

Sustainable Engineering Forum

Presentations at the 2009 AIChE Annual Meeting

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

ISBN: 978-1-61567-944-7

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

Shaping Our Energy Future: Advanced Research at the U.S. Department of Energy	1
<i>Jacques Beaudry-Losique</i>	
The Challenges of Scale and Sustainability in U.S. Energy Policy	2
<i>Marilyn Brown</i>	
The Nation's Renaissance in Energy Technology	3
<i>Dana C. Christensen</i>	
Clean Coal Technology and CO₂ Capture: A Perspective	4
<i>L.-S. Fan</i>	
Advanced Biofuels - The Path Forward	5
<i>W. Densmore Hunter</i>	
Surface Functionalisation of Bacterial Cellulose Nanofibrils as the Route to Produce Green Poly lactide Nanocomposites with Improved Properties	6
<i>Koon-Yang Lee, Jonny J. Blaker, Alexander Bismarck</i>	
All Green Composites for a Sustainable Manufacturing: Where We Are and Future Directions!	7
<i>Amar K. Mohanty</i>	
Sustainable Bio-Based Green-Composites for Automotive Interior Parts	8
<i>Hyun-Joong Kim, Byoung-Ho Lee</i>	
The Effect of Mono- and Poly-Organic Acids On Thermoformed Starch-Protein Composites	15
<i>C.I. Onwulata, Sudarsan Mukhopadhyay</i>	
Chain Scission Reaction in Hydrolytic Degradation of Polylactic Acid	22
<i>Shri Ramaswamy, Yuyang Liu, Ulrike Tschirner</i>	
Surface Modification of Cellulose Fibers by Starch Grafting	23
<i>Delong Song, Chunxu Dong, Yulin Deng</i>	
Environmentally Conscious Process Design - Identifying Tradeoffs Between Environmental Protection and Economic Viability at Different Scales	24
<i>Geoffrey F. Grubb, Bhavik R. Bakshi</i>	
Eco-Industrial Park Construction of the Korean Petrochemical Complex	25
<i>Changhyun Jeong, Chonghun Han</i>	
Integration of Industrial Scale Processes Using Biomass Feedstock in the Petrochemical Complex of the Lower Mississippi River Corridor	26
<i>Debalina Sengupta, Ralph W. Pike, Thomas A. Hertwig, Helen H. Lou</i>	
Towards Sustainable Manufacturing in Electroplating Industry: A Hierarchical Decision-Making Approach for Integrated P3 Technology Development	33
<i>Jie Xiao, Yinlun Huang</i>	
Sustainable Technologies for Arsenic Remediation and Carbon Dioxide Sequestration	34
<i>Cafer T. Yavuz, Vicki L. Colvin, Galen D. Stucky</i>	
Energy Efficiency – A New Methodology	35
<i>Renata Barros Pimentel Machado, Andreas Alexander Hahn, Valter Cesar Souza, Flavio Waltz</i>	
Material Balance for Leading Pretreatment Processes Including Sugar Conversion Using Switchgrass as Feedstock	40
<i>Rebecca J. Garlock, Leonardo da Costa Sousa, Bruce E. Dale, Venkatesh Balan</i>	
Effects of Enzyme Loading and β-Glucosidase On Enzymatic Hydrolysis of Switchgrass Processed by Leading Pretreatment Technologies	41
<i>V. Ramesh Pallapolu, Urvi D. Kothari, Y. Y. Lee, Charles Wyman, Bruce Dale, Richard T. Elander, Mark Holtzapple, Michael Ladisch, Ryan E. Warner, Steven R. Thomas</i>	
Optimization of Enzyme Formulation On Pretreated Switchgrass	42
<i>Matthew Falls, Mark Holtzapple</i>	
Interaction of Cellulase and Non-Cellulase Enzymes with Switchgrass Processed by Leading Pretreatment Technologies	43
<i>Jian Shi, Mirvat Ebrik, Bin Yang, Charles E. Wyman</i>	
Comparative Study On Enzymatic Digestibility of Upland and Lowland Switchgrass Varieties Processed by Leading Pretreatment Technologies	44
<i>Youngmi Kim, Nathan S. Mosier, Michael R. Ladisch, Mark Holtzapple, Bruce Dale, Y. Y. Lee, Charles Wyman</i>	
Native and Pretreated Switchgrass Surface and Ultrastructure Imaging Analysis and Process Modeling Update of Various Leading Pretreatment Technologies	45
<i>Richard T. Elander, Bryon S Donohoe, Todd B Vinzant, Tim Eggeman</i>	

Biomass Upgrading for the Production of Biofuels From Biowastes	46
<i>Michiel Van Der Stelt</i>	
Low Temperature Catalytic Gasification of Biomass for Syngas and Chemicals Production	47
<i>Foster A. Agblevor, Sedat H. Beis, Ofei Mante, Norredine Abdoulmoumine, Junia Pereira</i>	
Liquid Phase Pyrolysis of Biogenic Feedstock	56
<i>Verena Mertlitz, Nikolaus Schwaiger, Peter Pucher, Matthäus Siebenhofer, Edgar Ahn</i>	
Decomposition of Heptylbenzene by Supercritical Water	58
<i>Pradip Chandra Mandal, Tatsuya Shiraishi, Wahyu Diono, Mitsuru Sasaki, Motonobu Goto</i>	
Optimal Synthesis and Planning of Sustainable Processes	68
<i>Ignacio E. Grossmann, Gonzalo Guillén-Gosálbez</i>	
On the Application of Information Theory to Sustainability	69
<i>Heriberto Cabezas</i>	
NSF and Sustainable Engineering	70
<i>Bruce Hamilton</i>	
Biomass Feedstock Production and Provision: A System Level Optimization Approach	71
<i>Yogendra Shastri, Alan Hansen, Luis Rodriguez, K.C. Ting</i>	
Food and Fuel: Integrating Biomass Crops with Conventional Agriculture	93
<i>Tom L. Richard, Gustavo Camargo, Ed Van Ouwerkerk, Robert P. Anex</i>	
Potential for Biofuel and Animal Feed Production From Native Prairie Grasslands	94
<i>Rebecca J. Garlock, Bryan Bals, Venkatesh Balan, Bruce E. Dale</i>	
High Solid Content Biomass and Biosolid Feedstock Preparation Using a Hydro-Thermal Pretreatment	95
<i>Wei He, Chan S. Park, Joseph M. Norbeck</i>	
Investigation of a Screening Tool for Managing the Ash Composition of Biomass Feedstocks	96
<i>Peter A. Pryfogle, Judy K. Partin</i>	
Eco-Laboratory: Pushing Boundaries	97
<i>Myer Harrell, Dan Albert</i>	
Evaluation of Designer Biochars to Ameliorate Select Chemical and Physical Characteristics of Degraded Soils	111
<i>Jeffrey M. Novak, Warren J. Busscher, Thomas Ducey</i>	
Algae Bio-Remediation, Environmental Restoration, and Biogas	118
<i>Kelly M. Ogilvie</i>	
Comparing Evaporative Cooling to the Alternatives: Methodology, Data and Preliminary Results	122
<i>Elaine T. Hale, Kristin Field, Paul Torcellini</i>	
An Analysis of Anaerobic Dual-Anode Microbial Fuel Cell (MFC) Performance	123
<i>Min Hea Kim, Ying Wang, Donglee Shin, John Sanseverino, Paul Frymier</i>	
Bio-Butanol Vs. Bio-Ethanol: A Technical and Economic Assessment	137
<i>Peter Pfromm, Vincent Amanor-Boadu, Richard Nelson, Praveen Vadlani, Ronald Madl</i>	
Microbial Oils From Seafood Processing Waste	138
<i>Guochang Zhang, Todd French, Rafael Hernandez, Earl Alley, William E. Holmes</i>	
Exergy Analysis for Biofuel Production	139
<i>Xiang Li, Helen.H Lou, Anjan Kumar Tula, Anand Zanwar</i>	
Extraction Methods for Algae-Based Biodiesel	140
<i>Aaron Graham, Stephen Dufreche, Rakesh Bajpai, Mark Zappi</i>	
A Survey of Lake Erie Algae for Bio-Diesel or Bio-Ethanol Production	141
<i>Vasudev Gottumukala, Constance A. Schall, Thomas Bridgeman</i>	
Effects of Nitrogen Source and Concentration On the Production of Fatty Acids in Heterotrophic Chlorella Protothecoides	142
<i>Dong Wei, Na Lv, Shang-Tian Yang, Qingyu Wu</i>	
Engineering Aspects of Open-Pond Algae Farming	164
<i>Ron Putt</i>	
Light Dynamics of Light Emitting Diodes (LED) in a Microalgae Culture	167
<i>Barbara C. Benson, Harry M. Daultani, Rakesh K. Bajpai, Mark E. Zappi</i>	
Low-Cost Photobioreactors for Production of Algae-Biofuels	168
<i>Bryan Willson, Joel Butler</i>	
Two-Stage Photobioreactor Cultivation Process for Enhancing Lipid Production From Diatom Cells by Controlled Silicon Limitation	169
<i>Jennifer Adkins, Keungarp Ryu, Gregory L. Rorrer</i>	
Hydrothermal Carbonization of Switchgrass for Biochar Production	170
<i>Sandeep Kumar, Lingzhao Kong, Ram B. Gupta</i>	
Inulin Surfactants for Drug Delivery	171
<i>E. Delgado, Julio C. Arboleda, H. Contreras, G. Toriz</i>	

Lignocellulosic-Fiber-Reinforced Thermoplastic Composites: Effect of Processing-Induced Stresses On Mechanical Properties	175
<i>Venkata S. Chevali, Michael A. Fuqua, Shanshan Huo, Chad A. Ulven</i>	
Extrusion Foaming of Cellulose Fiber Reinforced Polypropylene Composites	176
<i>Takashi Kuboki, Ryohei Koyama, John W. S. Lee, Chul B. Park, Jingjing Zhang, Qingfeng Wu, Mohini Sain</i>	
Lignin Based Novel Blends and Composites	186
<i>S. Sahoo, Manju Misra, Amar K. Mohanty</i>	
Integrated Hydrolysis and Hydroconversion Process for Production of Gasoline and Diesel Fuel From Biomass	187
<i>Terry Marker, Larry Felix, Martin Linck</i>	
Kinetic Modeling of Biomass Torrefaction	198
<i>Wei Yan, Jason Hastings, Charles J. Coronella, Victor R. Vásquez</i>	
Biomass Pyrolysis Under Reactive Gas Environments	199
<i>Matthew Cooper, David Dayton, Raghbir Gupta</i>	
Porosity and Surface Characteristics of High Alkali Content, Rapid Pyrolysis Biomass Chars	201
<i>Jim Frederick, Mark Nimlos</i>	
Ni/Al₂O₃ Reforming Catalyst Deactivation From Actual Biomass-Derived Syngas Clean-up & Conditioning	202
<i>Whitney Jablonski, Kim Magrini, Matthew M. Yung</i>	
Comparison of Sodium and Potassium Carbonates as Lithium Zirconate Modifiers for High-Temperature Carbon Dioxide Capture From Biomass-Derived Synthesis Gas	203
<i>Steven Phillips, Jessica L. Olstad</i>	
The Role of Energy Efficiency in Meeting National Energy Goals	204
<i>Ben Taube</i>	
Lessons Learned from the TVA Energy Efficiency Program	205
<i>Sara Madugula</i>	
Zero Energy Buildings/Homes Play a Major Role in Meeting US Energy Goals	206
<i>Jennifer S. Banner</i>	
Energy Efficient Transportation in the U.S.: At the Nexus of Energy Security, Climate Change and the Economy	220
<i>Keith Kahl</i>	
Energy Storage - A Critical Component in Energy Efficiency Technology Implementation	222
<i>Haresh Kamath</i>	
Promoting Energy Efficiency in the Southeast Region of the United States	223
<i>Robert W. Peters, Candace Watson</i>	
Assessment of Freshwater Requirements and Conservation Options for the Production of Lignocellulosic and Algal Biofuels and Thermoelectricity	231
<i>Bala Padmini Lingaraju, Joo-Youp Lee, Tim C. Keener, Jeff Yang</i>	
Challenges to Water Quality Sustainability From Chronic PAH Pollution in An Urban Estuary	242
<i>Leslie M. Shor, Sandra Valle, Gabriela Munoz, Lisa A. Rodenburg</i>	
Evaluating the Fate of Several Micro-Pollutants in Wastewater Using Membrane Bioreactor and Conventional Activated Sludge Reactor	251
<i>Qiang Zhang, Rendahandi G. Silva, Ruth Marfil-Vega, Ali Medella, Makram Suidan, Jeff Yang</i>	
Bio-Remediation of Waste Water Streams Using Soil Bio-Technology (SBT)	252
<i>Chandrashekar Shankar, H. S Shankar</i>	
Formation of Halogenated Organic Compounds in Seawater	253
<i>Ahmed Abdel-Wahab, Ahmed Khodary, Patrick Linke, Bill Batchelor, Mahmoud El-Halwagi</i>	
Design of Water Networks Using Rigorous Models	255
<i>Debra C. Faria, Miguel J. Bagajewicz</i>	
Evaluating Water Quality Changes in Wastewater Reuse Using Pilot-Scale Experiments	256
<i>Donald A. Schupp, E. Radha Krishnan, Jeff Yang, Young-Shin Jun</i>	
Barriers and Status in Woody Biomass Pretreatment for Ethanol Production: Technology and Energy Cost	265
<i>J.Y. Zhu, Xuejun Pan, Roland Gleisner</i>	
Fast Pyrolysis of Pine Wood: The Influence of Process Parameters On the Quality and the Quantity of the Pyrolysis Oil	268
<i>Sadat H. Beis, Saikrishna Mukkamala, Nick Hill, Heini Lehtonen, Adriaan Van Heiningen, Brian G. Frederick, M. Clayton Wheeler, William J. DeSisto</i>	
2D HSQC NMR Analysis and Application to Hot-Water Wood Extract Hydrolysate Characterization	270
<i>Alan M. Shupe, David Kiemle, Shijie Liu</i>	
Hot-Water Extraction of Aspen Woodchips Prior to Pulping	271
<i>Houfang Lu, Thomas E. Amidon, Shijie Liu</i>	

An Incremental, Multi-Technology Approach to Retrofitting Existing Pulverized Coal Power Plants for Carbon Capture.....	272
<i>David C. Miller</i>	
Conversion of Solid Fuels in the Iron-Based Chemical Looping Process.....	273
<i>Hyung Rae Kim, Fanxing Li, Liang Zeng, Deepak Sridhar, Fei Wang, Andrew Tong, Nobusuke Kobayashi, L. -S. Fan</i>	
Bio Conversion of Glycerol to Methane and Hydrogen.....	274
<i>R. Mark Bricka, Trey Fleming, Todd French, Sumesh Arora</i>	
Bioremediation Costs Estimation in Lakes and Reservoirs through Dynamic Optimization Based On Hybrid Eutrophication Models.....	275
<i>Vanina Estrada, Maria Soledad Diaz</i>	
Reimagining Agriculture to Accommodate Large Scale Energy Production	277
<i>Bruce E. Dale, Lee R. Lynd, Tom L. Richard, Robert P. Anex, Mark Laser, Bryan D. Bals</i>	
Development of a Sustainable Microalgal Biofuels Industry: Of Ponds, Promises and Prospects	279
<i>Al Darzins</i>	
Catalytic Conversion of Sugars to Conventional Liquid Fuels	281
<i>Randy Cortright</i>	
Abengoa Bioenergy New Technologies Development of Enzymatic Cellulosic Ethanol	282
<i>Robert Wooley</i>	
Engineering Microbial Metabolism for Production of Advanced Biofuels	284
<i>Jay D. Keasling</i>	
Algenol Biofuels's DIRECT to ETHANOL™ Technology	285
<i>Paul Woods</i>	
Coal, Biomass, and Algae as Precursors to Liquid Fuels	286
<i>Charles Taylor, Anthony V. Cugini, Cynthia Powell</i>	
Technology Challenges for Sustainable Energy Solutions – Battelle’s Perspective.....	287
<i>Charles Lucius</i>	
The Challenge of Feedstock Flexibility	288
<i>Dwight E. Anderson</i>	
Lignocellulosic Biomass to Ethanol: Process Design and Economics for Corn Stover	297
<i>Ling Tao, Andy Aden, David Humbird, Abhijit Dutta, Chris Kinchin, Daniel Inman, David D. Hsu, Doug Dudgeon, John Lukas, Bryan Olthof, Paul Schoen, Matt Worley</i>	
The Effects of Xylooligomers On Enzymatic Hydrolysis of Pure Cellulose and Pretreated Corn Stover	301
<i>Qing Qing, Bin Yang, Charles E. Wyman</i>	
Enzyme-Catalyzed Conversion of Glycerol to Glycerol Carbonate: Effect of Dialkyl Carbonate, Molar Ratios, Solvent Identity and Catalyst Loading On Reaction Rates, Conversions and Selectivity	302
<i>Kerri A. Cushing, Steven W. Peretti</i>	
Conversion of Fermentation Inhibitors and Byproducts in Biorefinery Recycle Water Into Electricity.....	303
<i>Abhijeet P. Borole, Jonathan R. Mielenz, Choo Y. Hamilton, Tatiana A. Vishnivetskaya</i>	
Wood-Based Biorefinery: An Update On the ESF Technology	304
<i>Thomas E. Amidon, Shijie Liu</i>	
Process Engineering for Lignocellulosic Ethanol Facilities: a Combined Model- and Experiment-Based Approach and Comparison with Operational Results From a Demonstration-Scale Plant	305
<i>Keith Flanagan, Dave Litzen, Dennis Harstad, Jim Schultze</i>	
Chemical Characterization of Catalytic Hydrodeoxygenated Bio-Oil and Their Distilled Fractions.....	306
<i>El barbary M. Hassan, Sanjeev K. Gajjela, Fei Yu, Phillip Steele</i>	
Biomass Conversion Via Direct Chemical Looping Technology – Process Simulations	307
<i>Liang Zeng, Fanxing Li, Hyung Rae Kim, Deepak Sridhar, Fei Wang, Andrew Tong, Zhenchao Sun, Nobusuke Kobayashi, L. -S. Fan</i>	
Ethanol Fermentation From Hot-Water Wood Extract Hydrolysate with A Modified Pichia Stipitis Strain HWR	318
<i>Alan M. Shupe, Shijie Liu</i>	
Anaerobic Fermentation of Hemicellulose Present in Pre-Pulping Extracts of Northern Hardwoods to Carboxylic Acids.....	319
<i>Rakhi Baddam, G. Peter van Walsum</i>	
Sustainability Initiatives at Several U.S. Institutions of Higher Education	330
<i>M. P. Sharma, Robert W. Peters</i>	
Interdisciplinary Tribal Energy Design Project.....	331
<i>Daniel T. Schwartz</i>	
Education Modules for Teaching Sustainability in An Mass and Energy Balance Course	332
<i>Kailiang Zheng, Doyle P. Bean, Helen H. Lou, Thomas Ho, Yinlun Huang</i>	

A Sustainable Design Project for the Process Separations Class	333
<i>Jeffrey R. Seay, Richard A. Liner, Jason B. Gish</i>	
State of Green Construction Building in the State of Alabama: LEED Certification of Selected Buildings	334
<i>Robert W. Peters</i>	
Effect of Cellulose-Binding Module Choice On Catalytic Activity of Cellulases	348
<i>Danielle Tullman-Ercek, Edward Y. Kim, Supratim Datta, Dean Dibble, Gang Cheng, Masood Hadi, Michael Kent, Seema Singh, Blake Simmons, Rajat Sapra</i>	
Synergistic Interactions Between Fungal and Bacterial Glycosyl Hydrolases On Ammonia Fiber Expansion Treated Corn Stover	349
<i>Dahai Gao, Shishir P. S. Chundawat, Bruce E. Dale, Venkatesh Balan</i>	
The Importance of Surface Area: Comparing Switchgrass Hydrolysis After COSLIF and SAA Pretreatments at Standard and Low Cellulase Loadings	350
<i>Joseph A. Rollin, Noppadon Sathitsuksanoh, Zhiguang Zhu, Y.-H. Percival Zhang</i>	
Desorption of CBH1 From BMCC Substrate Is a Function of Enzymatic Activity	351
<i>Zhuoliang Ye, Andrew N. Lane, R. Eric Berson</i>	
Interaction of the Enzyme with Substrate Is the Most Significant Factor Accounting for Enzyme Deactivation in the Enzymatic Hydrolysis of Cellulose	352
<i>Zhuoliang Ye, Kristen M. Hatfield, Andrew N. Lane, R. Eric Berson</i>	
Media Requirements for Aerobic Cultivation of Saccharomyces Cerevisiae TMB 3400-F30-3 On Undetoxified Softwood Dilute Acid Hydrolyzate	353
<i>Caroline Högström, Ulrika Rova, Tomas Brandberg, David Hodge</i>	
Analyses of Switchgrass Bio-Oils	354
<i>Roberto Galiasso, Lance Lobban, Daniel Resasco, Richard Mallinson</i>	
Influence of Pyrolysis Parameters On Individual Component of Bio-Oil	355
<i>Suchithra T. Gopakumar, Sushil Adhikari, Ram B. Gupta</i>	
Potential Use of Sugar Beet (Beta Vulgaris L.) Bagasse as a Renewable Hydrocarbon Source Via Fast Pyrolysis	356
<i>Sedat H. Beis</i>	
Product Distribution From Fast Pyrolysis of Hemicellulose	357
<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	358
<i>Muhammad Faisal Irfan, Katsuki Kusakabe</i>	
Fast Pyrolysis of Wood Lignin: Towards A Continuous Process	359
<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>	
Water Energy Interface	360
<i>Robert W. Peters, Atul Kajale</i>	
Optimization Under Uncertainty for Water Consumption in a Pulverized Coal Power Plant	366
<i>Juan M. Salazar, Stephen E. Zitney, Urmila Diwekar</i>	
Reducing Water Demand by Increasing Energy Efficiency for Bio-Ethanol	367
<i>Peter Pfromm, Mohammed Hussain</i>	
Use of Microbial Fuel Cells for Produced Water Treatment	368
<i>Abhijeet P. Borole, Costas Tsouris</i>	
Catalytic Production and Upgrading of Biomass Derived Monofunctional Hydrocarbons	369
<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	371
<i>David Lynch</i>	
Gas- and Aqueous-Phase Hydrogenation of Acetic Acid Over Ru Catalysts	375
<i>George W. Huber, Hakan Olcay, Ye Xu</i>	
Commercializing Pyrolysis Oil Into Motor Fuels Leveraging the Existing Refining Infrastructure	376
<i>Thomas D. Foust, Robert Baldwin, Jim Frederick</i>	
Thermal Pretreatment Options for Thermochemical Conversion of Lignocellulosic Biomass	377
<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	378
<i>Martina Poppenwimmer, Harald Raupenstrauch</i>	
Investigating the Effects of Ethanol Organosolv Pretreatment On Buddleja Davidii	386
<i>Bassem Hallac, Poulomi Sannigrahi, Yunqiao Pu, Michael Ray, Richard Murphy, Arthur J. Ragauskas</i>	

Ethanol Production from SPORL-Pretreated Lodgepole Pine: Preliminary Evaluation of Mass and Energy Balance	393
<i>Junyong Zhu, Xuejun Pan, Roland Gleisner, W. Zhu, B.S. Dien, S. Tian</i>	
Optimization of Process Parameters for Alkaline Pretreatment of Switchgrass	396
<i>Urvi D. Kothari, Y. Y. Lee</i>	
Characterizing the Effect of AFEX Pretreatment Severity On Corn Stover Cell Wall Ultra-Structural Modifications and Formation of Ammonolysis by-Products	397
<i>Shishir Chundawat, Bryon Donohoe, Leonardo D. Sousa, Naveen Nair, Ramin Vismeh, James Humpula, Umesh Agarwal, A. Daniel Jones, Michael E. Himmel, Bruce E. Dale, Venkatesh Balan</i>	
Understanding Ionic Liquid Pretreatment of Lignocellulosic Biomass by Hyperspectral Raman Imaging	398
<i>Lan Sun, Chenlin Li, Blake Simmons, Seema Singh</i>	
ABE (Acetone, Butanol, and Ethanol) Production From Fiber-Enriched DDGS Pretreated by Electrolyzed Water	399
<i>Xiaojuan Wang, Yi Wang, Hao Feng, Hans Blaschek, Zhiyi Li</i>	
Sustainable Bioprocess Synthesis Routes for Tailor-Made Chemicals	400
<i>Chutima Swangkotchakorn, Rafiqul Gani, John Woodley, Jan-Dierk Grunwaldt</i>	
Synergy of Technological and Ecological Systems for Self-Reliant Process Design	401
<i>Robert A. Urban, Bhavik R. Bakshi</i>	
Effect of Green Roofs On Building Energy Cost	402
<i>Sandra Nunez, Robert W. Peters</i>	
Supercritical Carbon Dioxide: A Promising Green Solvent in One-Pot Synthesis of ZrO₂-TiO₂ Nanotubes	413
<i>Rahima A. Lucky, Paul A. Charpentier</i>	
Synthesis of Crystal α-Capric Betaine Surfactant	414
<i>Yun Fang, Minyun Jiang</i>	
Dissolution and Fractionation of Wood and Straw Using Ionic Liquids	418
<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	419
<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	420
<i>Aymn Abdurahman, Adriaan van Heiningen, G. Peter van Walsum</i>	
Key Metric Comparison of Five Cellulosic Biofuel Pathways	428
<i>Ben Thorp</i>	
Preliminary Studies of pH and Char Particle Content On Bio-Oil Aging	444
<i>Caitlin D. Naske, Sarah E. Crosby, Andrew McMaster, Keisha B. Walters</i>	
Production of Fisher-Tropsch Liquids From Biomass-Derived Syngas	445
<i>Weihua Deng, Zheng Li, Justinus A. Satrio, Robert C. Brown</i>	
Novel Solid Base Catalyst for Condensation of Carboxylic Acids	448
<i>Ambareesh Murkute, James Jackson, Dennis Miller</i>	
Electrochemical Oxidation of Glycerol Combined with Product Adsorption	456
<i>Peter Stehring, Susanne Lux, Matthäus Siebenhofer</i>	
Kinetics of Glycerol Selective Oxidation Over PtBi/C Catalyst	457
<i>Wenbin Hu, Daniel Knight, Arvind Varma</i>	
Heterogeneously Catalyzed Conversion of Cellulose to Sugar Alcohols	458
<i>Ryan Ravenelle, Carsten Sievers, John C. Crittenden</i>	
Fractionation of Corn Stover Using Aqueous Ammonia and Hot Water	459
<i>Chang Geun Yoo, Tae Hyun Kim</i>	
Comparison of Bench Scale and Pilot Plant Operations Via Characterization of a Ni/Mg/K/Al₂O₃ Tar Reforming Catalyst	460
<i>Matthew M. Yung, Whitney Jablonski, Kimberly Magrini-Bair</i>	
Development of Comprehensive Models to Predict the Processability of Miscanthus in Biological Conversion	461
<i>Taiying Zhang, Charles Wyman, Bin Yang, James Zhang</i>	
Effective Hemicellulose Hydrolysis in a Pilot Scale Continuous Pretreatment Reactor; Improving Reactor Design and Understanding Process Performance	462
<i>Erik Kuhn, Noah D. Weiss, Nicholas J Nagle, Melvin P Tucker, David Sievers, Richard T Elander</i>	
How Dilute Acid Pretreatment Produces a Highly Digestible Cellulosic Substrate	463
<i>David K. Johnson</i>	

Kinetic Modeling of Lime Pretreatment of Switchgrass	464
<i>Rocio Sierra, Matthew Falls, Mark Holtzaple</i>	
Cellulose Dissolution in Ionic Liquids: Influence of Ion Structure On β-Glucosidase Stability and Activity	465
<i>Xinglian Geng, William McDanel, Wesley A. Henderson</i>	
Effect of Biomass Size Partitioning On Pretreatment and Enzyme Requirements Using Response Surface Analysis	466
<i>Swetha Mahalaxmi, Geoffrey Siming, Clint Williford</i>	
Two-Stage Pretreatment of Miscanthus with Alkaline Peroxide and Electrolyzed Water for Ethanol Production	467
<i>Atilio de Frias, Xiaojuan Wang, Hao Feng</i>	
Hydrothermal Pretreatment of Switchgrass for Ethanol Production	468
<i>Sandeep Kumar, Urvi D. Kothari, Lingzhao Kong, Y. Y. Lee, Ram B. Gupta</i>	
Solvent Fractionation of Biomass: Applications of Switchgrass Pretreatment for Biofuels	469
<i>C.J. O'Lenick, Joseph J. Bozell, Timothy G. Rials, Rene Buchinger, Anton Astmer, Stuart Black, Stacy A. Warwick</i>	
High Value Products Derived From Biological Pretreatment	470
<i>Deepak Singh, Xiaochen Yu, Sulin Chen</i>	
Ionic Liquid Pretreatment of Lignocellulosic Material for Enhancement of Enzyme Hydrolysis	471
<i>Indira Priya Samayam, Constance Schall, Sasidhar Varanasi</i>	
The Kinetics of Reversion Reactions During Acid Pretreatment of Biomass	472
<i>Mark R. Nimlos, Heidi M. Pilath, Michael E. Himmel, David K. Johnson</i>	
Optimization of Energy and Material Balances in Small-Scale Bioethanol Production System	473
<i>Kazuhiro Mochidzuki, Qingrong Qian, Akiyoshi Sakoda</i>	
Development of a Supercritical Water Microchannel Reactor for Reforming Biomass to Hydrogen Gas	474
<i>Aaron Goodwin, Greg Rorrer</i>	
Role of 5-HMF in the Char Formation Mechanism in the Supercritical Water Gasification Process	475
<i>Athika Chuntanapum, Yukihiko Matsumura</i>	
Mechanical Mixing of Non-Newtonian Fluid Flow in Anaerobic Digestion	484
<i>Liang Yu, Shulin Chen</i>	
Numerical Simulation of Heat Transfer through the Pyrolysis of Woody Biomass	485
<i>Ken-ichiro Tanoue, Widya Wijayanti, Kei Yamasaki, Tatsuo Nishimura, Miki Taniguchi, Ken-ichi Sasauchi</i>	
Thermodynamics of An Aqueous-Alkaline Carbonate Carbon Fuel Cell	491
<i>Michael J. Antal Jr., Gerard C. Nihous</i>	
Bioprocessing Waste Paper to Ethanol & Byproducts	492
<i>Jim Henry, Murat Ozkaya</i>	
Evaluation of Methods for Co-Immobilized Enzyme Pellet Development for Xylose-Xylulose Isomerization	493
<i>Bin Li, Patricia Relue, Sasidhar Varanasi</i>	
Mass Transfer Limitations of Enzymatic Hydrolysis of Cellulose at High Insoluble Solids Concentrations	494
<i>Daniel L. Williams, David Hodge</i>	
Enzymatic Hydrolysis of Cellulosic Substrates Under High Solid Loading	495
<i>Wei Wang, Y.Y. Lee</i>	
Effects of Polyvinyl Alcohol and Surfactants On the Enzymatic Hydrolysis of Alkali-Treated Waste Newsprint	496
<i>Li Kang, Y.Y. Lee</i>	
Cellulosic Ethanol Progress in China	497
<i>Xin Xiao</i>	
A Techno-Economic Analysis of Carbon Dioxide Bio-Mitigation Using Microalgae	498
<i>Samuel A. Morton III</i>	
A Framework to Determine Economic Potential and Environmental Impact of Sustainable Polygeneration Facilities	499
<i>Norman E. Sammons Jr., Wei Yuan, Mario R. Eden, Harry T. Cullinan, Burak Aksoy</i>	
Synthesis of Technology Pathways for AN Integrated Biorefinery	500
<i>Buping Bao, Denny K. S. Ng, Mahmoud M. El-Halwagi, Douglas H. S. Tay</i>	
Carbon-Fueled Fuel Cell Using Charcoal From Unused Biomass	505
<i>Azusa Okazaki, Toshihiko Hiaki, Kazuhiro Mochidzuki</i>	
Energy and Fuel Value of Wastewater Sludge Residuals	509
<i>Kevin Schmidt, Cody Wagner, Charles J. Coronella, Victor R. Vasquez</i>	
Fractionation and Bioconversion of Micro-Algae Into Bioethanol	510
<i>Jung Kon Kim, Tae Hyun Kim, Eun Ju Lee, Dong Uk Ahn</i>	

Survey of Lake Erie Algae for Bio-Diesel or Bio-Ethanol Production	511
<i>Vasudev Gottumukala, Constance A. Schall, Thomas Bridgeman</i>	
Activated Sludge: A Potential Feedstock for Green Diesel	512
<i>Emmanuel D. Revellame, Rafael Hernandez, William T. French, Tracy Benson, Earl G. Alley, William E. Holmes, Darrell L. Sparks</i>	
Analysis of Biodiesel: Use of HPLC with An ELSD, Size Exclusion Method	513
<i>Bryan Lieb, William C. Conner, Christopher A. Carlin, Geoffrey A. Tompsett, Ronen Weingarten</i>	
Predicting the Oxidation Stability of Soybean Oil/Coconut Oil Biodiesel Blends as a Function of Feedstock Mass Fraction	516
<i>Andrew M. Duncan, William H. Bennett, Susan M. Stagg-Williams</i>	
A Multiscale Model for Determination of Kinetic Rate Constants for Hydrotalcite Catalyzed Biodiesel Synthesis	518
<i>Ankur Kapil, Andrew Masters, Jhuma Sadhukhan</i>	
Lipids From Alligator Fat and Production of Biodiesel	519
<i>Srividya Ayalamayajula, August Gallo, Mark Zappi, Rakesh Bajpai</i>	
Utilization of Static Mixers in the Oil Transesterification Reaction for Biodiesel Production	520
<i>Dario Frascari, Michele Zuccaro, Davide Pinelli, Alessandro Paglianti</i>	
Fluid Mechanics of Pretreated Corn Stover Slurries in Process Equipment	526
<i>Bradley J. Niesner, Vinay Raman, Jinyoung Baek, Jonathan J. Stickel, Clare J. Dibble, Robert J. Fisher</i>	
Disruption of Recalcitrant Switchgrass by COSLIF and Efficient Sugar Release at a Low Enzyme Loading	527
<i>Noppadon Sathitsuksanoh, Zhiguang Zhu, Neil Templeton, Percival Zhang</i>	
Bamboo Saccharification by Cellulose Solvent- and Organic Solvent-Based Lignocellulose Fractionation Followed by Ultra Low Enzyme Concentration	528
<i>Noppadon Sathitsuksanoh, Zhiguang Zhu, Min-Der Bai, Tsung-jen Ho, Percival Zhang</i>	
Hydrothermal Pretreatment of Eucalyptus for Bioethanol Production	529
<i>Yukihiko Matsumura, Indra Gandidi, Minoru Nakashima</i>	
Mass and Energy Balance of Biomass Hydrothermal Pretreatment	530
<i>Wei Yan, Charles J. Coronella, Victor R. Vasquez</i>	
Comparative Analysis of Corn Stover Components and Non-Conventional Biomass Feedstocks with Diluted and Concentrated Acid Hydrolysis	531
<i>Jose A. Perez</i>	
Dilute Acid Pretreatment of Hardwood and Softwood Using Different Laboratory Scale Reactors	539
<i>Byung-Hwan Um, G. Peter van Walsum</i>	
Alkaline Hemicellulose Extraction and Solubility-Based Separation From Hardwoods	540
<i>Ryan J. Stoklosa, David Hodge</i>	
Enhanced Enzymatic Digestibility of Crystalline Cellulose After AFEX Treatment: The Role of Cellulose I Conversion to Other Alloforms	541
<i>Albert M. Cheh, Shishir P. S. Chundawat, Leonardo D. Sousa, Umesh Agarwal, Venkatesh Balan, Bruce E. Dale</i>	
Rapid Analysis of Furfural and Acetic Acid From Lignocellulose Hydrolysate in Fermentation Media	542
<i>William Holmes, Darrell L. Sparks, Andro Mondala, Rafael Hernandez</i>	
Cellulose Dissolution in Ionic Liquids: Link Between Ion Structure and Cellulose Solubility	543
<i>E. Kate Brown, Wesley A. Henderson</i>	
Enzymatic Conversion of Lignocellulosic Biomass Pretreated with Ionic Liquid	544
<i>Indira Priya Samayam, Constance Schall, Sasidhar Varanasi</i>	
Enzyme Systems for Optimization of Ionic-Liquid Pretreated Biomass Saccharification	545
<i>Christopher J. Barr, Indira Priya Samayam, Constance A. Schall, Jeffery Mertens</i>	
Engineering the Cofactor Preference of Xylose Reductase and Xylitol Dehydrogenase to Enhance Xylose Fermentation by Recombinant Saccharomyces Cerevisiae	546
<i>Stefan Krahulec, Barbara Petschacher, Mario Klimacek, Bernd Nidetzky</i>	
Heterologous Expression and Characterization of Three Trichoderma Reesei Cellulose Hydrolases in Kluyveromyces Lactis	548
<i>Michael J. Brodeur-Campbell, Jill R. Jensen, Michael Brendel, David R. Shonmard</i>	
A Family of Thermostable Fungal Cellulases Created by Structure-Guided Recombination	549
<i>Pete Heinzelman, Christopher D. Snow, Indira Wu, Catherine Nguyen, Matthew Smith, Arvind Kannan, Linzy Yu, Shannon Mohler, Jeremy Minshull, Alan Villalobos, Sridhar Govindarajan, Frances H. Arnold</i>	
Cloning and Expression of Laccase From Trametes Versicolor in Saccharomyces Cerevisiae Using a Novel Vector System	550
<i>Rebecca J. Pinkelman, Stephen R. Hughes, Hyoung-Tae Choi, Sookie S. Bang</i>	
Removal of Acetic Acid From Hydrolysate Using a Membrane Extractor/Reactor	560
<i>Rahul Patil, G. Glenn Lipscomb, Frederick F. Stewart</i>	

Improvements in Dilute-Acid Steam Pretreatment and SSF of Softwood, Using Yeast Cultivated On Hydrolyzate, for Bioethanol Production	561
<i>Sanam Monavari, Mats Galbe, Guido Zacchi</i>	
Investigating the Role of the Cel7A Linker Peptide in Enzymatic Hydrolysis of Cellulose Chains: A Simulation Study.....	562
<i>Xiongce Zhao, Courtney Taylor, Clare McCabe, William S. Adney, Michael E. Himmel</i>	
Scale-up Issues From Bench to Pilot	563
<i>Dennis D. Gertenbach, Brian L. Cooper</i>	
Implementation of the U.S. Environmental Protection Agency's Waste Reduction (WAR) Algorithm in Cape-Open Based Process Simulators	577
<i>William M. Barrett Jr., Jasper M. Van Baten</i>	
Techno-Economic Analysis of Waste to Energy Process Based On Biorefinery Process Models.....	578
<i>Jie Chen, Hayk Khachatryan, Craig Frear, Shulin Chen, Eric Jessup</i>	
Bioenergy and Sustainability: An Engineer's Unit Operations/Mass Balance Approach	579
<i>Peter Pfromm, Richard Nelson, Vincent Amanor-Boadu</i>	
Ranking Energy Efficiency of UAB Buildings and Quantitative Determination of Heat Transfer Reduction From Setback Schemes	580
<i>Dana Lackey, Robert W. Peters</i>	
Modeling of a Continuous Two-Phase Bubble Column Reactor for the Production of Biodiesel From Free Fatty Acids.....	590
<i>Richard A. Cairncross, Minhazuddin Mohammed, Cory Melick</i>	
Evaluation of Reaction Conversion and Energy Consumption During Biodiesel Production Using a Pilot Scale High Shear Mixer Reactor	591
<i>Sipho C. Ndelela</i>	
Optimization of Ultrasound-Enhanced Intensification of Biofuel Synthesis Using a Multifrequency Reactor and Taguchi Statistical Experimental Design Methodology	600
<i>Naresh N. Mahamuni, Yusuf G. (Debo) Adewuyi</i>	
Efficiency of Lipase Immobilized Mesoporous Silica as Catalyst for Preparing Biodiesel.....	604
<i>Sang-Hyuk Ye, Won-Hyun Jeon, Sun-Geon Kim</i>	
Optimization of a Pilot Plant for Production of Biodiesel From Jatropha Curcas L. Oil	605
<i>Rogelio Sotelo-Boyd, Ma. del Pilar Piña-Delgado, Morayma Uribe-Gomez</i>	
Conversion of Inexpensive Oils Into Biodiesel Using ZnO Nanoparticle Catalyst.....	606
<i>Shuli Yan, Manhoe Kim, Steven Salley, Simon K. Y. Ng</i>	
Two-Phase Bioconversion Process for Effective Utilization of Hexoses and Pentoses in Corn Stover	607
<i>Xuan Li, Tae Hyun Kim</i>	
Simultaneous Enhancement of Solid-Liquid Clarification and Removal/Recovery of Fermentation Inhibitory Compounds From Biomass Slurries	608
<i>Todd Menkhaus, Devon Burke, Brian Carter, Patrick C. Gilcrease</i>	
The Potential of Cellulosic Ethanol Production From Municipal Solid Waste: A Technical and Economic Evaluation.....	609
<i>Jian Shi, Bin Yang, Charles E. Wyman, Shri Ramaswamy, Huajiang Hua</i>	
Potential for Hydrogen Production Using Microbial Electrolysis Cells From Biorefinery Recycle Water	610
<i>Abhijeet P. Borole, Jonathan R. Mielenz</i>	
Effects of Dilute Acid Pretreatment Conditions On Enzymatic Hydrolysis Monomer and Oligomer Sugar Yields for Aspen, Balsam, and Switchgrass.....	611
<i>Jill R. Jensen, Juan E. Morinelly, Kelsey R Gossen, Michael J Brodeur-Campbell, David R Shonnard</i>	
Adsorption of Second Generation Biofuels Using Polymer Resins with in Situ Product Recovery (ISPR) Applications.....	613
<i>David R. Nielsen, Kristala Jones Prather</i>	
Controlling the Rheology of Biomass	614
<i>J. R. Samaniuk, C. Tim Scott, T. W. Root, D. J. Klingenberg</i>	
Impact of Hemicellulose Pre-Extraction for Bioconversion On Birch Kraft Pulp Properties	615
<i>David Hodge, Jonas Helmerius, Jonas Vinblad von Walter, Curt Lindström, Ulrika Rova</i>	
Kinetics of Sulfur Deactivation of Steam Reforming Catalyst.....	616
<i>Stefan Czernik, Whitney Jablonski</i>	
Increasing the Economic Efficiency of a Biomass Feedstock Used for Greenhouse Heating	617
<i>Monty Singletary, Mark Bricka</i>	
Investigation and Modeling Natural Biodegradation System in Soil; Application for Designing An Efficient Biological Pretreatment Technology for Biofuel Production.....	618
<i>Mythreyi Chandoor, Deepak Singh, Shulin Chen</i>	

Life Cycle Assessment of Ethanol in 2022	619
<i>David D. Hsu, Garvin A. Heath, Daniel Inman, Andy Aden, Margaret K. Mann</i>	
Indirect Land Use Changes in Ethanol Fuel Derived From Corn Grain and Corn Stover	620
<i>Seungdo Kim, Bruce Dale</i>	
Techno-Economic Analysis of Corn Butanol Process	621
<i>Ling Tao, Andy Aden</i>	
Sustainability Metrics for Liquid Biofuels	624
<i>Raymond L. Smith</i>	
Life Cycle Assessment of Products From Pyrolysis BioOil: Heat and Power Generation	625
<i>David R. Shonnard, Jiqing Fan, Matthew Alward, Jordan Klinger, Adam Sadehvandi, Tom N. Kalnes</i>	
Life Cycle Assessment of Wood Pyrolysis for Bio-Oil Production for Use as a Wood Preservative	626
<i>Heather S. Thomas, R. Mark Bricka</i>	
Study of the Sustainability of An Integrated Ecosystem with Energy Considerations	627
<i>Prakash R. Kotecha, Joshua Templeton, Urmila D. Diwekar, Heriberto Cabezas</i>	
A Systematic Framework to Determine Economic Potential and Environmental Impact of Polygeneration Facilities	629
<i>Norman E. Sammons Jr., Wei Yuan, Mario R. Eden, Harry T. Cullinan, Burak Aksoy</i>	
Analysis of Industrial Sustainability Under Uncertainty Using Design of Experiments Technique and Fuzzy Logic Method	630
<i>Zheng Liu, Yinlun Huang, Cristina Piluso, Jie Xiao</i>	
Integrated Multiscale Modeling of Economic-Environmental Systems for Assessing Biocomplexity of Material Use	631
<i>Vikas Khanna, Bhavik R. Bakshi</i>	
Trends in Solvent Management in the Pharmaceutical Industry	632
<i>C.Stewart Slater, Mariano J. Savelski</i>	
A Green Two-Step Preparation of Dimmer Acids	633
<i>Yan Cai, Yongmei Xia</i>	
Making Pharma Greener - An Overview of 4 Years of the ACS GCI PR	639
<i>Julie Manley, Concepcion Jimenez-Gonzalez</i>	
Key Green Engineering Research Areas of Pharmaceuticals and Fine Chemicals - a Perspective From Manufacturers	640
<i>Concepcion Jimenez-Gonzalez, Julie Manley</i>	
Asymmetric Bioreduction of Aromatic Nitro Compounds and Nitroalkenes with Enoate Reductase and Nitroreductase Enzymes	641
<i>Yanto Yanto, Mélanie Hall, Andreas S. Bommarius</i>	
Nearcritical Water for the Benign Removal of N-Boc Protecting Groups	642
<i>Ryan Hart, Elizabeth Cope, Pamela Pollet, Charles A. Eckert, Charles L. Llotta, Douglas P. Kjell</i>	
A Paradigm for Scale-up of Piperylene Sulfone as a Sustainable Pharmaceutical Solvent	643
<i>Gregory Marus, Pamela Pollet, Eduardo Vyhmeister, Megan Donaldson, Veronica Llopis Mestre, Charles L. Llotta, Charles A. Eckert</i>	
Space Solar Power: The Cornerstone for Sustainable Energy, Economy, and Environment	644
<i>Darel W. Preble</i>	
Conversion of Wastewater Treatment Facilities Into Biorefineries	649
<i>Jacqueline Hall, W. Todd French, Rafael Hernandez, William E. Holmes, Andro H. Mondala</i>	
Optimal Synthesis of a Pulverized Coal Power Plant with Carbon Capture	650
<i>Prakash R. Kotecha, Juan M. Salazar, Urmila Diwekar, Stephen Zitney</i>	
Massive Deep-Cycle Pb-Acid Batteries for Energy Storage Applications	652
<i>Wenhua H. Zhu, Ying Zhu, Bruce J. Tatarchuk</i>	
Can Large-Scale Advanced-Adiabatic Compressed Air Energy Storage Be Justified Economically in An Age of Sustainable Energy?	656
<i>Amy Shen, William Pickard, Nicholas Hansing</i>	
Measuring Renewability: A Mass Efficiency or E Factor Approach?	657
<i>Alan Curzons, Richard Henderson, Concepcion Jimenez-Gonzalez, Celia S. Ponder</i>	
Cellulosic Ethanol Production: Improving Viability through Enterprise-Wide Modeling and Optimization	658
<i>Paritosh K. Sharma, Omar Galan, Jose Romagnoli</i>	
Accounting for Ecosystem Services in Ecologically Based Life Cycle Assessment (Eco-LCA) by Combining Qualitative and Quantitative Information	660
<i>Shweta Singh, Bhavik R. Bakshi</i>	
Thermal Conversion of Carboxylate Salts (Biomass-to-Mixed Alcohols)	662
<i>Mohit Bhatia, Keith D. Hurley, G. Peter van Walsum, M. Clayton Wheeler</i>	

Sustainability Under Uncertainty: A Systems Analysis Perspective	670
<i>Urmila Diwekar, Yogendra Shastri</i>	
Multistage Stochastic Optimization with Recourse in Batch Plant Scheduling	671
<i>Fei Wang, Li Sun, Helen H. Lou</i>	
Integrated Exergy and Material Based System Analysis for Sustainability Enhancement Under Uncertainties	672
<i>Zheng Liu, Yinlun Huang</i>	
Comparison of Probability Bound Analysis and Information Gap Methodologies for the Sustainability of Industrial Ecosystems	673
<i>Helen H. Lou, Kailiang Zheng, Xiang Li</i>	
Nanoscale Reactions at CO₂—H₂O—Mineral Interfaces: Challenges in Monitoring CO₂ in Geologic Sequestration	674
<i>Young-Shin Jun, Hongbo Shao, Kathleen O'Malley, Ryan E. Matos</i>	
Author Index	