



eChemicles

**ELECTROLYSIS FOR
A BETTER TOMORROW!**

Topic - „Scaling-up low temperature CO₂ electrolysis to industrial levels”.

Abstract:

The transition to a sustainable energy landscape demands innovative solutions for carbon dioxide (CO₂) utilization. Among these, low-temperature CO₂ electrolysis has emerged as a promising pathway for converting CO₂ into valuable chemicals and fuels. During the presentation, Csaba explore the challenges and opportunities associated with scaling up CO₂ electrolysis to industrial levels.

The electrochemical reduction of CO₂ offers a dual benefit: mitigating carbon emissions and producing useful products at the same time. However, current CO₂ electrochemical reduction technologies often face limitations in energy efficiency or in selectivity of useful products. Low-temperature CO₂ electrolyzers operate at moderate temperatures and pressure, and with appropriate cell design, they are suitable for dynamic operation and integration with intermittent renewable energy sources. Zero-gap type electrolyzing cell design is one such example, the cells and cell stacks constructed in this way are able to convert carbon dioxide into a useful product for the chemical industry with high selectivity and industrially relevant current densities (for example into carbon monoxide, which can be used through the formation of syngas as additional chemical raw materials or production of fuels). Furthermore, since the two electrodes are connected through a membrane in the cell and are located close to each other, the applied voltage per cell is low, and thus the energy efficiency also shows good values for these types of cells. During scale-up, technologies similar to zero-gap CO₂ electrolyzers - such as water electrolyzer cells or fuel cells - can be integrated in a suitable way: the solutions, experiences, and production lines that have been proven there can be a significant advantage in the course of development.

Innovations in catalysts, cell design, and system integration are essential. Collaborations between academia, industry, and policymakers are vital for realizing large-scale CO₂ electrolysis. Scaling up low-temperature CO₂ electrolysis requires concerted efforts to enhance performance, stability, and economic viability. By addressing technical challenges, we can pave the way for sustainable carbon utilization on an industrial scale.

