**Novelty**

- The systems approach (toolbox) to couple the individual unit operations to obtain the most cost-effective and environmentally-friendly flow sheet for a given low-grade resource.

- The development of several new metallurgical unit operations. METGROW+ demonstrates and validates the New Metallurgical Systems Toolbox for a multitude of low-grade resources in the EU.

**Impact of METGROW+**

The use and replication of the METGROW+ toolbox boosts the European mineral extractive and processing industry since it triggers the cost-effective exploitation of Europe’s domestic low-grade primary and secondary resources. The metals include both economically important and critical metals.

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METGROW+ New Metallurgical System

METGROW+ project develops technologies for extracting valuable metals from metallurgical waste and low-grade ores, from which recovery is not yet economically viable.

The research involves the development and combination of pyro-, hydro-, solvo-, electro-, iono- and biohydrometallurgical unit operations for pre-treatment, metal extraction and metal recovery, as well as final residue matrix valorisation.

The primary objective of METGROW+ is to create, demonstrate and validate an industrially viable, flexible New Metallurgical Systems Toolbox. The toolbox allows producing innovative, systems based, metallurgical solutions to recover metals and to valorise the residual matrix, while minimising energy consumption and the overall environmental footprint.

Four low-grade resource families were selected:

- Nickel-cobalt laterite deposits (Ni, Co)
- Iron-rich sludges from the zinc industry (Zn, In, Ga, Ge)
- Chromium-rich sludges (Ni, Cr)
- Fayalitic slags from non-ferrous metallurgy (Cu, Sb, Fe)

Materials were chosen as they:

- Are relatively generic for Europe
- Cover a wide range of economically important and critical metals
- Cover a wide range of mineral compositions