HERIOT WATT UNIVERSITY | IMPEE Lecture Series

# From Lab Scale to Electrolyzer: Continuous CO2 electroreduction for the Production of Formic Acid and Formate


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**Abstract**: Carbon capture, utilization, and storage (CCUS) strategies are increasingly recognized as effective means to achieve carbon neutrality, while simultaneously enabling the conversion of $CO_2$ into value-added products. Among these approaches, electrochemical $CO_2$ reduction ($CO_2$RR) stands out due to its operation under mild temperature and pressure conditions and its potential to store intermittent renewable energy—such as solar or wind—in the form of chemical products like formic acid and formate. The Development of Chemical Processes and Pollution Control research group at the University of Cantabria (Spain) has been actively involved in advancing continuous $CO_2$ electroreduction to formate. Over the past years, the group has systematically investigated a wide range of cathodic and anodic electrocatalysts, as well as various electrode configurations, to optimize the performance and stability of the system. This communication presents recent advances and persistent challenges in the development of efficient continuous-flow $CO_2$ electroreduction systems, with a particular focus on the influence of the cathodic electrocatalytic area, an aspect that has been scarcely explored to date. These developments represent a significant step forward in the advancement and potential application of $CO_2$ electroreduction technologies.


**Biography**: Guillermo Díaz-Sainz completed his Ph.D. in Chemical Engineering, Energy and Processes focused on the development of processes for $CO_2$ electrocatalytic reduction to formate in 2021. He is Associate Professor in the Chemical and Biomolecular Engineering Departmen in the University of Cantabria, where his research activity and mid/long term interests are focused on the development of an innovative process for the $CO_2$ capture and photo/electrochemical conversion in products of interest, and the production of green hydrogen by electrolyzers. He has co-supervised three doctoral theses on $CO_2$ (photo)electroreduction to value-added products and has participated in over 20 international, national, and regional research projects, serving as principal investigator in several. To date, he has authored more than 30 scientific articles in high-impact journals.

**Date: December 10th, 2025**

**Time: 10:00-11:00**

**Location: DB1.13**