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Ulrike Krewer, Christine Weinzierl, Noga Ziv, Dario R. Dekel



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# Impact of Carbonation Processes in Anion Exchange Membrane Fuel Cells

Ulrike Krewer<sup>a,1,\*</sup>, Christine Weinzierl<sup>a,1</sup>, Noga Ziv<sup>b</sup>, Dario R. Dekel<sup>b</sup>

<sup>a</sup>*TU Braunschweig, Institute of Energy and Process Systems Engineering,  
Franz-Liszt-Str. 35, 38106 Braunschweig, Germany*

<sup>b</sup>*The Wolfson Department of Chemical Engineering and the Nancy & Stephan Grand  
Technion Energy Program (GTEP), Technion, Israel Institute of Technology, Haifa  
3200003, Israel*

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## Abstract

Alkaline anion exchange membrane fuel cell (AEMFC) is a promising technology to replace precious metals used today as fuel cell catalysts. However, AEMFC does not yet demonstrate high performance when running on ambient air where they are exposed to CO<sub>2</sub>. The resulting carbonation reaction reduces membrane conductivity. This paper analyses and quantifies the effect of CO<sub>2</sub> from ambient air on the concentration profiles in the membrane and the anode and, thus, assesses the CO<sub>2</sub> impact on fuel cell performance. The physico-chemical model contains chemical and electrochemical reactions, liquid-gas phase equilibria as well as the transport processes in the cell. Results imply that a significant part of fed CO<sub>2</sub> is absorbed in the cathode and is transported as carbonate ions to the anode. Concentration profiles in the membrane reveal an enrichment zone of CO<sub>2</sub> in the membrane close to the anode, negligible HCO<sub>3</sub><sup>-</sup> and a wide distribution of CO<sub>3</sub><sup>2-</sup> across the mem-

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\*Corresponding author; Tel.: +49 (0)531-391-3030; fax.: +49 (0)531-391-5932

*Email address:* u.krewer@tu-braunschweig.de (Ulrike Krewer)

<sup>1</sup>Both authors contributed equally to this work

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