



eChemicles

**ELECTROLYSIS FOR
A BETTER TOMORROW!**

Topic - „An Industrial Use-case for Low-temperature CO₂ electrolysis: CO₂ utilization in iron & steel refining”.

Abstract:

To realize carbon circularity, innovative strategies for carbon dioxide (CO₂) utilization are required. One award-winning approach is low-temperature CO₂ electrolysis, which enables the conversion of CO₂ into valuable chemicals and fuels for several industries. In this presentation, eChemicles will discuss the challenges and opportunities in adapting their CO₂ electrolysis solution for the iron and steel industry.

Electrochemical CO₂ reduction not only mitigates emissions but also generates valuable products. However, current technologies struggle with energy efficiency and product selectivity. Low-temperature CO₂ electrolyzers, operating under moderate conditions, can be designed for dynamic operation and integration with renewable energy. Zero-gap cell designs enable high selectivity and industrially relevant current densities at low cell voltages, efficiently converting CO₂ into chemicals such as Carbon monoxide (CO) for direct use or syngas applications.

Carbon monoxide (CO) is a core reducing agent in iron and steelmaking, where it reacts with iron oxides to produce metallic iron in blast furnaces and direct-reduction processes. Traditionally, this CO is generated from fossil sources (coke and coal), making steel production one of the largest industrial CO₂ emitters globally. Utilizing CO produced from captured CO₂ allows steel plants to substitute fossil-derived CO with circular, low-carbon CO without fundamentally changing existing furnace infrastructure. This approach reduces net CO₂ emissions, improves carbon efficiency of blast furnace and DRI operations, and enables drop-in defossilization of hard-to-abate steel assets while maintaining process performance and reliability.

Scaling low-temperature CO₂ electrolysis requires advancement in catalysts, cell design, and system integration, supported by collaboration across academia, industry, and policy to achieve performance, stability, and economic viability for industrial carbon utilization.

