

## MSc thesis project: "Tackling Chlorine Evolution in Acidic Seawater Electrolysis: Towards Enhanced Anodic Performance"

### Background

Direct seawater electrolysis for hydrogen generation is a promising option for advancing the transition to non-fossil-based fuels by utilizing one of the most abundant and accessible resources. While seawater offers the significant advantage of preserving potable water for human consumption, it also presents technical challenges, such as the well-documented competition at the anode between the undesirable chlorine evolution reaction (CER) and the desired oxygen evolution reaction (OER). In light of this, the primary focus of this research is to address the anode side by implementing a coating that helps to prevent CER.

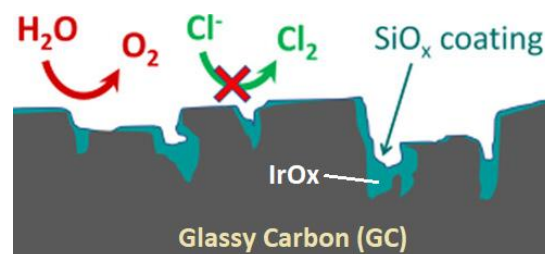


Figure 1.  $\text{SiO}_2$  overlayer to enhance  $\text{O}_2$  selectivity.  
Adapted from Vos et al. [1]

### Proposal

This project involves applying a protective coating on a catalyst using an advanced deposition technique. Starting with a standard method for growing the coating, the aim is to determine how to improve the selectivity. Comparative tests will be conducted to evaluate the coating's effect on the catalyst's behavior. Additionally, advanced analysis techniques will be used to study changes in the catalyst's surface and chemical properties.

### Contact information:

Those interested in this master's end project should contact your daily supervisor, Ph.D. Candidate Katherine Encalada ([K.S.EncaladaFlores@tudelft.nl](mailto:K.S.EncaladaFlores@tudelft.nl)). Your main supervisors will be either Dr. Ruud Kortlever or Professor dr. Ruud van Ommen.

### References:

- [1] J. G. Vos, A. A. Bhardwaj, A. W. Jeremiasse, D. V. Esposito, and M. T. M. Koper, "Probing the Electrode Composition and Morphology on the Effectiveness of Silicon Oxide Overlayers to Enhance Selective Oxygen Evolution in the Presence of Chloride Ions," *J. Phys. Chem. C*, vol. 126, no. 48, pp. 20314–20325, Dec. 2022, doi: 10.1021/acs.jpcc.2c07116.
- [2] J. G. Vos, T. A. Wezendonk, A. W. Jeremiasse, and M. T. M. Koper, " $\text{MnO}_x/\text{IrO}_x$  as Selective Oxygen Evolution Electrocatalyst in Acidic Chloride Solution," *J. Am. Chem. Soc.*, vol. 140, no. 32, pp. 10270–10281, Aug. 2018, doi: 10.1021/jacs.8b05382.