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Study of the Water Saturation on a PEM Fuel Cell Cathode GDL Using a Modified Buckley Leveret Method

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Fuel Cell is considered one of the promising technology which can be utilized in many different applications, such as stationary, transportation, and portable usage. One of fuel cell efficiency limitation is water flooding at the cathode gas diffusion layer (GDL) at high current densities or low operating temperatures. There are many different experimental and theoretical studies regarding this issue, yet the cathode GDL design is not settled. In this study, the Buckley-Leverett method is used to predict the transient water percolation throughout the GDL. In order to model the very slow water flow rates expected in a GDL, the Buckley-Leverett method was modified by including capillary pressure effects. This modified Buckley-Leverett method has the advances of predicting the transient response of the water percolation inside the GDL as well as the maximum and minimum level of water saturation. Predictions of water saturation level using the modified Buckley-Leverett method show a good agreement with existing models and ex-situ experimental observations.

References

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Primary author: ALOFARI, Karrar

Co-author: Dr MEDICI, Ezequiel

Presenter: ALOFARI, Karrar

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