

Fuels and Petrochemicals Division

Presentations at the 2009 AIChE Annual Meeting

**Nashville, Tennessee, USA
8-13 November 2009**

ISBN: 978-1-61567-938-6

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2009) by AIChE
All rights reserved.

Printed by Curran Associates, Inc. (2010)

For permission requests, please contact AIChE
at the address below.

AIChE
3 Park Avenue
New York, NY 10016-5991

Phone: (203) 702-7660
Fax: (203) 775-5177

www.aiche.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

Approaches to Renewable Diesel Production	1
<i>Patrick L. Hanks, Katie Cole, Ernie Lewis, Ed Ellis</i>	
Simultaneous Reforming and Hydrodeoxygenation of Bio-Oil for Liquid Fuels Production	2
<i>Suchithra T. Gopakumar, Harideepan Ravindran, Sushil Adhikari, Ram B. Gupta, Oladiran Fasina</i>	
Continuous Supercritical-Phase Hydrogenations of Biomass-Derived Compounds	4
<i>Jackson W. Ford, Bala Subramaniam, Raghunath V. Chaudhari</i>	
Catalytic Deoxygenation of Free Fatty Acids Over Pd/C	5
<i>Jeremy G. Immer, H. Henry Lamb</i>	
Oxidative Stability of Biodiesel From Castor Oil Fatty Acid Methyl Esters	7
<i>Yguatara L. Machado, Monica C. G. Albuquerque, Francisco Murilo T. Luna, Marianna C. Aragao, Diana C. S. Azevedo, Celio L. Cavalcante Jr.</i>	
Conversion of Vegetable and Algae Oils to Hydrocarbons Over Supported Metal Catalysts	8
<i>Tonya Morgan, Daniel Grubb, Eduardo Santillan-Jimenez, Samuel A. Morton III, Mark Crocker</i>	
Production of Biofuel From Biomass Via Fast Pyrolysis and Hydrotreatment Processes	9
<i>Satya K. Jujjuri, Justinus A. Satrio, Robert C. Brown</i>	
Catalytic Conversion of Tall Oil to Biodiesel and Renewable Diesel	10
<i>Kiran Pathapati, Stephen Dufreche, Rakesh Bajpai, Mark Zappi</i>	
BIOMASS Upgrading for the PRODUCTION of Biofuels FROM Biowastes	11
<i>Michiel Van Der Stelt</i>	
Low Temperature Catalytic GASIFICATION of BIOMASS for Syngas and Chemicals PRODUCTION	12
<i>Foster A. Agblevor, Sedat H. Beis, Ofei Mante, Norredine Abdoulmoumine, Junia Pereira</i>	
Pyrolysis of Biomass Using FCC Catalyst	13
<i>Foster A. Agblevor, Ofei Mante, Ron McClung, Ted S. Oyama</i>	
Liquid Phase Pyrolysis of Biogenic Feedstock	21
<i>Verena Mertlitz, Nikolaus Schwaiger, Peter Pucher, Matthäus Siebenhofer, Edgar Ahn</i>	
Decomposition of Heptylbenzene by Supercritical Water	23
<i>Pradip Chandra Mandal, Tatsuya Shiraishi, Wahyu Diono, Mitsuru Sasaki, Motonobu Goto</i>	
Atomistic Simulations of Alternative Proton Exchange Membranes for Fuel Cell Applications	33
<i>Chetan V. Mahajan, Venkat Ganesan</i>	
Effects of the Micro-Porous Layer on Water Transport in a PEM Fuel Cell	34
<i>Trung V. Nguyen, Xuhai Wang</i>	
Modelling of Cross-Over Effects in Direct Ethanol Fuel Cells (DEFCs)	37
<i>Suresh N S, Sreenivas Jayanti</i>	
Steady State Modeling and Optimization Studies of a Tubular Proton Exchange Membrane Fuel Cell (PEMFC) Validated with Experimental Studies	39
<i>Brian Bullocks, Debansu Bhattacharyya, Raghunathan Rengaswamy</i>	
AC Impedance in Characterization of SOFC and Interpretation of a Low Frequency Inductive Loop	40
<i>Ying Zhu, Wenhua H. Zhu, Bruce J. Tatarchuk</i>	
Topological Modeling of Reaction Networks for Engineering of Microbial Fuel Cells	47
<i>Adam C. Baughman, Lealon L. Martin</i>	
Understanding Long-Term Changes in Microbial Fuel Cell Internal Resistances Using Electrochemical Impedance Spectroscopy	48
<i>Doug S. Aaron, Abhijeet P. Borole, Choo Y. Hamilton, Costas Tsouris</i>	
Soy-Based Oligomeric Polyols with Reduce Isocyanate Loadings	49
<i>Galen J. Suppes, Zuleica Lozada, Arnold Lubguban</i>	
Conversion of Biomass Derived Sugars to 2,5-Dihydroxymethyltetrahydrofuran	50
<i>Mark H. Tucker, Yomaira Pagán-Torres, Anthony Crisci, Susannah L. Scott, James A. Dumesic</i>	
Etherification of Glycerol and Other Biomass-Derived Polyols: New Routes to Valuable Bulk Chemicals	51
<i>Pieter C. A. Bruijninx, Agnieszka M. Ruppert, Andrei N. Parvulescu, Maria Arias, Peter J. C. Hausoul, Monica Calatayud, Robertus J. M. Klein Gebbink, Bert M. Weckhuysen</i>	
Reactivity and Carbon Deposition Study On Steam Reforming of Bio-Oil	53
<i>Pedro J. Ortiz-Toral, Justinus A. Satrio, Robert C. Brown, Brent H. Shanks</i>	
Conversion of Short Aldehydes From Bio-Mass Over $Ce_xZr_{1-x}O_2$ and Basic Zeolites	54
<i>Anirudhan Gangadharan, Q. V. Amen, T. Sooknoi, L. L. Lobban, Daniel Resasco, R. G. Mallinson</i>	

Etherification of 2-Methyl-Pentanal On Supported Palladium	55
<i>Trung Pham, Richard G. Mallinson, Steven Crossley, Tawan Sooknoi, Lance L. Lobban, Daniel E. Resasco</i>	
A Microfluidic Fuel Cell as a Platform for Individual Fuel Cell Component Analysis	62
<i>Fikile R. Brushett, Paul J. A. Kenis</i>	
Operation of Polymer Electrolyte Membrane Fuel Cells with Dry Feeds. Design and Operating Strategies	63
<i>Jay B. Benziger</i>	
Layer by Layer Assembly of Multi-Functional Graphite/Silica Nanoparticle Coatings for PEM Fuel Cell Applications	64
<i>Feng Wang, Mubarak Alazemi, Indrajit Dutta, Anastasios Angelopoulos</i>	
Improvements to the Miniature Direct Formic Acid Fuel Cell: Catalyst Layer Optimization	65
<i>Robert D. Morgan, John L. Haan, Richard I. Masel</i>	
Nano-Materials to Control Two-Phase Transport in PEM Fuel Cell Electrodes	66
<i>Trung V. Nguyen</i>	
Micro Computed Tomography Investigation of Water Distribution and Transport in a Gas Diffusion Media	69
<i>Wei Zhu, Richard I. Masel</i>	
Effect of Wall Adhesion On Liquid Water Transport through the Gas Diffusion Layer of a PEM Fuel Cell	70
<i>P. V. Suresh, Jayanti Sreenivas, Prathap Haridoss, Abhijit P. Deshpande</i>	
A Comparative Study of the Hydrated Morphologies of Perfluorinated Ionomers with Distinct Protogenic Groups	72
<i>Dongsheng Wu, Stephen J. Paddison</i>	
A Highly Conductive Quaternary-Phosphonium Functionalized Membrane for High-Performance Hydroxide Exchange Membrane Fuel Cells	73
<i>Shuang Gu, Rui Cai, Ting Luo, Kurt Jensen, Yushan Yan</i>	
PVDF-Acrylic Semi-Interpenetrating Network Proton Exchange Membranes	74
<i>Carson Meredith, Pedro J. Zapata</i>	
Sodium Silicate Based Sol-Gel Structures as Proton Exchange Membranes for Microfluidic Fuel Cells	75
<i>Debashis Dutta, Chandelle Wadsworth</i>	
Unraveling the Problem of Carbonate Formation in Alkaline Fuel Cells	76
<i>Matthew S. Naughton, Fikile R. Brushett, Paul J. A. Kenis</i>	
Development of Cathode Air Filters for PEM Fuel Cell Using Microfibrous Entrapped Sorbents	77
<i>Abhijeet Phalle, Bruce Tatarchuk</i>	
Ethanol Production from the Biological Fermentation of Synthesis Gas	78
<i>Richard E. Tobey</i>	
Design and Operation of Novel Photobioreactors for the Cultivation of Microalgae for the Biofuels Sector	81
<i>Nadia Abunasser, Haiying Tang, Mario Enrique Danton Garica Perez, Meng Chen, Ansheng Li, Hongzhi Ma, Mahbuba Ara, Steven Salley, K. Y. Simon Ng</i>	
Biodiesel Oxidative Stability Study: Factors and Improvement	82
<i>Rhet Joseph De Guzman, Haiying Tang, Steven Salley, K. Y. Simon Ng</i>	
Leveraging Intellectual Property for Biofuel Innovators	83
<i>Peter A. Jackman</i>	
Consecutive Very-High-Gravity Batch Ethanol Fermentations with the Self-Flocculating Yeast SPSC01	109
<i>Xumeng Ge Sr.</i>	
Influence of Antioxidants Type and Concentration On the Oxidative Stability of Castor Oil FAME	110
<i>Susana V. Araujo, Francisco Murilo T. Luna, Estelio M. Rola Jr., Diana C. S. Azevedo, Célio L. Cavalcante Jr.</i>	
Hydroprocessing of Vegetable Oil	111
<i>Elvan Sari, Craig Dimaggio, Manhoe Kim, Shuli Yan, Steven O. Salley, K. Y. Simon Ng</i>	
Carbon Dioxide Sequestration From Air Using Microalgae	112
<i>Lihai Fan, Lihua Cheng, Lin Zhang, Huanlin Chen</i>	
Investigation of Esterification of Biomass Pyrolysis Acids Over Sulfonic Acid-Functionalized Mesoporous Silicas	113
<i>Shaojun Miao, Brent H. Shanks</i>	
Combined One-Step Hydrogenation/Esterification Over Bifunctional Mesoporous Organic-Inorganic Hybrid Silica: Model Reaction for Bio-Oil Upgrading	114
<i>Yang Tang, Shaojun Miao, Brent H. Shanks</i>	
De-Oxygenation Catalysis for Gasoline Production On Titania	115
<i>Prashant Reuben Daggolu, Mark G. White</i>	

Pd/TOMPP-Catalyzed Telomerization of 1,3-Butadiene with Polyols and Carbohydrates: New Opportunities for Catalytic Biomass Valorization	116
<i>Pieter C. A. Bruijninx, Andrei N. Parvulescu, Peter J. C. Hausoul, Regina Palkovits, Robertus J. M. Klein Gebbink, Bert M. Weckhuysen</i>	
Conversion of Propylene and Propanal On HZSM-5	118
<i>Trung Hoang, Xinli Zhu, Tawan Sooknoi, Daniel E. Resasco, Lance L. Lobban, Richard G. Mallinson</i>	
Deoxygenation of Furfural On Pd and Pd-Cu Catalysts	126
<i>Surapas Sithisa, Tawan Sooknoi, Lance L. Lobban, Richard G. Mallinson, Daniel E. Resasco</i>	
Conversion of Oxygenated Aromatics	127
<i>Teerawit A. Prasomsri, Roberto E. Galiasso, Walter E. Alvarez, Tawan Sooknoi, Daniel E. Resasco</i>	
Nanoporous Carbon for Energy Applications	135
<i>Galen J. Suppes, Michael Gordon, Eric Leimkuehler, Ali Tekeei, Bryan Sawyer</i>	
Modeling and Optimization of Fischer-Tropsch Synthesis Processes	136
<i>Wei Yuan, Norman E. Sammons Jr., Mario R. Eden</i>	
Transforming Chemistry From Postdictive to Predictive: Extensible Automated Reaction Mechanism Generation for Butanol Pyrolysis	137
<i>Michael R. Harper, Kevin M. Van Geem, Guy B. Marin, William H. Green</i>	
Limitations and Challenges Associated with the Disposal of Mercaptan-Rich Acid Gas Streams by Injection – A Case Study	145
<i>Felise Man, John J. Carroll</i>	
Renewable Carbohydrates Are a High-Energy Density Storage Carrier for Generation of Hydrogen or Electricity	153
<i>Y-H. Percival Zhang</i>	
Use of Alternative Fuels to Replace Coal in the Manufacture of Cement	154
<i>Steve R. Duke, Scott C. Morris, Aaron Folta, Srikanth Akkapeddi, Anton Schindler, Don Stafford</i>	
Enabling Crude Recovery through Inhibition of Asphaltenes	155
<i>Sara M. Hashmi, Abbas Firoozabadi</i>	
Synthesis of Biodiesel with Fat Based Feed of High Content of Free Fatty Acids	156
<i>M. Siebenhofer, Irmela Kofler, Wolfgang Glasl</i>	
Deterioration of B20 Under Compression Ignition Engine Operation Conditions	157
<i>Kapila Wadumesthrige, Mark Winston-Galant, Haiying Tang, Steven O. Salley, K. Y. Simon Ng</i>	
Bench-Top Engine System for Fast Screening of Alternative Fuels and Fuel Additives	158
<i>Hongmei An, Rachel L. Muncrief, Miguel Cruz, Charles Rooks, Michael Harold, Huzeifa Ismail</i>	
Conversion of Crude Glycerol From Biodiesel Production to Oil Via the Oleaginous Yeast <i>Rhodotorula Glutinis</i>	161
<i>J. Mathew Thomas, Rafael Hernandez, Todd French, William Holmes, Earl Alley, Jacqueline Hall</i>	
Biodiesel Production by Using Methanol-Ethanol Mixture in a Two Stage Batch Reactors	162
<i>Manhoe Kim, Shuli Yan, Steven O. Salley, Simon K. Y. Ng</i>	
Optimization of the Pre-Treatment Process of Cottonseed Oil for Biodiesel Production	163
<i>Regina C. R. Santos, Breno S. Rocha, Monica C. G. Albuquerque, Celio L. Cavalcante Jr.</i>	
Optimization and Reaction Kinetics of the Production of Biodiesel From Castor Oil	164
<i>Scott D. Crymble, Rafael Hernandez, W. Todd French</i>	
Analyses of Switchgrass Bio-Oils	165
<i>Roberto Galiasso, Lance Lobban, Daniel Resasco, Richard Mallinson</i>	
Influence of Pyrolysis Parameters On Individual Component of Bio-Oil	166
<i>Suchithra T. Gopakumar, Sushil Adhikari, Ram B. Gupta</i>	
Potential Use of Sugar Beet (<i>Beta Vulgaris L.</i>) Bagasse as a Renewable Hydrocarbon Source Via Fast Pyrolysis	167
<i>Sedat H. Beis</i>	
Product Distribution From Fast Pyrolysis of Hemicellulose	168
<i>Pushkaraj R. Patwardhan, Justinus A. Satrio, Robert C. Brown, Brent H. Shanks</i>	
Reaction Kinetics of Coal Gasification with the N₂/O₂/CO₂ Mixture	169
<i>Muhammad Faisal Irfan, Katsuki Kusakabe</i>	
Fast Pyrolysis of Wood Lignin: Towards A Continuous Process	170
<i>Sedat H. Beis, Saikrishna Mukkamala, Nick Hill, Ta-Hsuan Ong, Adriaan Van Heiningen, Brian G. Frederick, M. Clayton Wheeler, Elizabeth Stemmler, William J. Desisto</i>	
Catalytic Production and Upgrading of Biomass Derived Monofunctional Hydrocarbons	171
<i>Elif I. Gurbuz, Edward L. Kunkes, Dante A. Simonetti, Ryan M. West, Juan Carlos Serrano-Ruiz, Christian A. Gaertner, James A. Dumesic</i>	
Enerkem's Thermochemical Biorefineries: Converting Heterogeneous Biomass Into Alcohols	173
<i>David Lynch</i>	

Gas- and Aqueous-Phase Hydrogenation of Acetic Acid Over Ru Catalysts	177
<i>George W. Huber, Hakan Olcay, Ye Xu</i>	
Commercializing Pyrolysis Oil Into Motor Fuels Leveraging the Existing Refining Infrastructure.....	178
<i>Thomas D. Foust, Robert Baldwin, Jim Frederick</i>	
Thermal Pretreatment Options for Thermochemical Conversion of Lignocellulosic Biomass.....	179
<i>Wei Yan, Charles J. Coronella, Tapas Acharjee, Victor R. Vásquez</i>	
Pyrolysis Investigations and Ash Melting Behaviour of Agricultural Residues Used as a Fuel in Small Furnace Installations	180
<i>Martina Poppenwimmer, Harald Raupenstrauch</i>	
Dissolution and Fractionation of Wood and Straw Using Ionic Liquids.....	188
<i>Miguel A. Tavares Cardoso, Gianluca Marcotulio, Jaap Van Spronsen, Geert-Jan Witkamp, W. De Jong, J. Ruud Van Ommen</i>	
An Assessment of The Recovery and Recycle of Ionic Liquids (ILs) Following Lignocellulosic Biomass Pretreatment	189
<i>Thehazhnan K. Ponnaiyan, Ananth P. Dadi, Fei Zhao, Christa M. Graham, Constance Schall, Jared Anderson, Sasidhar Varanasi</i>	
Acetic Acid Removal From Pre-Pulping Wood Extract.....	190
<i>Aymn Abdurahman, Adriaan Van Heiningen, G. Peter Van Walsum</i>	
Key Metric Comparison of Five Cellulosic Biofuel Pathways.....	198
<i>Ben Thorp</i>	
Preliminary Studies of pH and Char Particle Content On Bio-Oil Aging	214
<i>Caitlin D. Naske, Sarah E. Crosby, Andrew McMaster, Keisha B. Walters</i>	
Production of Fisher-Tropsch Liquids From Biomass-Derived Syngas.....	215
<i>Weihua Deng, Zheng Li, Justinus A. Satrio, Robert C. Brown</i>	
Simultaneous Infrastructure Investment and Operation Decisions for Bio-Refinery Networks	218
<i>Jinkyung Kim, Matthew J. Realff, Jay H. Lee, Craig Whittaker, Ludwig Furtner, Amar Neogi</i>	
Integrating Biomass Torrefaction Technology with Thermochemical Conversion Processes.....	219
<i>Sudhagar Mani</i>	
Simulation of Combustion and Gasification of Biomass Including Agricultural and Forest Residues and Pulp Mill Black Liquor Using FactSage	227
<i>Hua-Jiang Huang, Shri Ramaswamy</i>	
Catalytic Steam Reforming of Water Extracted Bio-Oil Fractions	228
<i>Satya K. Jujuri, Justinus A. Satrio, Robert C. Brown</i>	
Review and Analysis of Transportation Fuel Production From Biomass-Derived Syngas.....	229
<i>Christopher M. Kinchin</i>	
Chemistry Modeling of Biomass Pyrolysis: Application to the CFD Simulation of a Laminar Entrained Flow Reactor	230
<i>Perrine Pepiot, Mark W. Jarvis, Mark R. Nimlos</i>	
Estimation of Lithium-Ion Battery Condition Using Reduced Electrochemical Cell Modeling	231
<i>Sungwoo Cho, Hyunseok Chung, Hoi-In Jeong, Chonghun Han</i>	
Thermal Phase Behavior of Ionic Liquid-Lithium Salt Electrolytes	232
<i>Wesley A. Henderson, Qian Zhou</i>	
Uncertainty Analysis in Battery Packs.....	233
<i>Shriram Santhanagopalan</i>	
Analysis of Electrode Materials for Use in Lithium Ion Cells for Automotive Applications.....	241
<i>Rajeswari Chandrasekaran, Jagjit Nanda, Jeffrey Remillard, Ken Nietering, Ann O'Neil, Ted Miller</i>	
Battery Design for Large Lithium and Zinc Batteries.....	243
<i>Galen J. Suppes, Bryan Sawyer, Michael Gordon</i>	
Virtual Screening for Lithium Ion Battery Electrolyte Additives	244
<i>Mathew D. Halls, Ken Tasaki, Nick Reynolds</i>	
Volume Expansion and Phase Transformation in Single Lithium Insertion Silicon Electrode Particle	245
<i>Rajeswari Chandrasekaran, Thomas F. Fuller</i>	
Mathematical Modeling of Lithium Ion Batteries: A Paradigm Shift.....	251
<i>Martin Z. Bazant, Damian Burch, Liam Stanton, Gerbrand Ceder</i>	
Phase Transformation Kinetics of LiFePO₄ Cathodes.....	252
<i>Yujie Zhu, Chunsheng Wang</i>	
A Novel Scaffold Binder Structure for High Capacity Silicon Anodes of Lithium-Ion Battery.....	253
<i>Juchen Guo, Chunsheng Wang</i>	
Polymer Nanocomposites: Advanced Polymer Electrolyte Materials for Li Ion Batteries.....	254
<i>Tirtha Chatterjee, Ramanan Krishnamoorti</i>	

Inexpensive Oxidative Desulfurization of Middle Distillate Fuels for Portable Power Applications	255
<i>Michael T. Timko, Lino A. Gonzalez, Richard C. Mlake-Lye, Peter E. H. Kracke, Jefferson W Tester, William H. Green</i>	
Design of Ammonia Oxidation Reactor for Portable Fuel Cell Applications	259
<i>Vijayanthi Alagharu, Srinivas Palanki</i>	
Method to Release Hydrogen From Ammonia Borane for Portable Fuel Cell Applications	260
<i>Moiz Diwan, David Hanna, Arvind Varma</i>	
Sulfur Selectivity of Ag/TiO₂ Sorbents and the Effects of Fuel Chemistry	261
<i>Sachin Nair, Bruce J. Tatarchuk</i>	
Behavior of Platinum Nanotubes in the Methanol Oxidation Reaction	269
<i>Shaun Alia, Yushan Yan</i>	
Reformats Desulfurization Using Regenerable Sorbent for Logistic SOFC Power Units	270
<i>Hongyun Yang, Troy J. Barron, Bruce Tatarchuk</i>	
Algae Products for Biofuels: Isoprenoids	271
<i>Juergen Polle, D. Brogun, D. Tran</i>	
Effects of Two-Stage Semi-Continuous Culture and CO₂ Aeration On Cell Growth and Lipid Accumulation of Nannochloropsis Oculata	272
<i>Fang Zhang, Jianming Lu, Lihua Cheng, Lin Zhang, Huanlin Chen</i>	
Direct Monitoring of Oil Production in Individual Microalgae in Situ by Raman Spectroscopy	273
<i>Huawen Wu, Joanne Volponi, Seema Singh</i>	
Diurnal Cycling of Triacylglycerides in a Chlorophyte Sp.: Implications for the Production of Algal Biofuels	274
<i>Keith Cooksey, Robert M. Thomas</i>	
Physical and Nutrient Stresses for Stimulating Algal Biofuel Production: Quantitative Control of Fermentation	275
<i>Damian Carrieri, Gennady Ananyev, Dariya Momot, Ian Brasg, G. Charles Dismukes, Oliver Lenz, Oliver Lenz</i>	
Algal Feedstocks for Biogas Production: What Are We Waiting for?	276
<i>Mark B. Smith, Jun Cheng, Jun Cheng, Minghui Zhang, Damian Carrieri, Charles Dismukes</i>	
The Role of Molecular Level Modeling in Gas Hydrate Studies	279
<i>Brian J. Anderson</i>	
Molecular Dynamics Simulations of WATER Cavity Distortion for Determining Clathrate Hydrate Equilibria	281
<i>Krishnadeo Jatkar, Sangyong Lee, Jae W. Lee</i>	
Comparison of Numerical Simulators for Methane Production From Hydrate Reservoirs	282
<i>Yong Liu, Isaac K. Gamwo</i>	
Mechanisms for Thermal Conduction in Various Polymorphs of Methane Hydrate	283
<i>Niall J. English, John S. Tse</i>	
Investigation of Methane Hydrate Growth Using Molecular Dynamics Simulation	284
<i>Matt Walsh, David T. Wu, Amadeu K. Sum, Carolyn A. Koh, E. Dendy Sloan</i>	
Biodiesel Production From Algae by Supercritical Methanol and Liquefaction Method	285
<i>Prafulla Patil, Shuguang Deng</i>	
The Impacts of Light, CO₂ Concentration, Temperature, Medium On Growth of Microalgae for Biofuels Production	286
<i>Haiying Tang, Nadia J. Abunasser, M. E. D. M. E. D. Garcia, Meng Chen, Ansheng Li, Hongzhi Ma, Steven O. Salley, K. Y. Simon Ng</i>	
Coordination of Growth Rate and Lipids Biosynthesis by Nutrients in Microalgae	287
<i>Meng Chen, Haiying Tang, Hongzhi Ma, Danton Garcia, Ansheng Li, Nadia J. Abunasser, Kapila Wadumesthrige, Thomas Holland, Steven O. Salley, Simon K. Y. Ng</i>	
Extraction of Microalgae Using An Ionic Liquid Co-Solvent System	288
<i>Gregory L. Young, Michael Cooney</i>	
Biodiesel Production From Microalgae	298
<i>Nkongolo Mulumba, Ihab H. Farag</i>	
Identification and Reduction of Expression of the Delta-12 Desaturase in Microalgae Dunaliella Tertiolecta	305
<i>Meng Chen, Steven O. Salley, K. Y. Simon Ng, Thomas Holland</i>	
Author Index	