
Ionic and Mixed Conducting Ceramics 7

Editors:

M. Mogensen

Technical University of Denmark
Roskilde, Denmark

T. Armstrong

Carpenter Technology Corporation
Reading, Pennsylvania, USA

T. M. Gür

Stanford University
Palo Alto, California, USA

H. Yokokawa

AIST
Tsukuba, Japan

Sponsoring Divisions:



High Temperature Materials



Energy Technology



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. 28, No. 11

Copyright 2010 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)

Printed in the United States of America.

Table of Contents

<i>Preface</i>	<i>iii</i>
Chapter 1	
Electrodes for Solid Oxide Ion Conducting Electrolyte Cells	
Electrochemical Performance of Nanoscaled $\text{La}_{0.6}\text{Sr}_{0.4}\text{CoO}_{3-\delta}$ as Intermediate Temperature SOFC Cathode <i>J. Hayd, U. Guntow, and E. Ivers-Tiffée</i>	3
Impedance Modeling of Solid Oxide Fuel Cell Cathodes <i>J. E. Mortensen, M. Søgaard, and T. Jacobsen</i>	17
Validation of the Simple Infiltrated Microstructure Polarization Loss Estimation (SIMPLE) Model Using Single Layer, Nanocomposite $\text{Sm}_{0.5}\text{Sr}_{0.5}\text{CoO}_{3-x}$ - $\text{Ce}_{0.9}\text{Gd}_{0.1}\text{O}_{1.95}$ Solid Oxide Fuel Cell Cathodes <i>J. D. Nicholas and S. A. Barnett</i>	39
Oxygen Reduction at the Surface and the Hetero-Interface of La-Sr-Co-O-Oxides <i>A. Unemoto, K. Nagao, T. Tairako, K. Amezawa, and T. Kawada</i>	59
Oxygen Surface Exchange and Bulk Diffusion Coefficients Evaluated from Porous Mixed Ionic-Electronic Conducting Cathodes <i>C. Endler, A. Leonide, B. Rüger, A. Weber, and E. Ivers-Tiffée</i>	71
Electrode Reconstruction by FIB/SEM and Microstructure Modeling <i>J. Joos, B. Rüger, T. Carraro, A. Weber, and E. Ivers-Tiffée</i>	81
Microstructure-Electrical Properties of Original LSCF Films Deposited by ESD for IT-SOFCs <i>D. Marinha, L. Dessemond, and E. Djurado</i>	93
Influence of Electrode Morphology on Electrochemical Response of SOFC Cathodes <i>C. R. Kreller, M. E. Drake, and S. Adler</i>	105
Electrochemical Characterization of Ni/(Sc)YSZ Electrodes <i>T. Ramos, K. Thydén, and M. Mogensen</i>	123

Increase of Anode Performance of SOFC by Reverse Current Treatment <i>D. Klotz, B. Butz, A. Leonide, D. Gerthsen, and E. Ivers-Tiffée</i>	141
Effect of Ni-GDC AFL Composition on Performance of IT-SOFCs <i>K. Lee, N. J. Vito, M. Camaratta, H. Yoon, and E. Wachsman</i>	151
Thermodynamic Reconsiderations on Electronic Properties of Pure- and Doped-Ceria <i>H. Yokokawa, Y. Xiong, H. Kishimoto, K. Yamaji, M. Brito, and T. Horita</i>	165
Molybdate Based Ceramic Negative-Electrode Materials for Solid Oxide Cells <i>C. Graves, B. R. Sudireddy, and M. Mogensen</i>	173
Electrochemical Removal of NO _x -Gasses by Use of LSM-Cathodes Impregnated with a NO _x Storage Compound <i>M. L. Traulsen and K. Kammer Hansen</i>	193
Internal Reforming Kinetics in SOFC-Anodes <i>A. Kromp, A. Leonide, H. Timmermann, A. Weber, and E. Ivers-Tiffée</i>	205
Anchoring of Infiltrated Nickel Electro-Catalyst by Addition of Aluminum Titanate <i>C. Law and S. W. Sofie</i>	217
Enhanced Performance of the GdBaCo ₂ O _{5+δ} Cathode with Active Ce _{0.8} Sm _{0.2} O _{1.9} Nanoparticles <i>B. Wei, Z. Lü, T. Wei, D. Jia, X. Huang, Y. Zhang, and W. Su</i>	227
Structural, Chemical, and Electronic State on La _{0.7} Sr _{0.3} MnO ₃ Dense Thin-Film Surfaces at High Temperature: Surface Segregation <i>H. Jalili, Y. Chen, and B. Yildiz</i>	235

Chapter 2

Proton Conductors

Identification of the Charge Carriers in Cerium Phosphate Ceramics <i>H. L. Ray and L. C. De Jonghe</i>	243
Phase Transition Behavior of Proton Conducting Oxides, Sr _{1-x} Ba _x ZrO ₃ <i>T. Sugimoto, S. Hasegawa, and T. Hashimoto</i>	251
Phase Stability and Electrochemical Analysis of Nb Doped BaCe _{0.9} Y _{0.1} O _{3-x} Electrolyte for IT-SOFCs <i>E. Di Bartolomeo, A. D'Epifanio, C. Pugnalini, M. Zunic, C. D'Ottavi, and S. Licoccia</i>	259

Chapter 3 Li and Na Ion Conductors

Synthesis and Li-Ion Transport Mechanism of $\text{Li}_{1.4}[\text{M}_{0.4}\text{N}_{1.6}](\text{PO}_4)_3$ Electrolyte <i>R. Rao and S. Adams</i>	269
Ultrafast Lithium Migration by Heterogeneous Doping in Surface Modified Li_xFePO_4 <i>S. Adams, R. Prasada Rao, and H. Choo</i>	277
Preparation and Characterization of Fast Ion Conducting Lithium Thio-Germanate Thin-Films Grown by RF Magnetron Sputtering <i>I. Seo and S. W. Martin</i>	287
Interaction of Intercalated Li^+ Ions with Oxygen Vacancies in Rutile TiO_2 <i>P. V. Sushko, K. M. Rosso, and I. V. Abarenkov</i>	299

Chapter 4 Conducting Ceramics - General

$\text{Ba}_{0.5}\text{Sr}_{0.5}\text{Co}_{0.8}\text{Fe}_{0.2}\text{O}_{3-\delta}$ for Oxygen Separation Membranes <i>P. Müller, L. Dieterle, E. Müller, H. Störmer, D. Gerthsen, C. Niedrig, S. Taufall, S. Wagner, and E. Ivers-Tiffée</i>	309
Properties of Scandia-Doped Zirconia Synthesized by the Polymeric Precursor and the Polyacrylamide Techniques <i>R. Muccillo and G. C. Costa</i>	315
Effect of Processing Methodology on Microstructure and Ionic Conductivity of Yttria-Stabilized Zirconia <i>E. N. Muccillo and R. Muccillo</i>	325
Characterization of Conductivity in Single Crystal TlBr <i>S. R. Bishop, W. Higgins, A. Churilov, G. Ciampi, H. Kim, L. Cirignano, V. Biteman, J. Tower, K. Shah, and H. Tuller</i>	333

Chapter 5 Solid Oxide Fuel Cells and Stacks

A 0-Dimensional Stationary Model for Anode-Supported Solid Oxide Fuel Cells <i>A. Leonide, S. Hansmann, and E. Ivers-Tiffée</i>	341
--	-----

Evaluating H ₂ O Electrolysis on Ceria with Thin-Film Electrodes <i>S. DeCaluwe, C. Zhang, B. W. Eichhorn, and G. S. Jackson</i>	347
Long Term Testing of Solid Oxide Fuel Cell Stacks with Yttria Stabilized Zirconia Electrolyte in the H ₂ O Electrolysis Mode <i>J. Schefold, A. Brisse, and M. Zahid</i>	357
Author Index	369