Extra Session of Focus Materialchemie – Tuesday, **23.01.2024** 11:00 – @ Seminarraum Lehar 03 (TU-Wien, Getreidemarkt 9, BC, OG. 03) – join us on ZOOM (ID: 983 0066 2349)

Dynamic catalysts to improve eCO_2RR efficiency: Tandem Electrocatalysis vs Direct Carbonate Reduction.

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The electroreduction of CO_2 driven by renewable electricity is a sustainable way to store energy by generation of synthetic fuels. Copper is one of the most promising pure metals for generation of multicarbon products [1]. However, the variety of product distributions is not easily controllable, which makes necessary a high understanding of the reaction mechanisms to improve the catalyst performance. One of the challenges in CO_2 electroreduction reaction (eCO_2RR) on Cu is the rapid reaction of dissolved CO_2 with hydroxide (OH^-) to form carbonates (CO_3^{2-}), which compromises the efficiency of the catalyst [2]. To bypass the carbonate formation the tandem catalyst approach has showed high selectivity towards C_{2+} products by decoupling the reaction into two steps, CO_2-to-CO and CO-to-C_{2+}[3]. For this reason, we aim to achieve a better understanding of CO producing catalysts such as atomically precise gold nanoclusters, focusing on the different features that can tune their selectivity. Moreover, we found an alternative by applying a dynamic operation approach that can turn inert CO_3^{2-} into reactive. Herein, we combined Raman spectroscopy and DFT simulations to disclose a pulse potential enhanced pathway for direct carbonate reduction to formate during eCO_2RR on a Cu catalyst [4]. Thus, this prove of concept opens the possibility of reducing these CO_3^{2-} species and improving the eCO_2RR efficiency.

References

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