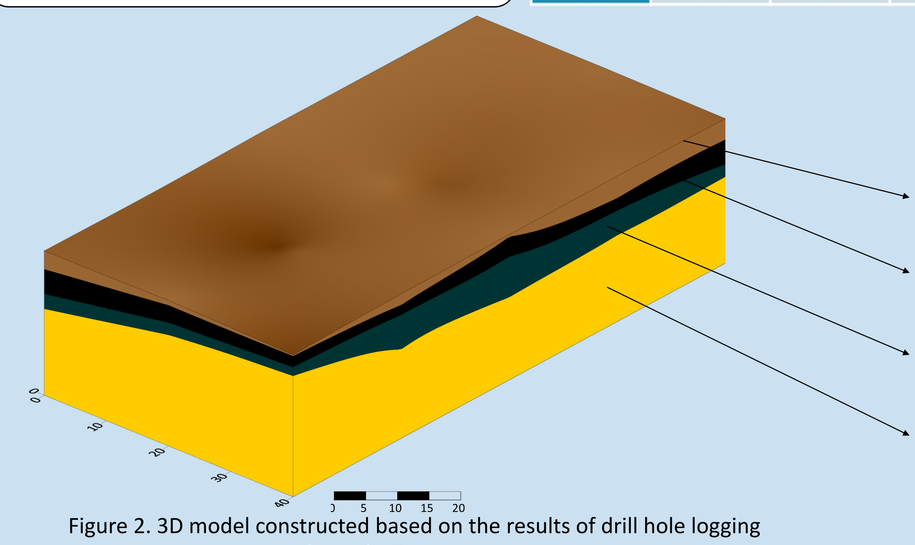

Figure 2. 3D model constructed based on the results of drill hole logging and geophysics messurments

Material	Quartz	Clays*	Fe**	Muscovite	Feldspars	Rutile	Amorph	Pb and Zn ***
Soil	46.5	3.4	0.8	9.1	10.4	1.3	23.9	0.3
Mine waste	41.7	5.5	0.9	10.8	3.6	0.6	33.1	1
Brown tailings	58.5	7.9	1.1	14.1	5.2	1.3	10.6	0.4
Yellow tailings	53.5	5.9	0.7	10	6.9	0.4	22.2	0.3

Table 3. Mineralogical results (wt %) of the different anthropogenic units identified at Plombières
*Kaolinite and Pyrophyllite ** Goethite, Lepidocrocite *** Anglesite, Cerussite and Smithsonite

Conclusion and next steps

Conclusions

1. Geochemical results of all 4 materials are similar
2. Mineralogy results are matching the geochemical results
3. Ge and In are below the detection limit

Next steps

1. Advanced statistical analysis
2. Mineral liberation (MLA) and Microprobe analysis on selected samples
3. Construction of geometallurgical model

Material				Classifiction
	Sand (%) ± 2σ	Silt (%) ± 2σ	Clay (%) ± 2σ	
Soil (n=16)	29.7 ± 14.7	57.1 ± 14.0	13.2 ± 4.4	Sandy silt
Mine waste (n=33)	32.7 ± 22.2	55.0 ± 20.3	11.8 ± 5.8	Sandy silt
Brown tailings (n=21)	18.7 ± 6.2	68.2 ± 5.6	13.1 ± 2.4	Sandy silt
Yellow tailings (n=33)	16.8 ± 5.1	69.8 ± 5.5	13.7 ± 2.8	Sandy silt

Table 4. Grain size analysis of different anthropogenic units identified at Plombières

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