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The effects of water accumulation at the interface between gas diffusion layer and gas supplying channel on the water distribution in polymer electrolyte membrane fuel cells

Donggun Ko ^a, Ho Jae Kwak ^a, Moo Hwan Kim ^{a,b,*}

^a Department of Mechanical Engineering, Pohang University of Science and Technology (POSTECH), 77, Cheongam-ro, Nam-gu, Pohang-si, Gyeongsangbuk-do, Republic of Korea

^b Division of Advance Nuclear Engineering, Pohang University of Science and Technology (POSTECH), 77, Cheongam-ro, Nam-gu, Pohang-si, Gyeongsangbuk-do, Republic of Korea

HIGHLIGHTS

- Water accumulation at the interface GDL and gas supplying channel is visualized and analyzed quantitatively.
- The relation between water accumulation at the interface and water distribution in PEMFC is analyzed quantitatively.
- The criterion of water accumulation at the interface that can affect the water distribution in PEMFC is proposed.
- The water distribution in PEMFC should be investigated not based on the steady state concept but based on the cyclic process.

ARTICLE INFO

Article history:

Received 9 February 2019

Received in revised form

31 March 2019

Accepted 24 July 2019

Available online 21 August 2019

Keywords:

Polymer electrolyte membrane fuel cell

Water distribution

Water accumulation

X-ray

ABSTRACT

The effects of water accumulation at the interface of gas diffusion layer (GDL) and gas supplying channel on the water distribution in polymer electrolyte membrane fuel cells (PEMFCs) is analyzed. The amount of water at the interface and in the GDL are quantified using X-ray. Quantitative analyses show that the value of the criterion of water accumulation that can affect the water distribution is in the water saturation range of 0.22–0.24. The amount of water in the GDL increases with the water accumulated at the beginning of the water generation cycle. However, it remains constant after the water accumulation exceeds a criterion value. The result shows that the water accumulation at the interface should be investigated to understand the water distribution in PEMFC. The water distribution in PEMFC cannot be analyzed based on the steady state concept but can be analyzed based on the concept of cyclic process.

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* Corresponding author. Department of Mechanical Engineering, Pohang University of Science and Technology (POSTECH), 77, Cheongam-ro, Nam-gu, Pohang-si, Gyeongsangbuk-do, Republic of Korea.

E-mail addresses: kdg9036@gmail.com (D. Ko), thecreated@postech.ac.kr (H.J. Kwak), mhkim@postech.ac.kr (M.H. Kim).

<https://doi.org/10.1016/j.ijhydene.2019.07.186>

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