Contribution ID: **32** Type: **Oral Presentation**

How does the structure of a gas diffusion layer control the performance of fuel cells

Friday, 4 June 2021 10:40 (15 minutes)

Gas diffusion layer (GDL) is one of the components in PEM fuel cells. The performance of PEM fuel cells is affected by the transport loss which is due to the complex two-phase flow of gas-liquid in the GDL and gas channel. In this presentation, we show how ordered structures for GDLs can improve the performance of fuel cells.
Water management within fuel cell porous transport layers is a key challenge for improving performance. When liquid water accumulates at a high current density, the oxygen diffusion resistance is increased. Additionally, we present the effect of GDL, microporous layer (MPL) and gas channel (GC) structure on the liquid water percolation and detachment in the channel.

Dynamic two-phase flow simulations have been performed using OpenFOAM® with the Volume of Fluid (VoF) method to evaluate the water distribution in 2D and 3D ordered and disordered porous media. This study highlights the importance of pore morphology in improving two-phase flow dynamics. The simulation approach was compared to x-ray micro-computed tomography data of water injected into a GDL with detachment in the channel, which showed a high level of agreement. The effects of GDL pore morphology, defects in the MPL, and interaction between GDL and GC on the water dynamics in the system have been studied.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

Daniel Niblett, Adrian Mularczyk, Vahid Niasar, Jens Eller, Stuart Holmes, Two-phase flow dynamics in a gas diffusion layer - gas channel - microporous layer system, Journal of Power Sources,
Volume 471, 2020,228427

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