### Accepted Manuscript

A practical method for measuring the true hydroxide conductivity of anion exchange membranes

electrochemistry communications

Additional of Selections

Additional

Noga Ziv, Dario R. Dekel

PII: S1388-2481(18)30028-6

DOI: https://doi.org/10.1016/j.elecom.2018.01.021

Reference: ELECOM 6146

To appear in: Electrochemistry Communications

Received date: 19 January 2018 Revised date: 30 January 2018 Accepted date: 31 January 2018

Please cite this article as: Noga Ziv, Dario R. Dekel, A practical method for measuring the true hydroxide conductivity of anion exchange membranes. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Elecom(2017), https://doi.org/10.1016/j.elecom.2018.01.021

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## **ACCEPTED MANUSCRIPT**

# A practical method for measuring the true hydroxide conductivity of anion exchange membranes

Noga Ziv and Dario R. Dekel\*

The Wolfson Department of Chemical Engineering and the Nancy & Stephan Grand Technion Energy Program (GTEP), Technion – Israel Institute of Technology, Haifa 3200003, Israel

#### **Abstract**

Hydroxide ions in anion exchange membranes (AEMs) are quickly exchanged for larger and less mobile anions (CO<sub>3</sub><sup>2</sup> and HCO<sub>3</sub><sup>-</sup>) when the membrane is exposed to ambient air. Therefore, reported conductivity values of AEMs in hydroxide form are difficult to reproduce, and existing conductivity measurement techniques are not always reliable. Up to now, comparison of reported data for the hydroxide conductivity of different membranes has not been possible because tests have been performed not just with different anions, but also under different conditions and using different methods. In this work we present a practical and reproducible ex situ method for measuring the true value of the hydroxide conductivity of AEMs.

**Keywords:** anion exchange membrane; CO<sub>2</sub>; carbonation; ambient air; ionic conductivity; hydroxide conductivity

\*Corresponding author. E-mail address: dario@technion.ac.il

#### 1. Introduction

Anion exchange membrane fuel cells (AEMFCs) have attracted a lot of attention in recent years due to their potential as highly effective, clean, low-cost sources of energy [1]. In an AEMFC, hydroxide anions (OH<sup>-</sup>) are the dominant anions transported through the anion exchange membrane (AEM) from the cathode to the anode side of the cell [2].

The value of OH<sup>-</sup> conductivity is therefore critical in distinguishing between different membranes and in determining those most suitable for use in a fuel cell. However, the true OH<sup>-</sup> conductivity value is difficult to measure due to the fast reaction of OH<sup>-</sup> with  $CO_2$  (ca. 400 ppm in ambient air), which replaces OH<sup>-</sup> with larger and less mobile anions – bicarbonate (HCO<sub>3</sub><sup>-</sup>) and carbonate (CO<sub>3</sub><sup>2-</sup>) (see reactions (1) and (2)) [3,4].

$$OH^- + CO_2 \rightleftarrows HCO_3^-$$
 (1)

$$OH^- + HCO_3^- \rightleftarrows CO_3^{2^-} + H_2O$$
 (2)

#### Download English Version:

## https://daneshyari.com/en/article/6600938

Download Persian Version:

https://daneshyari.com/article/6600938

<u>Daneshyari.com</u>