
Corrosion, Passivity, and Energy: A Symposium in Honor of Digby D. Macdonald

Editors:

M. Urquidi-Macdonald

The Pennsylvania State University
State College, Pennsylvania, USA
and Center of Research Excellence in Corrosion
King Fahd University of Petroleum and Minerals
Dhahran 31261, Saudi Arabia

C. D. Taylor

Los Alamos National Laboratory
Los Alamos, New Mexico, USA

T. Haruna

Kansai University
Suita, Osaka, Japan

Sponsoring Division:



Corrosion



Published by

The Electrochemical Society

65 South Main Street, Building D
Pennington, NJ 08534-2839, USA

tel 609 737 1902

fax 609 737 2743

www.electrochem.org

ecstransactions™

Vol. 50, No. 31

Copyright 2013 by The Electrochemical Society.
All rights reserved.

This book has been registered with Copyright Clearance Center.
For further information, please contact the Copyright Clearance Center,
Salem, Massachusetts.

Published by:

The Electrochemical Society
65 South Main Street
Pennington, New Jersey 08534-2839, USA

Telephone 609.737.1902
Fax 609.737.2743
e-mail: ecs@electrochem.org
Web: www.electrochem.org

ISSN 1938-6737 (online)
ISSN 1938-5862 (print)
ISSN 2151-2051 (cd-rom)

ISBN 978-1-62332-067-6 (Softcover)
ISBN 978-1-60768-419-0 (PDF)

Printed in the United States of America.

ECS Transactions, Volume 50, Issue 31
Corrosion, Passivity, and Energy: A Symposium in Honor of Digby D. Macdonald

Table of Contents

<i>Preface</i>	iii
----------------	-----

Chapter 1
Key Note Presentations

Could This Fuel Replace Gasoline <i>J. O. Bockris</i>	3
Birth and Death Stochastic Process in Pitting Corrosion and Stress Corrosion Cracking <i>T. Shibata</i>	13
Hydration and Structural Transformations during Titanium Anodization under Alkaline Conditions <i>P. Acevedo-Peña, J. G. Vázquez-Arenas, R. Cabrera-Sierra, L. Lartundo-Rojas, I. González</i>	21
Corrosion of Nickel and Iron Based Superalloys in High Temperature Gas Environments <i>T. K. Yeh, H. P. Chang, M. Y. Wang, J. J. Kai, T. Yuan</i>	33

Chapter 2
Passivity and Passivity Breakdown

The Semiconducting Properties and Impedance Analysis of Passive Films on Copper in Anoxic Sulfide-Containing Solutions from the Viewpoint of the Point Defect Model <i>Y. Ling, M. L. Taylor, S. Sharifiasl, D. D. Macdonald</i>	53
Determining the Coupling Current as a Means of Detecting Crevice Activity and Inhibition <i>S. K. Lee, W. Kuang, J. A. Mathews, D. D. Macdonald</i>	69

Effect of Sour Environment pH on Crack Morphology in Ultra-High Strength Drilling Steel Under Cyclic Stress <i>M. Ziomek-Moroz, J. A. Hawk, R. Thodla, F. Gui</i>	79
Dielectrostriction and Intergranular Stress Corrosion Cracking of Alloy 600 in PWR Primary Water <i>T. M. Devine</i>	91
Characterization of Repassivation Process on Fe-Cr Alloys Using Scratching Technique <i>M. Wada, A. Kawano, M. Saito, S. Fujimoto</i>	99
Effect of Galvanostatic Condition on Growth Behavior and Repassivation Potential of Crevice Corrosion of Duplex Stainless Steels <i>S. Aoki, T. Ehashi, J. Sakai</i>	105

Chapter 3 Models

Predicting the Steady State Thickness of Passive Films with the Point Defect Model in Fretting Corrosion Experiments <i>J. Geringer, M. L. Taylor, B. Normand, D. D. Macdonald</i>	115
Optimization of Impedance Models with Differential Evolution <i>M. L. Taylor, S. Sharifi, D. D. Macdonald</i>	131
Deterministic Prediction of Localized Corrosion Damage in Oil and Gas Pipelines <i>G. R. Engelhardt, R. C. Woollam, D. D. Macdonald</i>	141
Microstructure-Based Numerical Modeling of Pitting Corrosion in 316 Stainless Steel <i>N. Kota, S. M. Qidwai, A. C. Lewis, V. G. DeGiorgi</i>	155
Surface Layers in Alkaline Media: Nickel Hydrides on Metallic Nickel Electrodes <i>D. S. Hall, C. Bock, B. R. MacDougall</i>	165
Mathematical Models for Under-Deposit Corrosion in Aerated Media <i>Y. C. Chang, M. E. Orazem</i>	181

Chapter 4 Energy

Corrosion Behavior of Mild Steel Alloy A537 Used As Canister Material for Nuclear Waste Storage <i>J. Grant, D. Chidambaram</i>	199
Chloride-Induced Stress Corrosion Cracking of Austenitic Stainless Steel Used for Dry Storage of Spent Nuclear Fuel <i>T. M. Ahn, G. Oberson, S. DePaula</i>	211
Electrochemical Characterization of UNS N08367 and UNS S31603 Alloys in Presence of Chloride and Bromide Solutions <i>E. Maya Visuet, A. I. Karayan, H. C. Lopez</i>	227
Determination of Kinetic Parameters for Water Reduction on Copper <i>S. Sharifi(Asl), D. D. Macdonald</i>	241
In Situ Spectroscopic Ellipsometry and Electrochemical Studies of the Barrier Layer on Iron in Borate Buffer Solutions <i>Z. Lu, S. Sharifiasl, D. D. Macdonald</i>	251
Monitoring by an Electrochemical Integrated System the Corrosion and Antifouling Treatment on Aluminum Brass Condenser Tubes <i>M. L. Carvalho, P. Cristiani, G. Perboni</i>	267
State of Health Estimation of LiFePO ₄ /Graphite Cells <i>Y. Zhang, C. Y. Wang</i>	275
On the Stability of the Passive Film on Carbon Steel as Indicated by Electrochemical Impedance Spectroscopy <i>M. Urquidi-Macdonald, A. Almarzooqi, B. Kursten, D. D. Macdonald</i>	283

Chapter 5 Poster Session

Prediction Model for Atmospheric Stress Corrosion Cracking of Stainless Steel <i>G. Nakayama, Y. Sakakibara</i>	303
--	-----

Chapter 6

Corrosion

Electrochemical Corrosion Measurements in Supercritical Carbon Dioxide - Water Systems with and Without Membrane Coating <i>J. Beck, M. Fedkin, S. N. Lvov</i>	315
Overview of the Mg Corrosion Mechanism <i>A. Atrens</i>	335
Investigation of Zinc Dimercaptothiadiazole as a Corrosion Inhibitor for Steel <i>R. M. L. Mercado, J. Fury, M. B. Kiely, D. Buhrmaster, C. E. Miller, P. Zarras</i>	345

Chapter 7

Electrochemistry

The Palladium Hydrogen System; Corrosion Monitoring and Energy Production <i>M. C. McKubre, J. Bao, S. Crouch-Baker, P. Jayaweera, A. Sanjurjo, F. Tanzella</i>	357
12 V / Kilo-Farad Range Lead-Carbon Hybrid Ultracapacitors and Their Envisaged Applications <i>A. K. Shukla, A. Banerjee, A. Jalajakshi, M. K. Ravikumar</i>	367
In Situ Monitoring of Phosphate Inhibitor Surface Deposition during Corrosion of a Zinc Magnesium Aluminium (ZMA) Alloy Using Time-Lapse Microscopy and Energy Dispersive X-ray Spectroscopy <i>S. Mehraban, J. H. Sullivan, J. Elvins</i>	377
Inhibition of Corrosion-Driven Organic Coating Delamination on Hot Dip Galvanized Steel by Phenyl Phosphonic Acid <i>C. F. Glover, G. Williams</i>	391
Development of Zn-Mn Alloy Based Sacrificial Coatings <i>S. Ganesan, G. Prabhu, B. N. Popov</i>	405
Oxygen Sensors for Accelerator Driven System (ADS) Reactors <i>A. Verdaguer, S. Colominas, J. Abellà</i>	425

Electrochromic Behavior of Prussian Yellow <i>J. Agrisuelas, C. Delgado, J. J. García-Jareño, C. Moreno-Guerrero, A. F. Roig, F. Vicente</i>	435
Mechanistic Evaluation of SCC in Sensitized and Unsensitized Specimens of AA5083 Using Localized Probing Techniques <i>K. Williams, R. Bayles, P. M. Natishan, D. D. Macdonald</i>	449
Corrosion of Iron in Physically-Constrained Locations <i>D. D. Macdonald, B. Kursten, G. R. Engelhardt</i>	457
Mechanism of Depassivation <i>D. D. Macdonald</i>	469
Author Index	483