

Accepted Manuscript

Study of the Effect of Temperature on Pt Dissolution in PEM Fuel Cells Via Accelerated Stress Tests

S.R. Dhanushkodi, S. Kundu, M.W. Fowler, M.D. Pritzker



PII: S0378-7753(13)01195-6

DOI: [10.1016/j.jpowsour.2013.07.016](https://doi.org/10.1016/j.jpowsour.2013.07.016)

Reference: POWER 17709

To appear in: *Journal of Power Sources*

Received Date: 19 March 2013

Revised Date: 2 July 2013

Accepted Date: 3 July 2013

Please cite this article as: S.R. Dhanushkodi, S. Kundu, M.W. Fowler, M.D. Pritzker, Study of the Effect of Temperature on Pt Dissolution in PEM Fuel Cells Via Accelerated Stress Tests, *Journal of Power Sources* (2013), doi: 10.1016/j.jpowsour.2013.07.016.

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.

Study of the Effect of Temperature on Pt Dissolution in PEM Fuel Cells Via Accelerated Stress Tests

S.R. Dhanushkodi^{1,2}, S. Kundu², M.W. Fowler^{1,*} and M.D. Pritzker¹

¹Department of Chemical Engineering, University of Waterloo, Waterloo, Ontario, Canada N2G 3G1

²Automotive Fuel Cell Cooperation, 9000 Glenlyon Parkway, Burnaby, British Columbia, Canada V5J 5J8

*corresponding author e-mail: mfowler@uwaterloo.ca

Abstract

Operation of polymer electrolyte membrane fuel cells (PEMFC) at higher cell temperatures accelerates Pt dissolution in the catalyst layer. In this study, a Pt dissolution accelerated stress testing protocol involving the application of a potentiostatic square-wave with 3s at 0.6 V followed by 3s at 1.0 V was developed to test fuel cell membrane electrode assemblies (MEAs). The use of this Pt dissolution protocol at three different temperatures (40°C, 60°C and 80°C) was investigated for the same membrane electrode assembly composition. Impedance analysis of the membrane electrode assemblies showed an increase in polarization resistance during the course of the accelerated stress testing. Polarization analysis and electrochemical active surface area (ECSA) loss measurements revealed evidence of increased cathode catalyst layer (CCL) degradation due to Pt dissolution and deposition in the membrane as the cell temperature was raised. Scanning electron microscope (SEM) images confirmed the formation of Pt bands in the membrane. A diagnostic expression was developed to estimate kinetic losses due to oxygen reduction using the effective platinum surface area (EPSA) estimated from cyclic voltammograms. The results indicated that performance degradation occurred mainly due to Pt loss.

Key words: accelerated stress testing, fuel cell catalyst, durability, voltage loss analysis, electrochemical surface area

Download English Version:

<https://daneshyari.com/en/article/7738932>

Download Persian Version:

<https://daneshyari.com/article/7738932>

[Daneshyari.com](https://daneshyari.com)