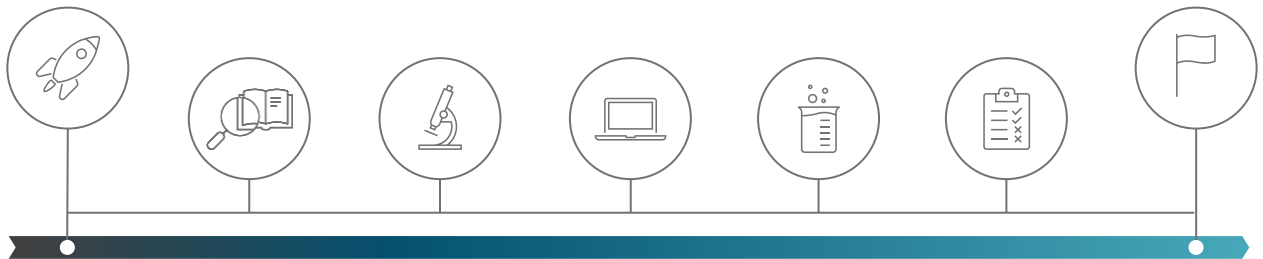




# Innovative Behandlung von metallurgischen Stäuben und Schlacken mittels Laugung und Abscheidung zur Rückgewinnung metallischer Sekundärrohstoffe



01/2023

12/2024

## MOTIVATION

Dust and slags from iron and steel production via the route Blast Furnace-Basic Oxygen Furnace (BF-BOF) or in the Electric Arc Furnace (EAF) represent valuable secondary raw materials. A global shift in thinking towards a circular economy, continuously reduced landfill capacities and considerable disposal costs are also leading to an increased interest in innovative recovery concepts for secondary raw materials. In the case of BOF slag (coming from the LD converter), an efficient separation of phosphorus as an undesired element in the steelmaking process is not yet solved. At the same time, phosphorus is classified as a critical raw material and, if appropriately recovered, could sustainably support, for example, fertilizer or battery production as valuable phosphate compounds.

INNOMET project therefore aims to optimize a recovery of valuable materials from steelmaking dusts and slags by a combination of biological leaching and downstream metal recovery (bioelectrochemical separation and fractional precipitation). Furthermore, alternative leaching processes will be explored, such as (low-melting) deep eutectic solvents to be applied for the BOF slag. The innovative aspect lies in the recycling of iron-rich fractions into the steelmaking process by energy-saving methods with simultaneous separation of the unwanted elements. Concepts to recycle iron-rich fractions into the steelmaking process will be developed and evaluated from a technical and economic point of view. In addition to the use of an iron-rich secondary material as ore substitute in a sinter plant, BF, BOF or EAF, a further nonferrous metal-rich fraction could alternatively be used in the BOF or EAF as alloying source to control the steel product quality.

## OBJECTIVES

- Combined innovative bioleaching and subsequent metal recovery to generate iron-rich secondary products and a non-ferrous metal alloy
- Use of (low-melting) deep eutectic solvents for the leaching of BOF slag from the LD-converter for a selective and energy-saving phosphorus recovery as phosphate with an interesting range of applications in steel-external industries
- Characterization and description of innovative concepts to recycle metallic secondary raw materials for a reuse in iron and steelmaking processes
- Evaluation of possible CO<sub>2</sub> reduction potentials by replacing primary iron ore for hot metal production with the derived iron-rich secondary products

## EXPECTED RESULTS

- Elaboration of two concepts to reuse metallic secondary raw materials for iron and steel production
- Optimized bioleaching process by reducing the leaching duration below 7 days and increase the substrate rate to 100 g/L
- Recovery of valuable material fractions

## INVOLVED PARTNERS



**K1-MET GmbH** is a competence centre for metallurgical and environmental process developments with a location in Leoben. It conducts research on sustainable digitalised metallurgical processes for a climate-neutral and resource-efficient society with the focus on the iron and steel industry. Regarding efficiency and circular economy, the orientation concentrates on enhancing process efficiency and product quality through analytics and the processing of raw and secondary materials.



The **Chair of Ferrous Metallurgy from Montanuniversitaet Leoben** teaches and researches in the fields of primary and secondary metallurgy. Primary metallurgical efforts being relevant for the current project rely on the processing of iron ore to hot metal or sponge iron and the further treatment to crude steel with special emphases on enhanced energy and resource efficiency as well as on emission reduction. Results are used for the enhancement of existing processes as well as the development and implementation of new technologies.



The **Chair of Process Technology and Industrial Environmental Protection from Montanuniversitaet Leoben** teaches and researches in the areas energy process engineering, fluid separations and thermal process engineering, renewable materials processing, and metallurgical process engineering. In the field of metallurgical process engineering being relevant for the current project, research work is focused among others on properties of metallurgical slags as well as on low-energy intensive ways to recover valuable materials from slags using solvent-based approaches.

### Update on dissemination activities

- *6<sup>th</sup> European Meeting of the International Society for Microbial Electrochemistry and Technology (EU-ISMET), 06.-08.09.2023, Wageningen (NED)*  
Presentation of Post-doc Sabine Spieß (K1-MET GmbH) "Coupling bioleaching and bioelectrochemistry for innovative recovery of zinc from metallurgical dusts and slags"

