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Insights into capillary pressure in the GDL of operating polymer electrolyte fuel cells

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X-ray tomographic microscopy (XTM) has become a versatile tool for the analysis of the microstructure in fuel cells, lithium ion and redox flow batteries, as well as the transport processes therein. Advanced analysis tools like 3D interfacial curvature analysis have been developed to determine the capillary pressure in digital rock physics investigations [1] and were recently applied to ex-situ XTM imaging experiments of the droplet release cycle in polymer electrolyte fuel cells [2]. Within this presentation, we will give insights into the water cluster formation using operando XTM imaging at a frequency of 1 Hz from liquid water emergence at the catalyst layer –gas diffusion layer interface until liquid water breakthrough and droplet formation in the gas channel of the flow field. With the help of interfacial curvature analysis as well as volume of fluid simulations [3], it was possible to obtain information about the capillary pressure evolution in the water phase. We will explain the nuanced interactions of water volume and pressure evolution during the growth of the percolation network within the GDL and the droplet formation and comment on the observed distinct differences to ex-situ pressure evaluations.

References
[1] Q. Lin, B. Bijeljic, R. Pini, M. J. Blunt and S. Krevor, Water Resources Research, 54, (2018) 7046
[2] A. Mularczyk, Q. Lin, M. J. Blunt, A. Lamibrac, F. Marone, T. J. Schmidt, F. N. Büchi and J. Eller, Journal of The Electrochemical Society, 167, (2020) 084506
[3] D. Niblett, A. Mularczyk, V. Niasar, J. Eller and S. Holmes, Journal of Power Sources, 471, (2020) 228427

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

References

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