

Mathematical Modeling of the Water Bridge Formation in Porous Media: PEMFC Microchannels

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Abstract : The static and dynamic formation of liquid water bridges is analyzed using a combination of visualization experiments in a microchannel with a mathematical model. This paper presents experimental and theoretical findings of water plug/capillary bridge formation in a 250 μm squared microchannel. The approach combines mathematical and numerical modeling with experimental visualization and measurements. The generality of the model is also illustrated for flow conditions encountered in manipulation of polymeric materials and formation of liquid bridges between patterned surfaces. The predictions of the model agree favorably the observations as well as with the experimental recordings.

Keywords : green energy, mathematical modeling, fuel cell, water plug, gas diffusion layer, surface of revolution

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