
Solid-Gas Electrochemical Interfaces – SGEI 1

Editors:

M. B. Mogensen

E. Ivers-Tiffée

T. Kawada

S. Adler

Sponsoring Divisions:



High Temperature Materials



Energy Technology



Physical and Analytical Electrochemistry



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

estransactions™

Vol. 66, No. 2

Copyright 2015 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 978-1-62332-235-9 (CD-ROM)
ISBN 978-1-60768-592-0 (PDF)

Printed in the United States of America.

Table of Contents

Preface iii

Chapter 1 General

Need for *In Operando* Characterization of Electrochemical Interface Features 3
M. L. Traulsen, C. Chatzichristodoulou, K. V. Hansen, L. T. Kuhn, P. Holtappels, M. B. Mogensen

(Invited) The Role of Solid-Gas Electrochemical Interfaces for Mixed Ionic Electronic Conducting Oxygen Transport Membranes 21
S. Baumann, P. Niehoff, F. Schulze-Küppers, M. Ramasamy, W. A. Meulenber, O. Guillon

Activation of Platinum-Based Centers through Modification with Metal Oxo Species toward Electrocatalytic Oxidation of Dimethyl Ether and Methanol 35
I. A. Rutkowska, J. P. Sek, E. Marks, P. Zelenay, P. J. Kulesza

Chapter 2 Oxygen Electrodes

Polarization Induced Changes in LSM Thin Film Electrode Composition Observed by *In Operando* Raman Spectroscopy and TOF-SIMS 47
M. D. McIntyre, M. L. Traulsen, K. Norrman, S. Sanna, R. A. Walker

Surface Segregation in Solid Oxide Electrode Materials Occurring at Intermediate Temperatures 61
J. Druce, H. Tézé, T. Ishihara, J. A. Kilner

Surface Segregation and Inter-Diffusion of Cations and Impurities in Microelectrodes for Solid Oxide Fuel Cells and Electrolyzers <i>H. T��llez, J. Druce, Y. Shi, M. Kubicek, N. J. Simrick, J. L. M. Rupp, T. Ishihara, J. A. Kilner</i>	69
Nature and Functionality of Oxygen/Cathode/Electrolyte-Interfaces in SOFCs <i>J. Sz��sz, F. Wankm��ller, V. Wilde, H. St��rmer, D. Gerthsen, N. H. Menzler, E. Ivers-Tiff��e</i>	79
Surface Composition of Layered Ruddlesden-Popper $\text{La}_{n+1}\text{Ni}_n\text{O}_{3n+1}$ (n = 1, 2 and 3) Epitaxial Films <i>K. T. Wu, H. T��llez, J. Druce, M. Burriel, T. Ishihara, J. A. Kilner, S. J. Skinner</i>	89
(Invited) Oxygen Reduction Reaction at Cathodes on Proton Conducting Oxide Electrolytes: Contribution from Three Phase Boundary Compared to Bulk Path <i>R. Merkle, D. Poetzsch, J. Maier</i>	95
Effect of $\text{Gd}_{0.2}\text{Ce}_{0.8}\text{O}_2$ Sintering Temperature on Formation of a SrZrO_3 Blocking Layer between $\text{Y}_{0.16}\text{Zr}_{0.84}\text{O}_2$, $\text{Gd}_{0.2}\text{Ce}_{0.8}\text{O}_2$ and $\text{La}_{0.58}\text{Sr}_{0.4}\text{Co}_{0.2}\text{Fe}_{0.8}\text{O}_3$ <i>V. Wilde, H. St��rmer, J. Sz��sz, F. Wankm��ller, E. Ivers-Tiff��e, D. Gerthsen</i>	103
Interfaces and Durability for Different LSCF/CGO/YSZ Systems for IT-SOFC <i>C. Rossignol, G. Constantin, P. Briois, A. Billard, E. Djurado, L. Dessemond</i>	109
(Invited) Structure and Stability of Pt-Y Alloy Particles for Oxygen Reduction Studied by Electron Microscopy <i>D. Deiana, J. B. Wagner, T. W. Hansen</i>	115
(Invited) Determination of Effective Reaction Area in a Mixed-Conducting SOFC Cathode <i>K. Amezawa, Y. Fujimaki, T. Nakamura, K. D. Bagarinao, K. Yamaji, K. Nitta, Y. Terada, F. Iguchi, K. Yashiro, H. Yugami, T. Kawada</i>	129
Investigation of Infiltration via Multi-Physics Simulation Tool with Realistic Microstructure Properties <i>T. Yang, I. B. Celik, H. Sezer, S. Lee, K. Gerdes</i>	137
(Invited) Capabilities of Analytical Transmission Electron Microscopy for the Analysis of Structural, Chemical and Electronic Properties Exemplified by the Study of Y-Doped $(\text{Ba,Sr})(\text{Co,Fe})\text{O}_{3-\delta}$ <i>M. Meffert, H. St��rmer, D. Gerthsen</i>	143

Modification of Oxygen/(Ba _{0.5} Sr _{0.5})(Co _{0.8} Fe _{0.2})O _{3-δ} Interfaces Derived by Metal-Organic Deposition	147
<i>K. Asano, C. Niedrig, W. Menesklou, S. F. Wagner, E. Ivers-Tiffée</i>	
(Invited) Enhancement of Surface Oxygen Exchange Kinetics for Pr _{0.1} Ce _{0.9} O _{2-δ} with Deposition of La or Sm Oxide	157
<i>L. Zhao, N. H. Perry, K. Sasaki, S. R. Bishop</i>	
Surface Modification of LaNi _{0.6} Fe _{0.4} O _{3-δ} Film Electrode by Ce _{0.9} Gd _{0.1} O _{1.95} Porous Layer	161
<i>R. A. Budiman, T. Miyazaki, S. I. Hashimoto, K. Yashiro, K. Ameszawa, T. Kawada</i>	
Study of Electrode Performance for Nanosized La _{0.4} Sr _{0.6} Co _{0.8} Fe _{0.2} O _{3-δ} IT-SOFC Cathode	169
<i>L. V. Mogni, K. Yakal-Kremiski, C. M. Chanquía, Z. Gao, H. Wang, A. Caneiro, S. A. Barnett</i>	
Oxygen Nonstoichiometry and Electrochemical Properties of LaNiO _{3-δ}	177
<i>R. A. Budiman, S. I. Hashimoto, T. Nakamura, K. Yashiro, K. Ameszawa, T. Kawada</i>	
GDC-Infiltrated La _{0.3} Ca _{0.7} Fe _{0.7} Cr _{0.3} O _{3-δ} Symmetrical Oxygen Electrodes for Reversible SOFCs	185
<i>B. Molero-Sánchez, P. K. Addo, A. Buyukaksoy, V. Birss</i>	

Chapter 3 Hydrogen and CO Electrodes

(Invited) High Temperature CO ₂ Electrolysis on La(Sr)Fe(Mn)O ₃ Oxide Cathode by Using LaGaO ₃ Based Electrolyte	197
<i>T. Ishihara, K. T. Wu, S. Wang</i>	
Phase Field Simulation Coupling Microstructural Evolution and Crack Propagation during Performance Degradation of Solid Oxide Fuel Cells	207
<i>T. Abdullah, L. Liu</i>	
Sulfur Tolerance of La _{0.3} M _{0.7} Fe _{0.7} Cr _{0.3} O _{3-δ} (M= Sr, Ca) Solid Oxide Fuel Cell Anodes	219
<i>P. K. Addo, B. Molero-Sanchez, A. Buyukaksoy, S. Paulson, V. Birss</i>	
Modeling Water Reduction on 10 Mole% Gadolinia-Doped Ceria (GDC10) Porous Electrodes	229
<i>H. Valdes-Espinosa, E. M. Stuve, S. B. Adler</i>	

Impedance Spectroscopy Analysis of Ni/YSZ Interfaces Prepared by Liquid Precursor Deposition <i>A. Buyukaksoy, V. Birss</i>	253
Stabilization of Ni-YSZ Nanocomposite Anodes by Deposition of a Thin YSZ Overlayer <i>A. Buyukaksoy, V. Birss</i>	267
Author Index	275