Seminar

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Wednesday, 28th February 2024, 9:00 s.t.
TU Wien (BC), 1060 Wien, Getreidemarkt 9
Seminar Room BC (Ground Floor)

Understanding Selectivity and Stability of Gas Diffusion Electrodes for CO_2 Reduction

Electrochemical CO_2 reduction (eCO_2R) is a promising pathway to convert detrimental CO_2 emissions into sustainable fuels and chemicals. To ensure the applicability of this technology, electro-catalysts need to be highly active, selective towards a desired product, and offer long-term stability. Thanks to the use of gas diffusion electrodes (GDEs) fed with gasesous CO_2, high activities can be achieved, but product selectivity and stability still need to be improved before practical applications.

In this presentation, I will show how the properties of polymeric GDE substrates play an important role in determining selectivity and stability of Cu GDEs during eCO_2R. Specifically, substrates with high hydrophobicity and small pore sizes yield GDEs showing a remarkable faradaic efficiency of ~50% for C_2H_4 and ~75% for $C_{\geq 2}$ products at 200 mA cm^{-2}. On the contrary, low hydrophobicity and large pore size substrates mainly yield GDEs that produce H_2. In addition, stability data show that, even for high hydrophobicity and small pore size substrates, a gradual shift from C_2H_4 to CH_4 to H_2 production is observed during long-term eCO_2R. These findings will be discussed in the context of CO_2 mass transport limitation and their dependence on GDE substrate properties. Lastly, I will present our development of a comprehensive analytical system for eCO_2R that combines complex electrochemical protocols, online gas and liquid product analysis, temperature, pressure, and gas flow data. This hardware is coupled with an open-source data pipeline that performs automated, transparent data analysis, enabling us to run 8 parallel electrochemical cells simultaneously

All interested colleagues are welcome to this seminar lecture
(45 min. presentation followed by discussion).

Günther Rupprechter
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