COMET FACTSHEET

COMET MODULE

[**PLASMARC4GREEN** – SIMULATION, MODELLING AND MONITORING OF PLASMA AND ARC BASED PROCESSES FOR GREEN METAL PRODUCTION]

Main location: Linz (Upper Austria)
Other locations: Leoben (Styria)
Thematic area: Material & Production
(according to *www.ffg.at/comet/netzwerk)*

Thematic focuses

- Modelling the state of plasma outside of thermodynamic equilibrium, at near-electrode regions and plasma fringes at very high current densities
- Development of reliable theoretical models describing the effects of collisions and species drifts on the plasma properties
- Theoretical and experimental study of surface-plasma interactions, including electromagnetic and chemical phenomena occurring inside the near electrode region
- Development of novel in-situ measurement techniques for better process control
- Validation of simulations through metallurgical lab and pilot scale experiments
- Implementation of a Data Management Platform following FAIR data principles

Planned realisation and outcomes

The metals industry has long been recognized as one of the major contributors to greenhouse gas emissions, with carbon dioxide (CO_2) being the primary pollutant. As global demand for metals continues to increase, there is an urgent need to find innovative solutions to reduce CO_2 emissions while maintaining productivity and competitiveness. To address this issue, the development of sustainable and CO_2-neutral metal production processes is essential.

Arc plasma-based processes have shown great potential to replace fuel-based processes and will become the predominant technology for reducing CO_2 emissions in metal production. By using arc plasma technology, it is possible to increase energy efficiency and reduce the carbon footprint of metal production. However, many phenomena underlying these processes are still not well understood, and the demand for detailed models and measurement techniques giving better insight is heavily increasing.

The goal of this project is to develop simulations, modelling, and monitoring tools that can accurately predict the performance of arc plasma-based metal production processes. These tools will be used to optimize process parameters and identify potential areas for improvement, leading to more efficient and sustainable metal production.

More specifically, we will create new insights into phenomena that are still not well understood but influence the performance and effectiveness of the relevant processes to a great extent. These are, for instance, interactions of high current arcs with surrounding media like graphite electrodes or refractories as well as the influence of evaporation of the melt on the reduction efficiency of hydrogen plasma-based smelting processes. We will address these issues both with modelling techniques strictly based on fundamental physics as well as with advanced sensor technologies designed for such harsh environments. With these new findings we will be prepared and help overcome challenges that need to be tackled to reach climate neutrality until 2050 and beyond.

COMET FACTSHEET

Selected company partners (max. 10)**:**

1. Montanwerke Brixlegg AG
2. Primetals Technologies Austria GmbH
3. RHI Magnesita GmbH
4. voestalpine Stahl GmbH
5. voestalpine Stahl Donawitz GmbH

Selected scientific partners (max. 5)**:**

1. University Leoben
2. Johannes Kepler University
1. Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia
3. University Oulu
4. Max-Planck-Institut für Eisenforschung

Selected international[1] partners (max. 5)**:**

2. Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia
3. University Oulu, Finland
4. Leibniz Institute for Plasma Science and Technology (INP Greifswald), Germany
5. TU Bergakademie Freiberg, Germany
6. Max-Planck-Institut für Eisenforschung, Germany

Duration:	01.07.2024 bis 30.06.2028 (4 years)
Staff employment:	10.2 FTE, thereof 9.6 scientists
Management:	Dr. Magdalena Schatzl, Team Lead and Module Manager Dr. Christine Gruber, Manager Area 3 Simulation and Data Analyses
Contact:	K1-MET GmbH Stahlstraße 14, 4020 Linz +43 732 6989 75607 office@k1-met.com www.k1-met.com

Status 07.02.2024

The COMET Module is funded within COMET – Competence Centers for Excellent Technologies – by BMK, BMAW as well as the co-financing federal provinces Upper Austria, Styria and Tyrol. The COMET programme is managed by FFG. www.ffg.at/comet

[1] Partners with headquarters outside Austria