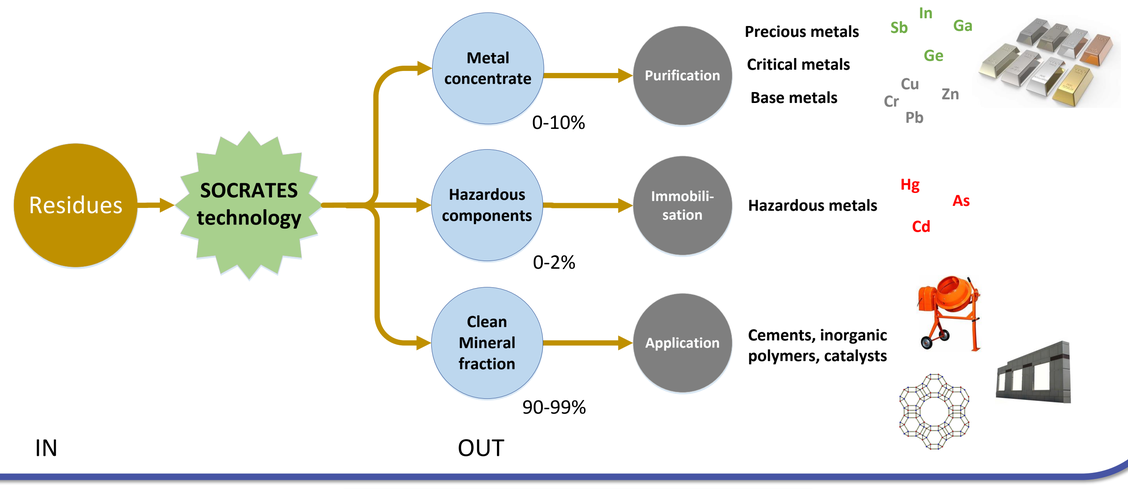
SOCRATES

Zero Waste

EU MSCA-ETN

The Project

The SOCRATES project targets metallurgical processes, including plasma-, bio-, solvo-, electro- and ionometallurgy for the treatment of industrial process residues, that can be integrated in **environmentally friendly, near-zero-waste* valorisation flow sheets**. By unlocking the potential of these secondary raw materials, SOCRATES contributes to a **more diversified and sustainable supply chain for metals, minerals and construction raw materials.**



WP 1: Metal extraction

Extraction of metals from industrial residues by:

- Solvometallurgy using organic solvents
- Ionometallurgy using Deep Eutectic Solvents (DESs)
- Hydrometallurgy using aqueous solutions
- Plasma metallurgy (Plasma-driven fuming process)

Main goals:

- Efficient extraction
- Selectivity
- Process scalability
- Economic feasibility

WP 2: Metal recovery

Synthesis of extractants, recovery of metals from both aqueous and ionic solutions by cementation, ion exchange and electrolytic techniques. In-silico approaches to describe solvent miscibility in solvent extraction processes and to design new extractants

Main goals:

- Recovery of solid metals
- High selectivity
- Process scalability
- Economic feasibility

Fe – rich sludge dissolved in DESs

Cementation of Fe out of DES on Zn substrate

SEM image of Cu flotation tailings

Cement mortars incorporating slags

WP 4: Advanced characterisation, mapping and integrated assessment of flowsheets

- Characterisation of SOCRATES residues:
  - Elemental composition
  - Mineralogical composition
  - Distribution of phases and elements
  - Porosity
  - Oxidation state of metal ions
- Sustainability assessment of flowsheets through simulation-based approach.

WP 3: Residual matrix valorisation

- Valorisation of residues from WP1 in applications such as cements, inorganic Polymers, catalysts

Main goals:

- Valorisation of the mineral fraction of the residues, composing 90-99% of the residues.

This Project has received funding from the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721385

*Disclaimer: SOCRATES envisions to develop eco-friendly flow sheets which minimise the production of waste and/or concentrate hazardous components in specific phases that can be stored safely. Hence, SOCRATES refers to "near-zero-waste" rather than 100% zero-waste processes, which are thermodynamically infeasible.

Follow us on:

https://etn-socrates.eu