**MSc Project** Posted on: 27-05-2024

## Gas-liquid phase distribution and $O_2$ mass transport in GDE

### Motivation and background

Reducing greenhouse gas emissions while producing fuels and value-added chemicals requires transforming petrochemical plants toward sustainability. Electrochemical $CO_2$ reduction – converting $CO_2$ into useful chemicals – is one of the technologies aiding this transition.

Mass transport resistances are the major barrier to achieving high current densities in $CO_2$ electrolyzers. Condensed water in the gas diffusion electrode (GDE), reduces species transport to the catalyst surface for electrochemical reaction. Macroscale models of GDEs are limited by an inability to resolve the phase distribution within the porous medium and calculate the water saturation-dependent properties. In this project, the GDE will be modeled on a microscale by using a structural geometry taken from Micro-CT. This technique can be used to develop material and design solutions to improve mass transport, which is the most critical for cell performance.

This MSc thesis project is a component of the FlexEchem project.

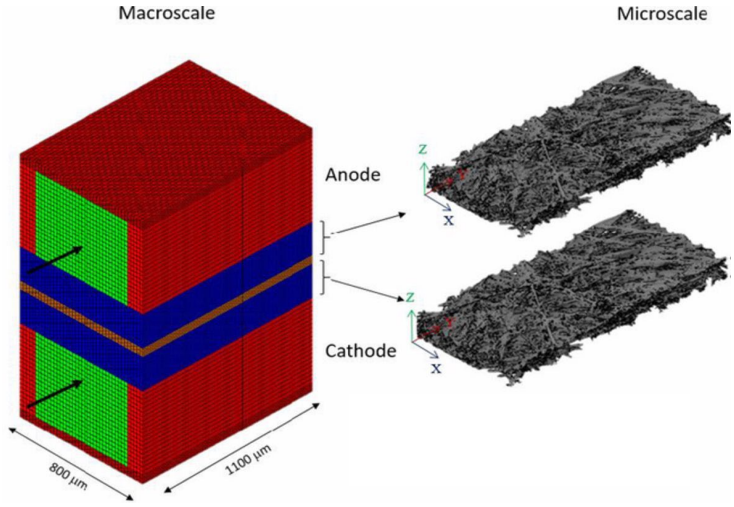


*Figure 1. Schematic of multiscale geometry.*

### Objective of MSc-research project

In this project, we aim to investigate $O_2$ mass transport in the porous GDE. The gas-liquid phase distribution in the catalyst layer and the $O_2$ transport in the dry and wet parts of the GDE will be studied through microscale modeling.

### Contact information:

If you are interested in improving your skills in modeling electrolyzers or porous medium modeling, then contact us at n.heydari@tudelft.nl. This project will be supervised by Nasim Heydari, Dr. Ankur Bordoloi, and Prof. Ruud van Ommen.