
Electrochemical Utilization of Solid Fuels

Editors:

T. M. Gür

Stanford University
Stanford, California, USA

S. Gopalan

Boston University
Boston, Massachusetts, USA

Sponsoring Divisions:



High Temperature Materials



New Technology Subcommittee



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. 41, No. 12

Copyright 2012 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 978-1-56677-944-9 (PDF)
ISBN 978-1-60768-302-5 (Softcover)

Printed in the United States of America.

Table of Contents

Preface *iii*

Chapter 1 Conversion in SOFC Systems

(Invited) Coal and Biomass Utilization in Solid Oxide Fuel Cells 3
R. E. Mitchell

Solid Fuel Utilization in High Temperature Fuel Cells 29
T. M. Gür

Study of a Renewable Biomass Powered SOFC 39
Y. Gong, A. C. Chien, Z. P. Mao, and K. Huang

Model of Carbon Utilization in a Solid Carbon Fuel Cell 45
B. R. Alexander, R. E. Mitchell, and T. M. Gür

Power Generation Characteristics of Pulse Jet Rechargeable Direct Carbon Fuel Cells at
Different Isooctane Fuel Supply Frequency 57
A. Yabuki, F. Ohba, H. Shimada, H. Tanaka, S. Sakamoto, and M. Ihara

Hydrogen and Electricity from Carbon in a Coupled Steam-Carbon-Air Fuel Cell 69
B. R. Alexander, R. E. Mitchell, and T. M. Gür

Chemical Degradation Behavior of SOFC Anode Due to Trace Impurities Contained in a
Coal Derived Syngas 81
*K. Kuramoto, T. Fukushima, K. Matsuoka, Y. Suzuki, H. Kishimoto, K. Yamaji,
T. Horita, M. E. Brito, and H. Yokokawa*

Chapter 2 Conversion in Molten Metal Anode Systems

(Invited) Electrolyzer for Waste to Energy Conversion 93
U. B. Pal, S. Pati, K. J. Yoong, and S. Gopalan

Electrochemical Characterization of Liquid Metal Anode Solid Oxide Fuel Cell 103
M. LaBarbera, S. Khurana, M. Fedkin, S. Lvov, H. Abernathy, and K. Gerdes

| | |
|---|-----|
| Liquid Tin Anode Solid Oxide Fuel Cell for Direct Biomass Conversion <i>T. T. Tao, M. Koslowske, J. Bentley, and J. Brodie</i> | 115 |
| Liquid Tin Anode SOFC for Coal Conversion and Sulfur Tolerance <i>T. T. Tao, M. Koslowske, J. Bentley, J. Brodie, and C. MacKean</i> | 125 |
| Carbon Oxidation in Fuel Cells and H ₂ Production <i>M. Colet Lagrille, U. Doraswami, and G. H. Kelsall</i> | 137 |
| Characteristics of Molten Metals as Anodes for Direct Carbon Solid Oxide Fuel Cells <i>A. Jayakumar, A. Javadekar, R. Küngas, D. J. Buttrey, J. Vohs, and R. Gorte</i> | 149 |
| Chapter 3 Conversion in Molten Carbonate and Hybrid Systems | |
| (Invited) Determination of Efficiency in Direct Carbon Fuel Cells <i>J. F. Cooper and J. R. Selman</i> | 161 |
| Author Index | 177 |