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Impact of Carbonation Processes in Anion Exchange Membrane Fuel Cells

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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_2. The resulting carbonation reaction reduces membrane conductivity. This paper analyses and quantifies the effect of CO_2 from ambient air on the concentration profiles in the membrane and the anode and, thus, assesses the CO_2 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_2 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_2 in the membrane close to the anode, negligible HCO_3^- and a wide distribution of CO_3^{2-} across the mem-

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