

Sustainable Engineering Forum 2014

Core Programming Area at the 2014 AIChE Annual Meeting

Atlanta, Georgia, USA
16-21 November 2014

ISBN: 978-1-5108-1274-1

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© (2014) by AIChE
All rights reserved.

Printed by Curran Associates, Inc. (2015)

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

AIChE
120 Wall Street, FL 23
New York, NY 10005-4020

Phone: (800) 242-4363
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

(39a) Grand Challenges for Energy Production in the 21st Century	1
<i>John C. Crittenden, Arka Pandit</i>	
(39b) Plenary on “Optimizing Health, Safety & Environmental (HSE) Sustainability”	2
<i>Hebab A. Quazi</i>	
(39c) Water Sustainability and Tools Available for Managing Water Risks	3
<i>Steve Layman</i>	
(39d) Simulation-Based Science and Engineering with Fossil Fuel Energy	4
<i>Chau-Chyun Chen</i>	
(43a) Supercritical CO₂ Based Pretreatment of Guayule Biomass for High Sugar Yield and Low Inhibition Hydrolysate	5
<i>S M Mahfuzul Islam, J. Richard Elliott Jr., Lu-Kwang Ju</i>	
(43b) Determination of Cellulose Degree of Polymerization in Lignocellulosic Biomass	6
<i>Lu Liu, Hou-min Chang, Hasan Jameel, Sunkyu Park</i>	
(43c) Quantifying Variations in the Biomass Recalcitrance of Douglas Fir	7
<i>Scott Geleynse, Xiao Zhang</i>	
(43d) Defeating Biomass Recalcitrance with a Novel Co-Solvent Pretreatment Technology	8
<i>Thanh Yen Nguyen, Charles M. Cai, Samarhya Bhagia, Yunqiao Pu, Rajeev Kumar, Arthur J. Ragauskas, Charles E. Wyman</i>	
(43e) Pretreatments As Tools to Improve Fast Pyrolysis Products from Lignocellulosic Biomass	9
<i>Justinus A. Satrio, Rene Garrido, Joseph Reckamp, Nicole L. Hammer, Charles G. Coe</i>	
(298a) Cellulose Reducing Ends Have No Impact on Cellulose Biological Conversion with T. Reesei Cellulase	10
<i>Rajeev Kumar, Ashutosh Mittal, Michael E. Himmel, Charles E. Wyman</i>	
(53a) Chemical Conversion of Biorefinery Lignin to Value Added Platform Chemicals	12
<i>Ruoshui Ma, Xiao Zhang</i>	
(53b) Metal Catalyzed Conversion of Biomass to Maximize Hemicellulose Sugar Conversion to Valuable Organic Acids	13
<i>Carlos Alvarez-Vasco, Xiao Zhang</i>	
(53c) Catalytic Hydroprocessing of Fatty Acid Methyl Esters to Jet Fuels	14
<i>Pengmei Lv</i>	
(53d) Saccharification and Lignin Fractionation of Lignocellulosic Biomass in Molten Salt Hydrate System	26
<i>Xuejun Pan, Ning Li, Chaoqun Mei, Li Shuai</i>	
(53e) Conversion of Lignin to Hydrocarbon Fuels Via Catalytic Depolymerization and Hydrogenation	27
<i>Xiao-dong Tian, Yue-yuan Ye, Yun-quan Liu</i>	
(53f) Catalytic Conversion of Xylose-Rich Hydrolyzate from Autohydrolysis into Furfural	28
<i>Lu Liu, Jing Du, Hou-min Chang, Hasan Jameel, Sunkyu Park</i>	
(80b) Energy, the Wealth of Nations, and Human Development: Why We Must Have Sustainable Biofuels	29
<i>Bruce Dale</i>	
(80c) Sustainable Cellulosic Feedstock Supply Chains	30
<i>Steven R. Thomas</i>	
Reverse Electrodialysis: Sustainable Energy from Hydraulic Fracturing Water Recycle	31
<i>Hatley Dunsworth</i>	
Modeling of the Aerobic Cometary Transformation of Chlorinated Ethenes By the Mycobacterium Elw-1	32
<i>Stephanie Rich</i>	
The Enzymatic Hydrolysis of Alfalfa Stalks for Use As a Biofuel Resource	33
<i>Elijah Wade</i>	
Synthesis and Characterization of Thin Film Fealcr for High Temperature Corrosion Applications	34
<i>Randy Fang</i>	
Border Environmental Education and Water Research	43
<i>Joshua Gomez</i>	
Ferroelectric BTO on Si (001) for High-Efficiency Solar Cell Heterostructures	52
<i>Emma Kaeli</i>	
Natural Gas, the Bridge Fuel	53
<i>Sravya Khasnavees</i>	

The Federal Role in Fostering an Innovative U.S. Energy Ecosystem	54
<i>Erin Alderink</i>	
A Biowall for Improving Indoor Air Quality	55
<i>Caroline Kelemen</i>	
(111a) Unveiling the Ionic Liquid Deconstruction of Lignocellulosic Biomass Using Glycome Profiling	56
<i>Jian Shi, Sivakumar Pattathil, Tammy Dutta, Sivasankari Venkatachalam, Michael G. Hahn, Blake A. Simmons, Seema Singh</i>	
(111b) Recycling of Inexpensive Ionic Liquids for Lignocellulose Fractionation	57
<i>Jason P. Hallett, Agnieszka Brandt</i>	
(111c) Flocculation Assisted Clarification of Enzymatically Hydrolyzed Corn Stover Slurries	58
<i>Jonathan J. Stickel, James J. Lischeske, David A. Sievers, Nathan C. Crawford</i>	
(111d) A Comparative Study on the Pyrolysis and Gasification Behavior of Sugarcane Tops/Leaves and Sugarcane Bagasse	59
<i>Mohmed Akil Syed, Pradeep K. Agrawal, Carsten Sievers, John D. Muzzy, Steven J. Lien, John Henley</i>	
(111e) Comparison of Lab, Pilot, and Commercial Scale Low Consistency Mechanical Refining for Improvements in Enzymatic Digestibility of Pretreated Hardwood	60
<i>Brandon W. Jones, Richard Venditti, Sunkyu Park, Hasan Jameel</i>	
(124b) The Importance of Advanced Supply Systems for Coupling Sustainable Bioenergy Land Use to Biomass Trade	61
<i>David N. Thompson, J. Richard Hess, Mohammad Roni</i>	
(156a) Purification and Concentration of Wood Extracts By Membrane Filtration	62
<i>Shijie Liu, Yipeng Xie</i>	
(156b) Design of an Organic-Inorganic Amine Monomer to Prepare Thin Film Composite Membranes for Bioethanol Purification	71
<i>Jian Zuo, Tai-Shung Chung</i>	
(156c) Distillation and Isolation of Commodity Chemicals from Bio-Oil Made By Tail-Gas Reactive Pyrolysis	72
<i>Yaseen Elkasabi, Charles A. Mullen, Akwasi A. Boateng</i>	
(156d) Effect of Operating Conditions on the Pervaporation of Butanol from Aqueous Binary Solutions for Bio-Butanol Production	73
<i>Hoda Azimi, Peter Gaudet, Jules Thibault, F. Handan Tezel</i>	
(156e) Strategies for Efficient and Cost-Effective Ionic Liquid Recycle and Product Recovery	74
<i>Jian Shi, Jian Sun, Noppadon Sathitsuksanoh, Ning Sun, Kim Tran, Anthe George, Blake A. Simmons, Seema Singh</i>	
(156f) Separation and Purification of Biobutanol during Bioconversion of Biomass	75
<i>Hua-Jiang Huang, Shri Ramaswamy</i>	
(176a) High Efficiency Solar Thermal Power and Integrated Chemical Storage Cycles for Continuous Grid Power Supply	76
<i>Emre Gençer, Dharik Mallapragada, François Marechal, Mohit Tawarmalani, Rakesh Agrawal</i>	
(176b) Optical Design of Multi-Source High-Flux Solar Simulators	77
<i>Roman Bader, Sophia Haussener, Wojciech Lipinski</i>	
(176c) High Operating Temperature Transfer and Storage (HOTTS) System for Concentrated Solar Power Generation and Metals Production	78
<i>Christopher Bonino, Bruce Cook, John Newman, James Trainham, Josh Hlebak, Richard Gould, Luke Coleman</i>	
(176d) Thermochemical Energy Storage Using Strontium Carbonate/Strontium Oxide System for Solar Energy Utilization	79
<i>Kelvin Randhir, Nathan Rhodes, Jeremy Grunewald, Conrad Cole, Michael Bobek, Like Li, Nicholas AuYeung, David Hahn, Renwei Mei, James Klausner</i>	
(176e) A Model of Transient Thermal Transport Phenomena Applied to the Carbonation and Calcination of a Sorbent Particle for Calcium Oxide Looping CO₂ Capture	80
<i>Lindsey Yue, Wojciech Lipinski</i>	
(176f) Computational Screening of Oxygen Vacancy Formation for Solar-Driven Isothermal CO₂ and H₂O Splitting with Metal Oxide Redox Materials	90
<i>Ronald Michalsky, Venkatesh Botu, Cory Hargus, Andrew A. Peterson, Aldo Steinfeld</i>	
(177a) Effects of Torrefaction Severity on the Product Distribution of Two-Stage Pyrolysis	91
<i>Jordan Klingner, Ezra Bar-Ziv, Ph.D., Miron Perlman, Bethany Klemetsrud, David R. Shonnard</i>	
(177b) In-Situ and Ex-Situ Upgrade of Pyrolysis Vapors from Beetle-Killed Trees	92
<i>Guanqun Luo, Fernando Resende</i>	
(177e) Pressurized Pyrolysis and Gasification of Switchgrass	93
<i>Gautami M. Newalkar, Kristiina Iisa, Carsten Sievers, Pradeep K. Agrawal</i>	
(177d) Understanding the Gasification Reactivity of Biomass Derived Chars	94
<i>Mohmed Akil Syed, Gautami M. Newalkar, Pradeep K. Agrawal, Carsten Sievers, John D. Muzzy, Scott A. Sinqefield, Derrick W. Flick</i>	

(177f) A Hybrid Biomass-Methane Gasification System for High Conversion and Selectivity to H₂ and CO	95
<i>Aaron W. Palumbo, Jeni C. Sorli, Alan W. Weimer</i>	
(196a) A Life Cycle Assessment on the Renewable p-Xylene Production	96
<i>Zhaojia Lin, Vladimiro Nikolakis, Marianthi G. Ierapetritou</i>	
(196b) Green House Gas Emissions from Lignocellulosics USED As Raw Material for Biorefineries	98
<i>Valentina Hernández, Laura V. Daza, Juan C. Carvajal, Carlos A. Cardona</i>	
(196c) Life Cycle Carbon Footprint of Linear Alkylbenzene Sulfonate from Coconut Oil, Palm Kernel Oil, and Petroleum Based Paraffins	111
<i>David R. Shonnard, Daniel Fogliatti, Scott Kemppainen, Tom N. Kalnes, Jiqing Fan</i>	
(196d) Development of an LCA Database for the Environmental Impact Assessment of Biorefinery Products	113
<i>Paraskevi Karka, Stavros Papadokostantakis, Konrad Hungerbuehler, Antonis C. Kokossis</i>	
(196e) Anhydrous Bio-Ethanol Production: Life Cycle Analysis of Distillation and Dehydration Steps	115
<i>Fernando Daniel Mele, Michel Kahwaji Janho, Jorge E. Gatica, Mauricio Colombo, María Rosa Hernández</i>	
(196f) GHG Credits: The Misunderstanding in the Lignocellulosic Case	116
<i>Juan C. Carvajal, Valentina Hernández, Carlos A. Cardona</i>	
(196g) A MULTI-Criteria Framework for Design and Assessment of BIO-Based Chemical Process	127
<i>HongThuy T. Nguyen, Yasunori Kikuchi, Noda Masaru, Masahiko Hirao</i>	
(212a) Revealing a Stimulatory Effect of Lignin in Enzymatic Hydrolysis of Lignocellulose	129
<i>Maobing Tu, Chenhua Lai</i>	
(212b) Modeling of Swelling and Dissolution of Cellulosic Fibers for Efficient Woody Biomass Utilization	130
<i>Mohammad Ghasemi, Abhiram Y. Singapati, Marina Tsianou, Paschalis Alexandridis</i>	
(212c) Investigations into the Chemical and Structural Factors Contributing to Large Differences in the Biomass Recalcitrance of Douglas Fir Trees	131
<i>Scott Geleynse, Xiao Zhang</i>	
(212d) Two Stage Pretreatment for Fractionation and Enhanced Enzymatic Hydrolysis of Lignocellulosic Biomass	132
<i>Subramanian Ramakrishnan, John Telotte, Gary Brodeur</i>	
(212e) Disrupting Cellulose for Conversion to Glucose in Loblolly Pine Using Ionic Liquid-Glycerol Mixtures	133
<i>Joan G. Lynam, Charles J. Coronella</i>	
(239a) Extracellular PHA Production from Woody Biomass	134
<i>Emma E Putman, Chenhui Liang, Yuanzhen Wang, Shijie Liu</i>	
(239b) Strategies to Achieve High-Solid Enzymatic Hydrolysis of Pretreated Corn Stover	135
<i>Wenhui Geng, Yongcan Jin, Hasan Jameel, Sunkyu Park</i>	
(239c) Enzymatic Hydrolysis of Waste Rejects from OCC Mills – Effect of Minerals and Optimal Methods to Reduce Inhibition	136
<i>Byeong Cheol Min, Bandaru V. Ramarao</i>	
(239e) Advances in Enzymes for Commercial Cellulosic Biomass Processing	137
<i>Vinod Srinivasan</i>	
(246a) Transient Heat and Mass Transfer Model of a Solar Thermochemical Reactor for CO₂ Capture	138
<i>Leanne Reich, Terrence Simon, Wojciech Lipinski</i>	
(246b) A New High Efficiency Solar Fuels Reactor Concept Based on a Liquid Metal Heat Transfer Fluid: Modeling and Efficiency Estimation	139
<i>Cansheng Yuan, Yoshiaki Kawajiri, Asegun Henry</i>	
(246c) Thermochemical Water Splitting: New Materials and High Performance	142
<i>Colby Jarrett</i>	
(246d) Solar Thermochemical Hydrogen Production Efficiency with Kinetic Limitations	147
<i>Brian D. Ehrhart, Christopher L. Muhich, Ibraheam Alshankiti, Alan W. Weimer</i>	
(246e) “Hercynite Cycle” Materials for Pseudo-Isothermal Solarthermal Water Splitting	148
<i>Christopher L. Muhich, Brian D. Ehrhart, Kayla Weston, Ibraheam Alshankiti, Charles B. Musgrave, Alan W. Weimer</i>	
(246f) Joule Boosted Sulphuric Acid Compact Heat Exchanger for Solar H₂ Production	149
<i>Moises Romero, Dennis Thomey, Jan-Peter Säck, Stefan Breuer, Martin Roeb, Christian Sattler</i>	
(266a) Life-Cycle Assessment of Diesel Fuel and Reformulated Gasoline Blendstock Production from Natural Gas and Biomass to Liquids Conversion Processes	158
<i>Eric C. D. Tan, Yimin Zhang, Dennis Schuetzle, Matthew Caldwell</i>	

(266b) Life Cycle Assessments of Jet Fuel and Co-Products Made from Lanzatech Biomass-Based Ethanol	159
<i>Robert M. Handler, David R. Shonnard, Ignasi Palou-Rivera, Andrea Lai, Richard T. Hallen, Yunhua Zhu, Karl O. Albrecht, Michael A. Lilga</i>	
(266c) Geographically Specific Life Cycle Assessment of Biofuels from Wastewater Microalgae	160
<i>Marie-Odile P. Fortier, Griffin W. Roberts, Susan M. Stagg-Williams, Belinda S.M. Sturm</i>	
(266d) Estimation of Soil Carbon Change from Rotation Cropping of Rapeseed with Wheat in the Hydrotreated Renewable Jet Life Cycle	161
<i>Suchada Ukaew, David R. Shonnard, David Archer</i>	
(266e) Multi-Stage Pyrolysis for Biofuel Production: A Life Cycle Evaluation of Energy Consumption and GHG Emissions	162
<i>George G. Zaimes, Daniel E. Resasco, Vikas Khanna</i>	
(266f) Techno-Economic Analyses and Life Cycle Assessment of Two Stage Fast Pyrolysis for Bio-Oil Production from Wood	164
<i>Olumide Winjobi, David R. Shonnard, Wen Zhou, Ezra Bar Ziv</i>	
(266g) Embedding Fundamental Models of Technological Alternatives within a Hybrid Inventory for Multi-Scale Life Cycle Design	165
<i>Rebecca Hanes, Bhavik R. Bakshi</i>	
(287a) Air Dispersion Modeling with Multi-Criteria Decision Approach for Sustainability	182
<i>Tony Liu, Morgan Reed, Eric Peterson, Meiqian Wang</i>	
(287b) Multi-Objective Optimization for Air-Quality Monitoring Network Design	183
<i>Min Chen, Qiang Xu</i>	
(287c) Optimal Design and Integration of a Process Site Waste Heat Recovery System	185
<i>Oluwagbemisola Oluleye, Megan Jobson, Robin Smith</i>	
(306a) The Effect of Types of Lignocellulosic Biomass on Autohydrolysis Liquor Inhibitor Composition	208
<i>Robert Narron, Qiang Han, Hou-min Chang, Hasan Jameel, Sunkyu Park</i>	
(306b) Potential of Alkaline Hydrogen Peroxide (AHP) As Softwood Forest Residue Pretreatment Method: Hemicellulose and Cellulose Conversion to Sugars and Chemicals	209
<i>Carlos Alvarez-Vasco, Xiao Zhang</i>	
(306c) Comparative Techno-Economic Analysis of a Softwood Ethanol Process Featuring Post-Hydrolysis Sugars Concentration Operations and Continuous Fermentation with Cell Recycle	210
<i>Steven J. Schneiderman, Raghu N. Gurrum, Todd J. Menkhaus, Patrick C. Gilcrease</i>	
(306d) Continuous Ethanol Fermentation with Microfiltration Cell Recycle Applied to a Concentrated, Solids-Free Softwood Hydrolysate	211
<i>Steven J. Schneiderman, Gabriel T. Rensch, Todd J. Menkhaus, Patrick C. Gilcrease</i>	
(306e) Engineering Neurospora Crassa for Improved Cellobionate Production from Cellulose	212
<i>Amanda Hildebrand, Edyta Szewczyk, Takao Kasuga, Zhiliang (Julia) Fan</i>	
(307a) A Techno-Economic Analysis of the Renewable Production of Phthalic Anhydride	213
<i>Zhaojia Lin, Vladimiro Nikolakis, Marianthi G. Ierapetritou</i>	
(307b) Techno-Economic Analysis for Upgrading Butanol to Hydrocarbon Fuel	215
<i>Ling Tao, Jennifer Markham</i>	
(307c) 2013 NREL Design Report: Biochemical Conversion of Biomass-to-Hydrocarbons, Process Design and Economics	216
<i>Ryan Davis, Ling Tao, Eric C. D. Tan, Mary Bidy, Chris Scarlata</i>	
(307d) Continuous Production of Ethanol from Syngas in a Trickle Bed Reactor By Clostridium Ragsdalei	219
<i>Mamatha Devarapalli, Hasan K. Atiyeh, John R. Phillips, Randy S. Lewis, Raymond L. Huhnke</i>	
(307e) Process Simulation Models Linking Biomass to Biofuel Experimental Outcomes with Supply Chain Optimization	220
<i>Kwabena Darkwah, Sumesh Sukumara, Jeffrey R. Seay</i>	
(307f) Process Intensification (PI) of CO Uptake: Cellular Biocomposites of Clostridium Ljungdahlii OTA1 Immobilized By Aerosol Deposition on Paper	227
<i>Mark Schulte, Michael Flickinger</i>	
(307g) Techno-Economic and Environmental Analysis of the Use of Different Biofuel Blends to Obtain Jet Biofuels	228
<i>Valentina Aristizábal, Javier Davila Sr., Alvaro Gómez, Germán Aroca, Carlos A. Cardona</i>	
(324a) Improving a process site sustainability through waste heat recovery	240
<i>G. Oluleye, S. J. Perry, Megan Jobson, Robin Smith</i>	
(324b) Multiscale Connectivity for Chemical Mixture Toxicity Assessment	263
<i>Dimosthenis Sarianni</i>	

(324c) Double Containment Piping Systems: A Fail-Safe, Leak-Proof and Environmentally Friendly Solution	271
<i>Darin Johnson</i>	
(324d) Humic Substances in Treatment of Water Contaminated with Hydrocarbons	278
<i>Yair Cruz-Narváez, Hever Honorato-Cervantes, Enrique Rico-Arzate, Jose J. Castro-Arellano, Vanessa Silva-Castro</i>	
(324e) Sustainability Assessment and Performance Improvement of Electroplating Systems	279
<i>Hao Song, Navdeep Bhadbhade, Yinlun Huang</i>	
(324f) Uncertainties of Ozone Increments Caused By Industrial Startup Flaring	280
<i>Jian Zhang, Ziyuan Wang, Qiang Xu, Thomas C. Ho</i>	
(324h) Experimental Investigations of a Salinity Gradient Solar Pond Under the Northern Cyprus Climate Conditions	281
<i>Mehdi Amouei Torkmahalleh, Sevgi Gödelek, Dilem Eroglu, Abdul Rehman Rajab Habib, Mohammad Askari, Negar Zare Pakzad, Soudabeh Gorjinezhad, Goodarz Ahmadi, Sitaraman Krishnan</i>	
(365a) Quantitative Structure-Activity Relationship (QSAR) Study on Carbonyl Inhibition of Microbial Fermentation	282
<i>Maobing Tu, Dongxu Cao, Rui Xie</i>	
(365b) Acid Extraction of the Phytate from Various Corn Ethanol Coproducts	283
<i>Qiyang He, Jing Gan, Hongjian Lin, Aravindan Rajendran, Mi Yan, Yan Yang, Bo Hu</i>	
(365c) Fragmentation of Organosolv Lignin By Fenton Reaction Facilitates Production of Lignin Derived Mucolic Acid and Aromatic Compounds	284
<i>Zhaohui Tong, Jijiao Zeng, Chang Geun Yoo, Xuejun Pan, Wilfred Vermerris, Fei Wang</i>	
(365d) Pd-Catalyst Assisted Organosolv Process to Isolate Ethanol Organosolv Lignin Retaining Compatible Characteristics for Producing Lignin Monomeric Compounds	285
<i>Hoyong Kim, Han-Seob Jeong, Su-Yeon Lee, Joon Weon Choi, In Gyu Choi</i>	
(365e) An Efficient Approach to Solely Biomass-Derived p-Xylene and Terephthalic Acid	286
<i>Zhaohui Tong, Fei Wang</i>	
(365f) Lipid Production from Lignocellulosic Biomass Via a Newly Isolated Oleaginous Fungal Strain	287
<i>Yan Yang, Mi Yan, Jing Gan, Aravindan Rajendran, Hongjian Lin, Qiyang He, Bo Hu</i>	
(366a) Techno-Economic Analysis of a Novel Indirect Coal-Biomass to Liquids (CBTL) Plant Integrated with a Combined Cycle Plant and CO₂ Capture and Storage (CCS)	288
<i>Yuan Jiang, Debangsu Bhattacharyya</i>	
(366b) A Framework for Defining the Economic Feasibility of Cellulosic Biofuel Pathways	289
<i>Tristan Brown, Mark Mba Wright</i>	
(366c) An Optimization-Based Framework for Design of Renewable Energy Processes Under Uncertainty: Application to Biorefineries	290
<i>Aryan Geraili, Jose A. Romagnoli</i>	
(366d) Production of Syn-Crude from Biomass/Oil Shale Using a Moving Bed Downdraft Reactor	292
<i>Hassan Golpour, Joseph D. Smith</i>	
(366e) Predicting the Properties of Torrefied Biomass with a Three-Stage Chemical Kinetics Model	293
<i>Jordan Klínger, Ezra Bar-Ziv, Ph.D., David R. Shonnard</i>	
(366f) Process Synthesis for Biomass Torrefaction	294
<i>Jeffrey A. Herron, Daniel E. Resasco, Christos T. Maravelias</i>	
(366g) Hydrogen Production and Gasification from Biomass: Challenges and Strategies	295
<i>Carlos A. Cardona, Carlos A. García, Juan B. Restrepo</i>	
(391a) Development and Characterization of γ-Dicalcium Silicate Nanoparticles for Greener Cementitious Materials	303
<i>Scarlett Widgeon, Mariané Silva de Miranda, Rahul P. Sangodkar, Elizabeth Cisneros, Flávio A. Rodrigues, Bradley F. Chmelka</i>	
(391b) Multiscale Modeling for Nanoclearcoat Curing	304
<i>Hao Song, Jie Xiao, Yinlun Huang</i>	
(391c) Continuous Sizing and Characterization of Suspension-Based Nanomaterials	305
<i>Fanxu Meng, Victor M. Ugaz</i>	
(410a) Self Sustaining Treatment for Active Remediation (STAR): Design and Implementation at a Coal-Tar Impacted Site	306
<i>Len A. de Vlaming</i>	
(410b) Exergetic Analysis in Performance Evaluation and Process Synthesis of Refrigeration System in an Ethylene Plant	315
<i>Ha Dinh, Jian Zhang, Qiang Xu</i>	
(391e) Novel Exposure and Toxicological Methods to Define the End-of-Life Environmental Health and Safety Implications of Nano-Enabled Products	316
<i>Georgios A. Sotiriou, Dilpreet Singh, Fang Zhang, Wendel Wohlleben, Philip Demokritou</i>	

(424a) Commercial Pilot for Closed-Loop Wastewater Treatment and Biofuel Production Using Microalgae	317
<i>Peter Valdez, Eric Sundstrom, Lucie Novoveska, Matthew Atwood</i>	
(424b) Hydrothermal Upgrading of Algae Paste in a Continuous Plug Flow Reactor	318
<i>Bhavish Patel, Klaus Hellgardt</i>	
(424c) Role of Species, Pretreatment, and Lipid Extraction Conditions in Hydrodeoxygenation and Hydroisomerization of Algae Oils to Hydrocarbon Fuels	319
<i>Jacob S. Kruger, Earl Christensen, Robert McCormick, Philip Pienkos</i>	
(424e) Catalytic Pyrolysis of Algae (<i>Scenedesmus dimorphus</i>)	320
<i>Foster A. Agblevor, Bhuvanesh kumar Yathavan, Daniel M. Ginosar, Deborah T. Newby, Jacob Whittle</i>	
(424f) Techno-Economic Analysis of a Perspective Bioethylene Production Process from Photosynthetically-Fixed CO₂ in Recombinant Cyanobacteria	321
<i>Jennifer Markham, Ling Tao, Ryan Davis, Jianping Yu</i>	
(431a) Study of the Effect of Alkali Distillation Liquid on Simultaneous Saccharification and Co Fermentation (SSCF) of Alkaline Pretreated Solid State Fermented Sweet Sorghum Bagasse with <i>Zymomonas Mobilis</i>	322
<i>Menghui Yu, Shizhong Li, Jihong Li, Ting Cui, Zhixing Zhou</i>	
(431b) Multi-Scale Investigation for the Effect of Mechanical Refining for Pretreated Lignocellulosic Biomass on the Subsequent Enzymatic Hydrolysis	323
<i>Junyeong Park, Wenhui Geng, Kabindra Kafle, Brandon W. Jones, Seong H. Kim, Sunkyu Park</i>	
(431c) Effect of Temperature on Pelletizing SPORL Pretreated Forest Biomass and Subsequent Enzymatic Saccharification and Fermentation	324
<i>Jingzhi Zhang, Andrea Laguna, Craig Clemons, Michael P. Wolcott, Rolland Gleisner, J.Y. Zhu</i>	
(431d) Optimization of Operating Conditions of Aerobic Digester for Effective Conversion of Biomass to Bio-Gas	325
<i>Saima Suleman, Muhammad Suleman Tahir, Sajid Mahmood</i>	
(431e) Life Cycle Assessment of Lignin-Derived Chemicals from Catalytic Reaction of Candlenut Nutshells with Methanol	326
<i>Mahdokht Montazeri, Evan Beach, Matthew J. Eckelman</i>	
(463a) Sustainable Process Networks for CO₂ Conversion	332
<i>Rebecca Frauzem, Pinchayapan Kongpanna, Kosan Roh, Jay H. Lee, Varong Pavarajarn, Suttichai Assabumrungrat, Rafiqul Gani</i>	
(463b) Spatial Decomposition Techniques for Strategic and Tactical Design of Biomass-to-Co-Combustion Supply Chains	344
<i>Mar Perez-Fortez, José Miguel Lainez, Luis Puigjaner</i>	
(463c) Techno-Ecological Synergy: A Framework for Sustainable Engineering	346
<i>Bhavik R. Bakshi, Guy Ziv, Varsha Gopalakrishnan</i>	
(463d) Multistage Fuzzy Decision-Making for Sustainability Performance Improvement	349
<i>Hao Song, Liwei Yan, Yinlun Huang</i>	
(463e) Bio-Based Bottles – Recyclable but More Ecological?	350
<i>Merten Morales, Sven Linster, Sara Badr, Stavros Papadokostantakis, Konrad Hungerbühler</i>	
(463f) New Systematic Approach Using Combined Constraints Logic Propagation and Mathematical Programming Techniques for Energy Efficient Synthesis of Eco-Industrial Parks	351
<i>Mahmoud Bahy Noureldin, Zeeshan Farooq, Mana Al-Owaidh, Hani Al-Saed</i>	
(464a) Self-Emulsification of Alkaline-Dissolved Clove Bud Oil By Whey Protein, Gum Arabic, Lecithin, and Their Combinations	354
<i>Yangchao Luo, Yue Zhang, Kang Pan, Faith Critzer, P. Michael Davidson, Qixin Zhong</i>	
(464b) Oil Extraction from Spent Coffee Grounds Using Advanced Techniques	355
<i>Javier Davila Sr., Moshe Rosenberg, Gonzalo Taborda Sr., Carlos A. Cardona</i>	
(464c) Microencapsulation of Blackberry Antioxidants. Modeling and Simulation	364
<i>Miguel Rojas, Javier Davila Sr., Moshe Rosenberg, Carlos A. Cardona</i>	
(464d) Liquid-Phase Electrical Discharge Plasmas Rapidly Inactivate Pathogenic and Spoilage Microorganisms in Water	376
<i>Tomislava Vukusic, Zoran Herceg, Shane Rogers, Selma Mededovic</i>	
(464e) Modeling the Drying Kinetics of Carrot Particles in a Closed Chamber Following Forced Convection and Electric Field Treatment	377
<i>Abdelbasset Bessadok Jemai</i>	
(464f) Antimicrobial Peptide Segments from Soy Protein for Use in Food Safety	378
<i>Ning Xiang, Yuan Lyu, Ganesan Narsimhan</i>	
(464g) Making Food Safe in Light of New Demands	379
<i>James Van Wyk</i>	

(464h) Low Temperature Batch Conversion of Cellulosic Biomass	384
<i>Mohit Nahata, Galen B Fisher, Johannes W. Schwank</i>	
(473a) Carbon Capture and Biofuel Production through Microalgae	385
<i>Saroj S. Baral, Kaustub Singh, Prabudh Sharma</i>	
(473b) Applying the Attainable Region Approach to Biogas Production	386
<i>Ralph Muvhiwa</i>	
(473c) Impacts of Thermal Processing on the Physical and Chemical Properties of Renewable Crude Oil	402
<i>Laibao Zhang, Anandavalli Varadarajan, Erick S. Vasquez, Keisha B. Walters</i>	
(474a) Calcium Pretreatment and the Resulting Compositional Changes in Pyrolysis Oils	403
<i>Paige Case, M. Clayton Wheeler, William J. DeSisto</i>	
(474b) Pyrolysis of Woody Residues: Impact of Mineral Content	404
<i>Kristina Iisa, Alan H Zacher, Robert Sykes, Fernando Preto, Benjamin Bronson</i>	
(474c) Effects of Biomass Inorganic Elements on Catalytic Fast Pyrolysis over HZSM-5	405
<i>Charles A. Mullen, Akwasi A. Boateng</i>	
(474d) Empirical Approaches to Predict Fast-Pyrolysis Products By Feedstock Characterization and Py-MBMS Analysis	406
<i>Hoyong Kim, Carlos Aizpurua, Xueyong Ren, Stephen Kelley, Hasan Jameel, Sunkyu Park</i>	
(474e) Levulinate and Formate Salt Reactions during Thermal Deoxygenation (TDO)	407
<i>Scott Eaton, M. Clayton Wheeler</i>	
(474f) In-Situ Catalytic Upgrading of Pyrolysis Vapors in a Bench-Scale Fluidized Bed Reactor	408
<i>Ravishankar Mahadevan</i>	
(480a) Assessment of Temperature- and pH-Sensitive Hydrogels for Dewatering Dilute Algal Suspensions	409
<i>Agasteswar Vadlamani, Jeremy Weir, Xiaofei Zhao, Sridhar Viamajala, Sasidhar Varanasi</i>	
(480b) Modeling and Dynamic Optimization of Algal Biomass Production in an Open Pond	410
<i>Abdulla Malek, Luca C. Zullo, Prodrimos Daoutidis</i>	
(480c) A Growth Model for <i>Chlorella vulgaris</i> Including Photolimitation and Photoinhibition Effects	411
<i>Jinsoo Kim, Joo-Youp Lee, Ting Lu</i>	
(480d) Towards an Autonomous Cyanobacterial Biorefinery: Continuous Production of Bio-Hydrogen and Biomass	412
<i>Pongsathorn Dechatiwongse, Geoffrey Maitland, Klaus Hellgardt</i>	
(480e) Dynamic Modeling of Photoproduction, Photoregulation and Photoinhibition in Microalgae Using Chlorophyll Fluorescence	413
<i>Andreas Nikolaou, Andrea Bernardi, Fabrizio Bezzo, Tomas Morosinotto, Benoit Chachuat</i>	
(480f) Comprehensive Modeling of Light-Limited Algae Growth Rate in a Taylor Vortex Photobioreactor: From Hydrodynamics, Radiation Transfer to Algae Growth Model	414
<i>Bo Kong, Xi Gao, R. Dennis Vigil</i>	
(490a) Conceptual Design of Seaweed-Based Biorefinery	415
<i>Peyman Fasahati, J. Jay Liu</i>	
(490b) A Single Molecule Investigation of Cellulose Hydrolysis By TrCel7a	416
<i>Sonia Brady, Sree Latha, Kelsea Best, Matthew Lang</i>	
(490c) Engineering More Effective Catalysts for Unnatural Allomorphs of Cellulose	417
<i>Gnana Gnanakaran, Shishir Chundawat, Cesar López, Leonardo D. Sousa, Bruce Dale, Brian G. Fox</i>	
(490d) Optimization of Enzyme Mixture for Simultaneous Hydrolysis of Cellulose and Hemicelluloses Based on a Novel Mechanistic Model	418
<i>Yang Zhang, Wen Zhou</i>	
(490e) Lignosulfonate on Enzymatic Saccharification of Cellulose	419
<i>Hongming Lou, Haifeng Zhou, J.Y. Zhu, Xueqing Qiu</i>	
(490f) Converting Lignocellulosic Biomass to Butanol By Clostridium	420
<i>Yu Yan, Chen Zhang, Jianzhong He</i>	
(532a) Efficient Hydrogen Storage: LOHC Vs. Other Technologies	421
<i>Wolfgang Arlt, Patrick Adametz, Karsten Müller</i>	
(532b) The Effect of High-Penetration Renewable Energy on Electricity Prices and Emissions	422
<i>Shisheng Huang, Xiaohui Liu, Lynette Cheah, Kristin Wood, James Dietz, Joseph Pekny</i>	
(532c) Thermodynamic Analysis of Hydrogen Storage in Metal Hydrides	423
<i>Patrick Adametz, Karsten Müller, Wolfgang Arlt</i>	
(532d) The Impacts of Regional Natural Gas Prices on the Deployment of Renewable Energy Systems	424
<i>Wesley Cole, Patrick Sullivan, Carolyn Davidson</i>	
(532e) Redox Flow Batteries with a Double Ion-Exchange Membrane Design	426
<i>Ke Gong, Xiaoya Ma, Kevin Kuttler, Shuang Gu, Yushan Yan</i>	

(532f) Life Cycle Optimization on Sustainable Design of Cellulosic Biopower Supply Chains	427
<i>Dajun Yue, Fengqi You</i>	
(533a) Effects of Feedstock, Collection Method and Post-Condensation Filtration on the Stability of Pyrolysis Oil	430
<i>Anandavalli Varadarajan, Andres F.Chaparro, Keisha B. Walters</i>	
(533b) The Effect of Hydrogen-Donor Agent in Catalytic Pyrolysis of Lignin to Hydrocarbons	431
<i>Xianglan Bai</i>	
(533c) Effect of Operating Parameters on the Fast Pyrolysis of Pakistani Maize Stalk in Bubbling Fluidized Bed Reactor	432
<i>Khurram Shahzad, Mahmood Saleem, Najaf Ali, Arshad Chughtai</i>	
(533d) Characterization of Aqueous Phase Bio-Oil Derived from Switchgrass Pyrolysis	441
<i>Shoujie Ren, X. Philip Ye, Abhijeet P. Borole</i>	
(533e) Fast Pyrolysis of Lignocellulosic Biomass By 2-Step Approach for Producing Fractionated Bio-Oil Products	450
<i>Justinus A. Satrio, Nicole L. Hammer, John Starcevich, Rene Garrido, Charles G. Coe</i>	
(533f) The Influence of Biomass Components and Pretreatments (hot-water extraction and electron beam irradiation) on Biomass Pyrolysis/ Catalytic Pyrolysis	451
<i>Ofei D. Mante, Thomas Amidon, Arthur Stipanovic, Suresh P. Babu</i>	
(544a) Effect of Inhibitory Compounds on Lactic Acid Fermentation By Lactobacillus Delbrueckii	452
<i>Jing Li, Maobing Tu, Caiqing Zhu</i>	
(544b) Engineering Escherichia coli for Ethanol Production from Pyrolytic Sugar	453
<i>Tao Jin, Laura Jarboe</i>	
(544c) Enhanced Mass Transfer in Syngas Fermentation	454
<i>John R. Phillips, Hasan K. Atiyeh, Raymond L. Huhnke</i>	
(544d) Continuous-Flow Production of Bioethanol: Reactor Design Considerations and Energy-Efficient Recovery	455
<i>Lan Ma, Rutvik Godbole, Michael Sees, Ronald Hedden</i>	
(544e) Syngas Fermentation of Clostridium Ragsdalei P11 in a Hollow Fiber Reactor	456
<i>Randy S. Lewis, James J. Orgill, Hasan K. Atiyeh, Mamatha Devarapalli</i>	
(544f) Small-Scale Biorefineries: Design Strategies and Applications	458
<i>Juan C. Carvajal, Jonathan Moncada, Carlos A. Cardona</i>	
(554a) Ionic liquid screening, process simulation and LCA towards CO2 capture process development	470
<i>Reza Farahipour, Arunprakash T. Karunanithi</i>	
(554b) Validation and Uncertainty Quantification of a High-Fidelity Dynamic Model of a MEA-Based CO2 Capture System	471
<i>Anderson Soares Chinen, Joshua Morgan, Benjamin Omell, Debansu Bhattacharyya, Charles Tong, David C. Miller</i>	
(554c) Study of Local Bubble Dynamics and Mass Transfer in a Split Column Airlift Photobioreactor for Culturing Microalgae for CO2 Sequestration Using a Sophisticated 4-Point Optical Probe Technique	473
<i>Aastha Ojha, Muthanna Al Dahhan</i>	
(554d) Process Design of a Coal-Based Hydrogen Plant with CO2 Capture and Its Improvement	474
<i>Hyungwoong Ahn, Mauro Luberti, Zoe Kapetaki, Daniel Friedrich, Dursun Can Ozcan, Xiao Luo, Pietro Brandani, Stefano Brandani</i>	
(554e) Economic Evaluation of CO2 Capture from Flue Gas By Membrane Permeation	475
<i>Igor L. Wiesberg, José L. Medeiros, Ofélia Q. F. Araújo, Rita M. B. Alves, Paulo L. A. Coutinho</i>	
(554f) Performance Assessment of Solvent-Based CO2 Capture Processes: Design of Complex Flowsheets with Different Solvents	484
<i>Theodoros Damartzis, Athanasios I. Papadopoulos, Panos Seferlis</i>	
(556a) Sustainable Winemaking – Challenges and Opportunities	486
<i>Michael Roland</i>	
(556b) The Challenges of Water Use Reductions and Food Safety in Dairy Processing	487
<i>Jill Brigham</i>	
(556c) The Challenges of Food Safety and Water Use Reductions in Dairy Processing	488
<i>Joseph Herrud, Montgomery Bohanan</i>	
(556d) Maximizing Water and Energy Efficiency in Food Processing While Minimizing Negative Environmental Impact	494
<i>Christopher W. Simmons</i>	
(591a) Determination of Optimum Hydrolysis Conditions for Conversion of a Forest Product Wastewater Effluent to Fermentable Sugars and Ethanol	495
<i>Jifei Liu, Stephanie Groves, Susan T. Bagley, David R. Shonnard</i>	

(591b) Recycling Aqueous Co-Products from Hydrothermal Liquefaction of Microalgae Is Improved By Bacterial Preculture	496
<i>Michael C. Nelson, Henry Y Wang, Xiaoxia Nina Lin</i>	
(591c) Conversion of Furanic and Phenolic Compounds to Hydrogen Gas in a Microbial Electrolysis Cell	497
<i>Xiaofei Zeng, Abhijeet P. Borole, Spyros G. Pavlostathis</i>	
(591d) Controlling the Molecular Properties of a Liquid-Lignin Phase Recovered from Kraft Black Liquor	502
<i>Julian Velez, Mark C. Thies</i>	
(591e) Bio-Oil Distillate Bottoms: Characterization and Applications	503
<i>Yaseen Elkasabi, Akwasi A. Boateng, Michael A. Jackson, Charles A. Mullen</i>	
(596a) Biomass Pyrolysis Reaction Kinetics Using Step-Isothermal Thermogravimetry and TGA/MS	504
<i>Catherine E. Brewer, Kyriacos Zygourakis</i>	
(596c) Catalytic Enhancement of Alkaline Thermal Treatment of Cellulose to H₂ in the Presence of Ca(OH)₂ and Mg(OH)₂	507
<i>Maxim Stonor, Thomas Ferguson, Jingguang G. Chen, Ah-Hyung Alissa Park</i>	
(596d) Warm Syngas Cleanup Using Carbon-Based Sorbents	508
<i>Jiajia Meng, Patrick Woolcock, Tim Hansen, Kevin McCabe, Andrew Lucero, Santosh Gangwal</i>	
(596e) Parametric Gasification Study Comparing Traditional and Blended Feedstocks at Varying Conditions	509
<i>Whitney S. Jablonski</i>	
(596f) Experimental Determination of the Structural Evolution of Biomass Particles during Gasification	510
<i>John Eshun, Rui Li, Lijun Wang, Abloghasem Shahbazi</i>	
(483d) Influence of Feedstock on Biodiesel Corrosiveness and Degradation	511
<i>Isabella P. Aquino, Tais P. Alves, Felipe de Freitas R. Da Silva, Idalina V. Aoki, Ricardo Torres</i>	
(604a) Assessing Changes on Plant Cell Wall Recalcitrance Associated with Alkaline Oxidative Pretreatments	516
<i>Muyang Li, David Hodge</i>	
(604aa) Carbon Dioxide Capture and Utilization from Aerobic and Anaerobic Bioprocesses Using Microalgae	517
<i>Prashant Praveen, Kai-Chee Loh</i>	
(604ab) Fuels and Chemicals from Wastes through Anaerobic Digestion	518
<i>Emmanuel Revellame, Dhan Lord Fortela, William Holmes, Rafael Hernandez, Mark Zappi</i>	
(604ac) Evaporator Fouling Tendencies of Thin Stillage from the Dry Grind Process	519
<i>Ravi K. Challa, David B. Johnston, Vijay Singh, M. E. Tumbleson, Mary-Grace C. Danao, Nicki J. Engeseth, Kent D. Rausch</i>	
(604ad) Process Design and Economic Assessment of Biofuel Production Via Hydrothermal Liquefaction of Defatted Microalgae	535
<i>Longwen Ou, Rajeeva Thilakarathne, Mark Mba Wright, Robert C. Brown</i>	
(604ae) Concentrating Algal Cultures in a Semi-Continuous Process Using Temperature-Sensitive Semi-Interpenetrating Network Hydrogels	536
<i>Xiaofei Zhao, Agasteswar Vadlamani, Sridhar Viamajala, Sasidhar Varanasi</i>	
(604ag) Pretreatment and Fractionation of Corn Stover Using Low Moisture Anhydrous Ammonia (LMAA)	537
<i>Roent Dune Cayetano, Gyong Gil Lee, Rubee koju Shrestha, Nhuan P. Nghiem, Kurt A. Rosentrater, Tae Hyun Kim</i>	
(604ah) Metal Catalyzed Alkaline Hydrogen Peroxide Pretreatment of Hardwoods	538
<i>Namita Bansal, Aditya Bhalla, Zhenglun Li, David Hodge, Eric Hegg</i>	
(604ai) Fractionation of Corn Stover By Non-Isothermal Flow-through (NIFT) Reaction	539
<i>Gyong Gil Lee, Roent Dune Cayetano, Rubee koju Shrestha, Jun Seok Kim, Tae Hyun Kim</i>	
(604aj) Ash Reduction Methods to Provide Least Cost Feedstocks for Conversion Processes	540
<i>John E. Aston, Robert S. Cherry, Jeffrey A. Lacey, Tyler L. Westover, David N. Thompson</i>	
(604ak) Strategies to Improve Cu(bpy)-Catalyzed AHP Pretreatment of Lignocellulosic Biomass	541
<i>Aditya Bhalla, Namita Bansal, Zhenglun Li, David Hodge, Eric Hegg</i>	
(604al) Impacts of Diverse Pretreatments on Cell Wall Porosity, Swelling, and Enzymatic Hydrolysis Yields	542
<i>Jacob Crowe, David Hodge</i>	
(604am) Impacts of Pyrolysis Temperature on Biochar Properties and CO₂ Emission of Soil Amended with Biochar	543
<i>Haoran Yuan, Tao Lu, Yazhuo Wang, Huhe Taoli, Yong Chen</i>	

(604b) Screening Oleaginous Yeast for Lipid Production	552
<i>Bruce S. Dien, C.P Kurtzman, R.L Evangelista, B. Moser, Badal C. Saha, Michael A. Cotta, Venkatesh Balan, Ming Jie Jin, Leonardo da costa Sousa, Bruce E. Dale</i>	
(604c) Coupled Low Temperature Algae Hydrothermal Liquefaction and Catalytic Hydrotreating to Produce Low Nitrogen Fuel Intermediates	553
<i>James Kastner, Will Costanzo, Roger Hiten, Andrew Smola, Keshav Das</i>	
(604d) Enhanced Conversion of Lipids in One-Pot Transesterification of Wet Microalgae	555
<i>Jae W. Lee, Hanjin Im</i>	
(604e) Discrete-Continuous Simulations for Performance Evaluation of Sequential Batch Reactor System for Lipid Accumulation from Volatile Fatty Acids By Activated Sludge Microorganisms Following Seasonal Stochastic Variations	556
<i>Dhan Lord Fortela, Rafael Hernandez, Mark Zappi, William Holmes, Emmanuel Revellame, Stephen Dufreche, Ramalingam Subramaniam, William Todd French</i>	
(604f) Use of Oxygen Uptake Rate Data to Measure the Inhibition Effect of Volatile Fatty Acids on Activated Sludge Dedicated for Lipid Production for Fuels	557
<i>Bimi Shrestha, Rafael Hernandez, Dhan Lord Fortela</i>	
(604g) Transesterification of Sunflower Oil Produced By Solvent Extraction	558
<i>Maristhela P. de A. Marin, Luís Fernando Novazzi, Matheus Leda Denari</i>	
(604h) A Techno-Economic Analysis of Bio-Oil Stabilization for Insertion into Petroleum Refineries and Upgrading to Transportation Fuels	563
<i>Wenqin Li, Mark Mba Wright, Robert C. Brown</i>	
(604i) Effects of Dissolved Inorganic Carbon and Mixing on Autotrophic Growth of <i>Chlorella vulgaris</i>	564
<i>Jinsoo Kim, Joo-Youp Lee, Ting Lu</i>	
(604j) Carbon Footprint Analysis of Hydrotreated Renewable Jet (HRJ) from Rapeseed in Rotation with Wheat	565
<i>Suchada Ukaew, David R. Shonnard, Kristin C. Lewis, David W. Archer, Joon Hee Lee</i>	
(604k) Conventional Versus Advanced Depot Biomass Supply Systems for a Thermochemical Conversion Process and Biorefinery Sizing: Life-Cycle Assessment and Techno-Economic Analysis	566
<i>Eric C. D. Tan, Jacob J. Jacobson, Kara G. Cafferty, Abhijit Dutta, Erin Searcy</i>	
(604m) Life Cycle Analysis on the Combined Separation and Dehydration Steps of Bio-Ethanol Production	567
<i>Fernando Daniel Mele, Michel Kahwaji Janho, Jorge E. Gatica, Mauricio Colombo, María Rosa Hernández</i>	
(604o) Techno-Economical and Environmental Analysis of the Production of Value-Added Metabolites in the Amazon	568
<i>Angela González, Paola Moreno, Carlos A. Cardona, Eulogio Castro, Alvaro Gómez</i>	
(604p) The Effect of Heat Carrier Properties on Pyrolysis Products in an Auger Pyrolyzer	569
<i>Tannon J. Daugaard, Mark Mba Wright, Dustin Dalluge, Robert C. Brown</i>	
(604q) Investigating the Impact of HZSM-5 Silica-to-Alumina Ratio on the Performance of Duckweed Catalytic Fast Pyrolysis	570
<i>Guangyi Liu, Mark Mba Wright, Robert C. Brown</i>	
(604s) Synthesis of AlPO₄-18 Membrane for Water/Acetic Acid Separation	571
<i>Masahiro Seshimo, Sonosuke Ishiguro, Takashi Kuramoto, Masahiko Matsukata</i>	
(604t) Pyrolytic Fractionation of the Biomass Lipids: Catalyst-Free Conversion of the Resulting Vapors to Hydrocarbons	572
<i>Yaser Shirazi, Balakrishna Maddi, Brook Urban, Sasidhar Varanasi, Sridhar Viamajala</i>	
(604u) Effect of Lignin Content on Pyrolysis Bio-Oil Properties	573
<i>Bethany Klemetsrud, Jordan Klinger, David R. Shonnard, Ezra Bar Ziv</i>	
(604v) Use of a Pilot Scale Fluid Bed Pyrolysis Reactor in Undergraduate Engineering Education	574
<i>Bethany Klemetsrud, Jordan Klinger, David R. Shonnard</i>	
(604w) Effect of Kinetic Limitations on Solar Thermochemical Hydrogen Production Efficiency	575
<i>Brian D. Ehrhart, Christopher L. Muhich, Ibraheam Alshankiti, Alan W. Weimer</i>	
(604x) Steam Gasification Characteristics of Waterweeds	576
<i>Hiroki Akagi, Masanori Ochi, Junichi Ida, Tatsushi Matsuyama, Hideo Yamamoto</i>	
(604y) High Temperature Thermochemical Processing of Biomass and Methane for Highly Selective Syngas	577
<i>Aaron W. Palumbo, Jeni Sorli, Alan W. Weimer</i>	
(604z) A New “Cross Metathesis” Synthesis Route for Producing Nylon 12 and Nylon 13 Precursors from Methyl Oleate	578
<i>Godwin Abel, Kim Nguyen, Sridhar Viamajala, Sasidhar Varanasi, Kana Yamamoto</i>	
(605b) Land Use Emissions and Environmental Impacts of Agricultural Systems	579
<i>Jonathan Dubinsky, Arunprakash T. Karunanithi</i>	

(624a) The Biocrack Pilot Plant - an Integrated Btl Concept for Biofuel from Lignocellulosic Feedstock	580
<i>Juergen Ritzberger</i>	
(624b) Mechanistic Study of the Conversion of Dodecanoic Acid into Hydrocarbons	581
<i>Andrés González-Garay, Rogelio Sotelo-Boyás, Jorge Luis Rosas-Trigueros, Fernando Trejo</i>	
(624c) Sustainable Process Design for Biomass-Derived Platform Chemical γ-Valerolactone from Levulinic Acid	582
<i>Jan D. Scheffczyk, Sven Wiezorkowski, Philip Voll, Regina Palkovits, Andre Bardow</i>	
(624d) Butanol Production from Paper Mill Sludge By Simultaneous Saccharification and Fermentation (SSF)	583
<i>Wenjian Guan, Suan Shi, Maobing Tu, Y. Y. Lee</i>	
(624e) Energy Biorefineries: Design and Analysis	584
<i>Carlos A. Cardona, Jonathan Moncada, Alvaro Gómez, Valentina Aristizábal</i>	
(624f) Catalytic Production of Aviation Fuel Hydrocarbons from Softwood Derived Lignin	595
<i>Haisheng Pei, Melvin Tucker, Bin Yang</i>	
(626a) Challenge for the Environmental Protection of Yangtze River Delta: High Density Pollution of Coal Power Plant	596
<i>Xiaohua Lu, Licheng Li, Tuo Ji, Xibing Wang, Xin Feng</i>	
(626b) Ancillary benefits of GHG mitigation in future Colorado electricity portfolio	598
<i>Bahador Mousavi, Arunprakash T. Karunanithi</i>	
(626c) Carbon Management in the Post-Cap-and-Trade Carbon Economy-Part II	599
<i>F. a. DeGroot</i>	
(626e) The Estimation Method Using the Advanced Simulation Technology for Cement Manufacturing Process	600
<i>Yuya Hatori, Takeshi Suemasu, Morihisa Yokota, Toshiyuki Takahashi, Masaki Fujimoto</i>	
(626f) Evaluation of Improving the Air-Conditioner Performance and the Effect on the Cruising Range of AI-EV System	617
<i>Masashi Shimamura, Tsuguhiko Nakagawa, Kyohei Shimono</i>	
(626g) Self-Heat Recuperation System By Electrocaloric Effect	621
<i>Toshihiro Kaseda, Yasuki Kansha, Masanori Ishizuka, Yui Kotani, Renald Rasfuldi, Atsushi Tsutsumi</i>	
(626h) Use Exergy Analysis to Increase Energy Efficiencies of LNG Processes	622
<i>Jian Zhang, Ha Dinh, Qiang Xu</i>	
(635a) Process Simulation of a Hybrid Gasification-Syngas Fermentation Plant for Production of Ethanol from Switchgrass	623
<i>Oscar Pardo-Planas, Hasan K. Atiyeh, John R. Phillips, Clint P. Aichele</i>	
(635b) Pyrolysis and Electrocatalysis of Biorefinery-Derived Lignin to Make Hydrocarbon Fuels	624
<i>Christopher M. Saffron, Mahlet Garedew-Ballard, James E. Jackson</i>	
(635c) Distributed Activation Energy Model for Solar-Driven Pyrolysis Kinetics of Untreated Human Feces	625
<i>Richard Fisher, Tesfayohannes Jacob, Ryan B. Mahoney, Barbara Ward, Karl G. Linden, Alan W. Weimer</i>	
(635d) Effects of Feedstock, Collected Condensate Fraction, and Filtration on Pyrolysis Oil Stability	626
<i>Anandavalli Varadarajan, Andres F. Chaparro, Keisha B. Walters</i>	
(635e) High-Value Fuels and Chemicals from Low-Value Gas Feedstocks	627
<i>Robert Conrad</i>	
(635f) Comparison of the Biochemical and Thermochemical Ways for Use of Lignin	628
<i>Juan C. Carvajal, Alvaro Gómez, Carlos A. Cardona</i>	
(635g) Hydrothermal Carbonization Pretreatment to Extract Lipids from Microalgae	640
<i>Yingda Lu, Robert B. Levine, Phillip E. Savage</i>	
(657a) Physicochemical Properties of Upgraded Bio-Oils from Catalytic Pyrolysis of Biomass: A ¹³C NMR Spectroscopic Investigation to Understand the Effects of the Chemical Composition of the Oils	641
<i>Ofei D. Mante, Foster A. Agblevor</i>	
(657b) The Importance of Reducing End Functionality in Oligosaccharide, Anhydrooligosaccharide and Cellulose Pyrolysis	642
<i>John C Degenstein, Priya Murria, McKay Easton, Harshavardhan Choudhari, Huaming Sheng, Jinshan Gao, James Riedeman, John Nash, W. Nicholas Delgass, Rakesh Agrawal, Hilkka I. Kenttamaa, Fabio H. Ribeiro</i>	
(657d) Low-Order Modeling of Biomass Particle Mixing and Reaction in a Bubbling-Bed Fast Pyrolysis Reactor	643
<i>Gavin Wiggins, C. Stuart Daw, Jack Halow</i>	
(657e) Computational Analysis of Biomass Particles in a Bubbling Bed	660
<i>Emilio Ramirez, C. Stuart Daw, Sreekanth Pannala, Jack Halow, Charles E.A. Finney, Janine Galvin</i>	

(657f) Hydrodynamics Study on Wind-Box and Gasifier Zone of Dual Fluidized-Beds By CFD Simulation	661
<i>Son Ich Ngo, Young-Il Lim, Byung-Ho Song, Uen-Do Lee, Young-Tai Choi, Won Yang, Jae-Hun Song</i>	
(677a) Hydrothermal Stability Strategies for Solid Acid Catalysts	662
<i>Michael T. Timko, Geoffrey Tompsett</i>	
(677b) Continuous Generation of Ethyl Levulinate from Levoglucosan Using Solid Acid Catalysts	663
<i>James Kastner, Roger Hilten, Justin Weber, Keshav Das</i>	
(677c) Hydrolysis of Lignocellulosic Biomass Using a High-Pressure Micro- Reactor – GC/MS System	664
<i>Kaige Wang, Robert C. Brown</i>	
(677d) Renewable Chemicals from Fatty Acids Via Hydrothermal Catalytic Treatment with Zeolite	665
<i>Na (Tiffany) Mo, Ryan L. Hostock, Phillip E. Savage</i>	
(677e) Selective Upgrading of Lignin Dimers to Aliphatic Hydrocarbon Biofuels	667
<i>Haoxi Ben, Mark Jarvis, Glen Allen Ferguson, Mark R. Nimlos, David Robichaud, Calvin Mukarakate, Erica Gjersing, Gregg T. Beckham, Thomas D. Foust</i>	
(677f) Concentrated Phosphoric Acid for Enhanced Conversion of Cellulose to HMF	668
<i>Barron B. Hewetson, Amanda Kreger, Nathan S. Mosier</i>	
(677g) Batch Catalytic Hydroprocessing of Algal Biocrude Produced Via Fast Hydrothermal Liquefaction	669
<i>Bhavish Patel, Pedro Arcelus-Arrillaga, Klaus Hellgardt</i>	
(683a) Understanding the Microalgae Fungal Attraction for a Novel Co-Pelletization Algae Harvesting Process	670
<i>Carlos Zamalloa Nalvartea, Sarman Oktovianus Gultom, Aravindan Rajendran, Mi Yan, Yan Yang, Hongjian Lin, Jing Gan, Bo Hu</i>	
(683b) Kinetic Modeling of Co-Cultured Saccharomyces Cerevisiae and Scheffersomyces Stipitis	671
<i>Min Hea Kim, Andrew Damiani, Q. Peter He, Jin Wang</i>	
(683c) Assessing the Influence of Hydraulic Retention Time on Microbial Community Dynamics during Fermentative Hydrogen Production	673
<i>Saravanan Ramiah Shanmugam, Subba Rao Chaganti, Sathyanarayanan Sevilimedu Veeravalli, Jerald A. Lalman, Daniel D. Heath</i>	
(683d) Characterization of Alginate Lyases from Vibrio Splendidus 12B01 and 13B01	680
<i>Geethika Yalamanchili, Mathew Plutz, Ahmet Badur, Christopher V. Rao</i>	
(683e) Analysis of Furfural As a Chemical Building Block for Future Biorefineries	681
<i>Valentina Aristizábal, Jonathan Moncada, Alvaro Gómez, Carlos A. Cardona</i>	
(707a) One-Pot Conversion of Cellobiose into Polyols and the Possible Reaction Pathways over Extremely Low Phosphotungstic Acid with Ru/C Catalyst	691
<i>Kai Zhang, Shubin Wu</i>	
(707b) Design of Process Plant for the Production of Formaldehyde and Formic Acid from Lignin	700
<i>Teri Curow, Ashley Hudson, Srinivas Palanki</i>	
(707c) Elucidation of Cellulose-Lignin Interaction during Pyrolysis: A Py-GC-MS Study	701
<i>Shiliang Wu, Rui Xiao</i>	
(707e) Mesoporous Molecular Sieve with Strong Acidity As Catalysts Support for Pyrolysis of Furfural Residue to Levulinic Acid	718
<i>Haiyan Xu</i>	
(707f) Ethanol Production with Process of Simultaneous Saccharification and Fermentation at High Temperature	719
<i>Jingliang Xu</i>	
(707g) Mechanism Study of Biomass Pyrolysis	720
<i>Shurong Wang</i>	
(718a) Characterization of Lignin Derived from Water-Only and Dilute Acid Flowthrough Pretreatment of Poplar Wood at Elevated Temperatures	721
<i>Libing Zhang, Lishi Yan, Bin Yang, Dhrubojyoti D. Laskar</i>	
(718b) Comparison of Detailed Characteristics of Substrates Produced By Pretreatment of Lignocellulosic Biomass in Flowthrough and Batch Reactors with Liquid Hot Water and Extremely Dilute Acid	722
<i>Samarthya Bhagia, Fan Hu, Reichel Samuel, Yunqiao Pu, Xianzhi Meng, Rajeev Kumar, Arthur J. Ragauskas, Charles E. Wyman</i>	
(718c) Ozone Pretreatment of Compacted Switchgrass	723
<i>Nathan S. Mosier, Iman Beheshti Tabar, Patrick T. Murphy</i>	
(718d) Simulation Study of Ozone Pretreatment of Wheat Straw with Experimental Validations	724
<i>Sujala Bhattarai, Allan Gao, Danny Bottenus, Shulin Chen, Cornelius F. Ivory</i>	

(718e) Simultaneous Pretreatment, Saccharification, Fermentation and Separation Processes to Obtain Ethanol	725
<i>Juan C. Carvajal, Laura V. Daza, Valentina Aristizábal, Carlos A. Cardona</i>	
(718f) Mixalco Fermentations and Continuum Particle Distribution Modeling of Shock Pretreated Corn Stover	737
<i>Pratik Darvekar, Mark Holtzapple</i>	
(738a) Experimental Investigation of Transport Processes and Fouling in Biofuel Process Streams	738
<i>Anuradha Mukherjee</i>	
(738b) A Comprehensive Mechanistic Kinetic Model for Dilute Acid Hydrolysis of Switchgrass Cellulose to Glucose, 5-HMF and Levulinic Acid	754
<i>Lishi Yan, Bin Yang</i>	
(738c) Efficient Cellulose Hydrolysis in Acidified Molten Salt Hydrate Reaction Media	755
<i>Weihua Deng, George Tsilomelekis, Vladimiro Nikolakis</i>	
(738d) Reaction Mechanism and Kinetics of Maleic Acid for Altering the Selectivity of Glucose Dehydration and Degradation	756
<i>Ximing Zhang, Nathan S. Mosier</i>	
(738e) 5-Hydroxymethyl Furfural Derived Humins: Growth Rates and Elucidation of Their Molecular Structure	757
<i>Michael Orella, George Tsilomelekis, Vladimiro Nikolakis</i>	
(738f) Kinetic Modeling of High-Pressure Biomass Gasification Using CO₂ and H₂O	758
<i>Gautami M. Newalkar, Kristiina Iisa, Carsten Sievers, Pradeep K. Agrawal</i>	
(744a) R&D of Green and High Efficient Cellulosic Fuel Ethanol Process Combined with Value Added By-Products By Three Main Feedstock Components	759
<i>Zhenhong Yuan</i>	
(744b) Effect of Phospholipids on Free Lipase-Catalyzed Biodiesel Production	760
<i>Dehua Liu, Wei Du, Yang Li</i>	
(744c) Study on Syngas Production By Catalytic Gasification of Maize Stalk Fast Pyrolysis Bio-Oil	761
<i>Weiming Yi</i>	
(744d) Support Effect on Fischer-Tropsch Synthesis of Gas from Biomass Gasification over a Ru-Cu-Co/Al₂O₃ Catalyst	763
<i>Shunqing Li</i>	
(744e) Co-Cracking of Bio-Oil Fraction and Ethanol for Aromatic Hydrocarbon Production	764
<i>Shurong Wang</i>	
(744f) Conversion of Corncob into Furfural By Acid and FeCl₃ Co-Catalysis Process	765
<i>Suxia Ren</i>	
(744g) Performance and Emission Characteristics of a Diesel Engine Using Alternative Vehicle Fuels Formulations Based on Ethyl Levulinate	766
<i>Zhiwei Wang</i>	
(752a) Recovery of Bioelectricity and Hydrogen from Biorefinery Effluents	767
<i>Abhijeet P. Borole, Daniel J. Schell</i>	
(752c) Using Wastewater for Microalgae Cultivation	768
<i>Renhe Qiu, Kimberly L. Ogden</i>	
(752d) Modeling and Optimization for Efficient Production of Lipids By Oleaginous Yeast Rhodotorula Glutinis Cultivated in Pulp and Paper Wastewater	769
<i>Marta AmirSadeghi, Todd French, Rafael Hernandez, Magan Green</i>	
(752e) Fuel Gas Production from Grey Water Using a Hybrid Digestion-Biomass Gasification Energy System	770
<i>Haider Al-Rubaye, Joseph D. Smith</i>	
(752f) Refining the Concept of Integrating Anaerobic-Aerobic Microbial Systems to Produce Chemicals and Lipids for Fuels	771
<i>Dhan Lord Fortela, Rafael Hernandez, Mark Zappi, William Holmes, Emmanuel Revellame, Stephen Dufreche, Ramalingam Subramaniam, William Todd French</i>	
(757a) A Finite Element Heat Transfer Model for the Solar-Driven Pyrolysis of Untreated Human Feces	772
<i>Richard Fisher, Allan Lewandowski, Janna Martinek, Alan W. Weimer</i>	
(757b) Influence of Main Components of Woody Biomass on Fast Pyrolysis	773
<i>Ken-ichiro Tanoue, Yuuki Hamaoka, Tatsuo Nishimura, Yoshimitsu Uemura, Miki Taniguchi, Ken-ichi Sasauchi</i>	
(757c) Torrefaction of Oil Palm Kernel Shell Under Nitrogen, Oxygen and Carbon Dioxide Atmospheres	774
<i>Yoshimitsu Uemura, Shazleen Saadon, Noridah Osman, Nurlidia Mansor, Ken-ichiro Tanoue</i>	

(757d) Supercritical Water Gasification of Amino Acids	777
<i>Yukihiko Matsumura, Thachanan Samanmulya, Shuhei Inoue, Takahito Inoue, Yoshifumi Kawai, Haruhito Kubota, Takashi Noguchi</i>	
(757e) Avicel Cellulose Pyrolysis at High Pressure in a Tubing Bomb - Reproducing the 1851 Findings of Violette	778
<i>Michael J. Antal Jr., Charissa Higashi, Phacharakamol Phothisantikul, Sam Van Wesenbeeck, Simon Williams</i>	
(757f) Secondary Reactions of Volatile Intermediates during Cellulose and Lignin Pyrolysis/Gasification	779
<i>Haruo Kawamoto</i>	
(757g) Thermogravimetric Studies of Charcoal Formation from Cellulose Under Different Pyrolysis Conditions	788
<i>Liang Wang, Oyvind Skreiberg, Morten Gronli, Michael J. Antal Jr.</i>	
Author Index	