

Forest and Plant Bioproducts Division

Held at the 2023 AIChE Annual Meeting

Orlando, Florida, USA
5-10 November 2023

ISBN: 978-1-7138-9295-3

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© (2023) by AIChE
All rights reserved.

Printed with permission by Curran Associates, Inc. (2024)

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: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

ADVANCES IN LIGNOCELLULOSE PROCESSING, CONVERSION, AND VALORIZATION I

364a One Pot Production of Levulinic Acid from Lignocellulosic Biomass Using a Catalytic Membrane Reactor	1
<i>Zhexi Zhu, Ranil Wickramasinghe, Xianghong Qian</i>	
364b Cellulose Dissolution and Regeneration in Calcium Bromide Solution	2
<i>Jiansong Chen, Zhiqiang Pang, Haishun Du, Xuejun Pan</i>	
364c Phenoxylethanol Pretreatment of Lignocellulosic Biomass Under Biphasic and Monophasic Solvent Systems	3
<i>Xuesong Tan, Yiqi Zhang, Xinshu Zhuang</i>	
364d Cellulose Hydrolysis Catalyzed By Solid Acid to Levulinic Acid	5
<i>Suping Zhang</i>	
364e Extraction and Characterization of Cellulose Nanocrystals from Corn Husk Wastes and It's Application in Bioplastic Preparation.....	6
<i>Sergio Mayta Paucara, Maria Quintana</i>	
364f Carbon Dioxide and Organic Base Additives for Polar Aprotic Organosolv Pulping of Lignocellulosic Biomass	8
<i>Kelechi A. Agwu, Rae Belmont, Jayna M. Enguita, James D. Sheehan</i>	
364g Study of Physical Properties and Multi-Phase Equilibrium of Ternary Mixture (Brine, Oil, Green Corrosion Inhibitor from Lignocellulosic Resource).....	10
<i>Tianxing Cai</i>	
364h Enhanced Carbon Dioxide Capture By Functionalizing Activated Hydrochar Derived from Loblolly Pine with Deep Eutectic Solvent.....	11
<i>Swarna Saha, Sarah Pezzenti, Toufiq Reza</i>	

ADVANCED SEPARATIONS PROCESSES IN BIOPROCESSING AND BIOMATERIALS

251a Fibrillated Cellulose Fibers for Barrier Coating of Fruits to Extend Shelf Life	12
<i>Jing Geng, Xiao Zhang, Junyong Zhu</i>	
251b Counter-Current Chromatography for Separating Lignin Monomers from Reductive Catalytic Fractionation Oils from Various Feedstocks.....	13
<i>Hoon Choi, Manar Alherech, Hakan Olcay, Louis Chirban, Sean Woodworth, Hannah Alt, Eric Tan, Gregg Beckham</i>	
251c Dynamic Capture and Elution of mRNA with Affinity Membranes for Vaccine Production	14
<i>Thomas Neuman, Riddhi Banik, Miral Al Sharabati, Zerui Hao, Andrew Hartin, Todd Przybycien, James (Chip) Kilduff, Georges Belfort</i>	
251d Spinning Band Distillation of Pyrolysis Oil Phenolics.....	16
<i>Yaseen Elkasabi, Charles A. Mullen, Kerby Jones, Victor Wyatt</i>	

251e A Scalable, High-Throughput Platform for Isolating Evs, Lipoproteins, and Rnps from Blood Plasma, Urine, and Saliva, Using Isoelectric Fractionation.....	17
<i>Himani Sharma, Fnu Vivek, Satyajyoti Senapati, Hsueh-Chia Chang</i>	
251f Effects of Flowrate, External Magnetic Field Strength, and Total Number of Cells Fed on Performance of Catch-and-Release Style Magnetic Separators for Red Blood Cells.....	19
<i>Jacob Strayer, Xian Wu, Hyeon Choe, Jeffrey Chalmers, Jenifer Gomez Pastora</i>	
251h Process Intensification in Biofuels Manufacturing – Characterization of Liquid-Liquid Extraction Behavior of Biofuel Components.....	20
<i>Gnanaselvan Gnanasekaran, Lucas Stolp, Hua-jiang Huang, Shri Ramaswamy</i>	

ADVANCES IN LIGNIN CHEMISTRY, ISOLATION, AND DEPOLYMERIZATION

329a Feedstock-Agnostic Reductive Catalytic Fractionation in Alcohol and Alcohol-Water Mixtures	21
<i>Jun Hee Jang, Ana Colaco Morais, Yuriy Román-Leshkov, Gregg Beckham</i>	
329b Depolymerization of Lignin for the Production of Phenolic Monomers	22
<i>Suping Zhang</i>	
329c Revealing Mechanistic Insights into Lignin Decomposition through Pygc-MS Analysis	23
<i>Heather LeClerc, Jeffrey Page, Zachary Manfredi, Chase McGee, Katelyn Honegger, Andrew R Teixeira, Julia A. Valla, Michael T. Timko</i>	
329d Mixed Metal Oxide Catalysts for Microwave-Assisted Kraft Lignin Depolymerization to Produce Phenolic Monomers.....	24
<i>Kirtika Kohli, Ravindra Prajapati, Jaemin Kim, Brajendra (BK) Sharma</i>	
329e Use of Biorenewable Alcohols in the Production of Lignin for High-Value Applications	25
<i>Biljana Bujanovic</i>	
329g Chemical Modification of Lignin: Increasing Molecular Weight and Polarity Control of Lignin Via Esterification	26
<i>Oreoluwa Agede, Mark Thies</i>	
329h A New Process for Recovering High Quality Lignins from Agricultural Black Liquors.....	27
<i>Bronson Lynn, Zachary Pamukcoglu, Mark C. Thies</i>	
329i Polymer Products from Lignin through De-Aromatization and COOH Functionalization	28
<i>Michael Kent, Daniella Martinez, Qi Wang, Mitra Ganewatta, JiHyuan Hwang, Chuanbing Tang</i>	

ANDREW CHASE AWARD IN HONOR OF DR. DEBORAH MIELEWSKI (INVITED TALKS)

157a “Black a New Green” – Innovation in Sustainable Manufacturing	30
<i>Amar K. Mohanty</i>	
157g Catalytic Upgrading of Carbohydrates in Paper Sludge to Sustainable Aviation Fuels.....	31
<i>Sunkyu Park</i>	
157c Sustainable Bio-Based PU Materials from Lignin and Other Biomolecules	32
<i>Ning Yan</i>	

157d Green-solvent Assisted Processing (GSAP) of Polylactic Acid Nanocomposites with Hybrid Cellulose Fibers.....	33
<i>Lu Wang, Griffin Miller</i>	
157e Optimization of Biobased and PCR Compounds Utilizing AI/ML Technology	34
<i>Arash Kiani</i>	
157f Achieving Sustainability: A Career in Automotive	35
<i>Deborah Mielewski</i>	

COMPUTATIONAL METHOD AIDED BIOMASS AND WASTE UTILIZATION

562b Computational Study on the Catalytic Reductive Depolymerization Mechanism of a B-O-4 Lignin Dimer Model Compound in Subcritical Methanol.....	36
<i>Panuwat Watthaisong, Subrata Kumar Kundu, Andreas Heyden</i>	
562c Reinforcement Learning Based Control for Biorefining Process Under Uncertainty.....	38
<i>Abigael Wahlen, Ji Gao, Caleb Ju, Yongsheng Chen, Guanghui Lan, Zhaohui Tong</i>	
562d Application of Discrete-Time Infinite-Dimensional Model for Optimal Control and Estimation of a Continuous Pulp Digester.....	39
<i>Lu Zhang, Haneen Arauydah, Stevan Dubljevic</i>	
562e A Multi-Scale Kinetic Modeling and Optimal Control Strategy for an Effective Lignin Fractionation Process.....	41
<i>Juhyeon Kim, Jiae Ryu, Mairui Zhang, Chang Geun Yoo, Joseph Kwon</i>	
562f COSMO Simulations and Experimental Evaluation for the Solvation of Lignin in Deep Eutectic Solvents	43
<i>Thomas Quaid, Laura Fronchetti Guidugli, Toufiq Reza</i>	
562g Machine Learning-Aided Ionic Liquid Design for PET Degradation.....	44
<i>Ji Gao, Wenbo Peng, Jose Perez Martinez, Ethan Slaton, Zhaohui Tong</i>	
562h Kinetic Modeling and Techno-Economic Analysis of a Sugar Production Process Via Hydrolysis of Lignocellulosic Biomass.....	45
<i>Poulomi Das, Debangsu Bhattacharyya</i>	

BIOMASS CHARACTERIZATION, PRETREATMENT, AND FRACTIONATION I

477a Effects of Sequential Pretreatment of Bamboo on Fermentable Sugar Yields for the Production of Biofuels and Bioproducts.....	47
<i>Nneka Ekwe, Maksim Tyufekchiev, Ali Salifu, Klaus Schmidt-Rohr, Zhaoxi Zheng, Alex Maag, Geoffrey Tompsett, Wole Soboyejo, Michael T. Timko</i>	
477b Application of Three-Component Dihydroxybenzoic Acid-Based Deep Eutectic Solvent in a Sustainable Biorefinery Process	49
<i>Jiae Ryu, Yunxuan Wang, Xianzhi Meng, Yang Tian, Linjing Jia, Aymerick Eudes, Kwang Ho Kim, Yunqiao Pu, Gyu Leem, Deepak Kumar, Arthur Ragauskas, Chang Geun Yoo</i>	
477c Comparative Study of Hydrothermal and Nades-Assisted Deconstruction of Transgenic Crops for Enhanced Recovery of Lipids and Sugars	50
<i>Tirath Raj Sr., Vijay Singh</i>	

477d Develop Deep Eutectic Solvent Systems for the Effective Fractionation of Lignin	52
<i>Gloria Agyapong, Sampath Gunukula, Clayton Wheeler</i>	
477e Fractionation of Cowpea Shells (<i>Vigna unguiculata</i>) Using Natural Deep Eutectic Solvent (Lactic acid-Proline)	53
<i>Chioma M Onyelucheya, Joseph T. Nwabanne, Michael Daramola, Samuel Iwarere, Okechukwu Onyelucheya</i>	
477f Application of Biomass-Derived Solvent Cyrene in the Pretreatment of Lignocellulosic Biomass	56
<i>Yunxuan Wang, Xianzhi Meng, Yunqiao Pu, Arthur Ragauskas</i>	
477g Optimization of Woody Biomass Conversion Via Amine-Based Solvent Pretreatment	57
<i>Md Tahmid Islam, Venkataramana Pidatala, Hemant Choudhary, Roland Kalb, Blake Simmons, Alberto Rodriguez, John M. Gladden</i>	

MODIFICATION, FUNCTIONALIZATION AND PROCESSING OF BIOMATERIALS

601a Cellulose Silylation in Flow with Enhanced Temperature and Pressure	58
<i>Yue Yuan, Stylianos Andreou, Jong K. Keum, Sabine Neumayer, Rigoberto Advincula</i>	
601b Impact of Sulfate Ester Content of Cellulose Nanocrystal on the Crystal Orientation and Its Applicability in Film Packaging	59
<i>Ananya Ghosh, Zhihua Jiang</i>	
601c Development of a Rechargeable Antimicrobial Textile Utilizing Radical Click Chemistry and Reactive Dyeing Techniques	60
<i>Joseph Milter, Jason Stallings Jr., Thomas Glover, Terrence Ravine, Kevin West</i>	
601e Janus Quaternarized-Hemicellulose-Modified PVDF Membrane for Desalination of Oily Seawater in Membrane Distillation	61
<i>Rongrong Liu, Qun Li, Zhaohui Tong</i>	
601f Making Cellulose-Based Films Work in High Humidity	62
<i>Tanner Hickman, Natalie Stingelin, Carson Meredith</i>	
601g Biobased Carbon Nano-Onions and Their Applications in Nanoengineered Composites	63
<i>Moham ED Abdur Razzaq, Xianglan Bai</i>	
601h Physical Activation of Microcrystalline Cellulose for High-Surface Area Carbon Materials	64
<i>Katarina Odak, Kent J. Warren, Alan Weimer</i>	

DIVISION PLENARY: VALORIZATION OF WASTE PLASTICS (INVITED TALKS)

49a Biocarbon-Metal Sustainable Composites for Energy Storage	65
<i>Ange Nzihou</i>	
49b High-Performance Silicon Active Materials from Biorenewable Resources	66
<i>Srikanth Pilla</i>	
49c From Waste to Treasure: Multiple-Functional Materials from Bio-Based Waste	68
<i>Zhaohui Tong</i>	

49d Circular Economy Driven Sustainable Composites through Waste Valorisation for Single-Use Plastic Alternatives	69
<i>Manjusri Misra</i>	

LIGNIN FOR SUSTAINABLE INDUSTRIAL USES

590a Comparative Techno-Economic and Lifecycle Assessment of Electrochemical Processes for Lignin Valorization.....	70
<i>Zahra Ebrahimpourboura, Manish Mosalpuri, Cheng Yang, Marcus Foston, Elijah Thimsen, Mark Mba Wright</i>	
590b Enabling Commercially Viable Green Carbon Fiber By Tuning Lignin Chemistry	71
<i>Yixin Luo, Moham ED Abdur Razzaq, Xianglan Bai</i>	
590c Fabrication and Property Testing of Carbon Foams Using 100% Kraft Lignin.....	72
<i>Qiang Yan, Zhiyong Cai</i>	
590d Economic and Environmental Impact of Recovering and Upgrading Lignin Via the ALPHA Process on an Ethanol Biorefinery	74
<i>Robert Handler, Daniel Kulas, Graham W. Tindall, Mark C. Thies, David Shonnard</i>	
590e Designing Ion-Conducting Materials for High-Temperature Fuel Cell Applications Using Low-Cost, Biorenewable Lignin	75
<i>Rajesh Keloth, Shudipto K. Dishari</i>	
590f Advancing Lignin Valorization: Elucidating Thermodynamic and Kinetic Properties through an Integrated Density Functional Theory and Kinetic Monte Carlo Approach	76
<i>Chi-Ho Lee, Juhyeon Kim, Joseph Kwon</i>	
590g Incorporation of Unmodified Technical Kraft Lignin Particles in Anticorrosive Epoxy Novolac Coatings	78
<i>Tejasvi Laxminarayan, Alessio Truncali, Narayanan Rajagopalan, Claus Erik Weinell, Mats Johansson, Søren Kiil</i>	
590h Improvement of Thermal and Mechanical Properties of Lignin Copolymers and Synthetic Polymer/Lignin Copolymer Blends.....	79
<i>David Chem, Samantha Glidewell, Keisha Walters</i>	
590i Kinetic Modeling and Optimization of a Bio-Adhesive Production Process from Lignin	80
<i>Poulomi Das, Debangsu Bhattacharyya, Changle Jiang, Jianli Hu</i>	

POSTER SESSION: ADVANCES IN FOREST AND PLANT BIOMASS UTILIZATION

240a Metal Ion Modification Enabled Hydrophobic and Dimensionally Stable Wood.....	82
<i>R.M. Oshani Nayanathara, Xuefeng Zhang</i>	
240b Impact of Methoxy Group Component of Lignin-Derived Deep Eutectic Solvents on the Biomass Pretreatment Performance.....	83
<i>Jiae Ryu, Jialong Lin, Yunxuan Wang, Gyu Leem, Kwang Ho Kim, Arthur Ragauskas, Chang Geun Yoo</i>	
240c Effects of Lignin Properties on the Performance of Lignin-Based Polyurethane Foam for Eco-Friendly Thermal Insulation	84
<i>Soyeon Jeong, Mairui Zhang, Charles M. Cai, Xianzhi Meng, Paul Crovella, Paul Crovella, Arthur Ragauskas, Chang Geun Yoo</i>	

240d Use of UV Irradiation on Photo Isomers to Enhance the Removal of Lignin from Woody Biomass Hydrolysate.....	85
<i>Dipesh Karki, Sampath Gunukula, Clayton Wheeler, G. Peter Van Walsum</i>	
240e Application of VBA and Excel to Develop Ternary Diagram of Brine, Oil, Green Corrosion Inhibitor from Lignocellulosic Resource.....	87
<i>Tianxing Cai</i>	
240f Fused Deposition Modeling (FDM) 3D Printing of Industrial Hemp Waste Polymer Composites.....	88
<i>Anqi Ji, Nara Han, Shuyang Zhang, Samarthya Bhagia, Xianhui Zhao, Arthur Ragauskas, Deepak Kumar, Jeong Jae Wie, Chang Geun Yoo</i>	
240h On the Effects of Chaotropic Promoters on Enzyme Hydrolysis	89
<i>Timothy Woodard, Michael T. Timko, Aidin Panahi</i>	
240i Mechano-Chemical Analyses of Plant Cell Walls at Nanoscale Using Atomic Force Microscopy Coupled with Infrared Spectroscopy	91
<i>Huiyong Li, Ram Dixit, Natasha Bilkey, Anton Ievlev, Neus Domingo Marimon, Marcus Foston</i>	

ADVANCES IN LIGNOCELLULOSE PROCESSING, CONVERSION, AND VALORIZATION II

409a Modeling and Simulation of Drying of Paper and Board	92
<i>Hua-jiang Huang, Shri Ramaswamy</i>	
409b Experimental Analysis of Drying of Paper and Board.....	93
<i>Koushik Sampath, Leonard Reynolds, Hua-jiang Huang, Shri Ramaswamy</i>	
409c The Investigation of Various Biomass Feedstocks for the Synthesis of 1 – 3 Layers Graphene.....	94
<i>Haider Al-Rubaye, Paul Ani, Hasan Al-Abedi, Joseph Smith</i>	
409d Transgenic Energycane As an Alternative Feedstock for Biodiesel Production: An Industrially Relevant Study	95
<i>Shraddha Maitra, Ming-Hsun Cheng, Hui Liu, Dang Viet Cao, Baskaran Kannan, Stephen P. Long, John Shanklin, Fredy Altpeter, Vijay Singh</i>	
409e Systems for Single Step Consolidated Bioprocessing of Unprocessed Agri Materials Using Thermophiles.....	98
<i>Rajesh Sani, Tanvi Govil, David R. Salem</i>	
409f Green Production of L-Alanyl-L-Glutamine By an Efficient Yeast Biocatalyst Expressing α -Amino Acid Ester Acyltransferase without N-Glycosylation.....	99
<i>Yimin Li, Wenjie Yuan</i>	
409g High-Efficient Biobutanol Production from Lignocellulosic Feedstocks By Developing Metabolic and Bioprocessing Engineering Approaches of <i>Clostridium Acetobutylicum</i>	100
<i>Youduo Wu</i>	
409h Antioxidant and Antibacterial Silver Nanoparticles from Agro-Industrial Residues Extracts for Biomedical, Pharmaceutical, Cosmetic and Environmental Applications.....	101
<i>Arleth Gualle Brito, Lourdes Orejuela Escobar, Andrea Landazuri, Sebastián Ponce, Patricio Rojas</i>	

BIODEGRADABLE POLYMERS FROM RENEWABLE AND WASTE RESOURCES AND BIOCOMPOSITES FROM INDUSTRIAL COPRODUCTS AND NATURAL FIBERS

446a Nature-Based Solutions: Food Waste-Derived Carbon Materials and Its Application in Air-Breathing Energy Storage.....	104
<i>Mengyao Gao</i>	
446b Carbon-Negative Biomaterials Via Engineered Composting with Carbon Capture	105
<i>Joe Sagues, Ethan Woods, Vanessa Rondon Berrio, Nicolas Clauser</i>	
446c Biowaste-Derived, Nanocomposite-Based Slow-Release Fertilizer Encapsulated with a Super Thin Coating Layer.....	106
<i>Jiaxuan Liu, Zhaohui Tong</i>	
446e Synergistic Enhancement of Barrier, Aging Resistance, and Hydrolysis for Biodegradable Copolyesters Based on Poly(butylene adipate terephthalate) and Polyglycolic Acid.....	107
<i>Bingxue Jiang, Yisong Wang, Wen-Jun Wang, Pingwei Liu, Xuan Yang, Bo-Geng Li</i>	
446g Production of Polyhydroxybutyrate from Forest Residue Using a Chemical-Free Pretreatment	108
<i>Md Shahadat Hossain, Bandaru V. Ramarao, Obste Therasme, Timothy A. Volk, Vinod Kumar, Deepak Kumar</i>	
446h Development and Characterization of Biobased Biodegradable Sprayable Mulching Materials to Control the Weeds in Agricultural Crops.....	109
<i>Muhammad Ehtasham Akram, Mark Wilkins, Loren Isom, Ozan Ciftci</i>	

CATALYTIC AND THERMOCHEMICAL CONVERSION OF LIGNOCELLULOSIC MATERIALS I

516a Hydrogen Production Via Biomass Gasification Using Calcium Ferrite Based Chemical Looping	110
<i>Shekhar Shinde, Rushikesh Joshi, Liang-Shih Fan</i>	
516b Alkaline Thermal Treatment of Challenging Waste Biomass Feedstocks for in-Situ H ₂ Production with Tandem Carbon Sequestration	113
<i>Jonah Williams, Ah-Hyung Park</i>	
516c Surfactant Assisted Catalytic Hydrothermal Liquefaction (CHTL) of Corn Stover for Fuels and Value-Added Products	114
<i>Bharathkiran Maddipudi, Rajesh Shende, Khang Huynh, Anuradha Shende</i>	
516d Sustainable Aviation Fuel Production through Co-Hydroprocessing of Catalytic Fast Pyrolysis Oil with Petroleum Streams.....	115
<i>Xiaolin Chen, Kristiina Iisa, Kellene A. Orton, Calvin Mukarakate, Michael B. Griffin</i>	
516e Automated Reaction Network Generation and Kinetic Modeling for Fast Pyrolysis of Lignin with Model Compounds	116
<i>Tanzina Azad, Maria Auad, Thomas Elder, Andrew Adamczyk</i>	
516f Investigating C-C Coupling Pathways for the Sustainable Production of Liquid Fuels.....	117
<i>Laura Paz Herrera, Randy Cortright, J. Will Medlin</i>	
516g Pyrolysis Oil: A Promising Anode Precursor for Lithium-Ion Batteries.....	118
<i>Shaikat Chandra Dey, Lilian Lower, Joe Sagues, Bertrand Tremolet de Villers, Sang-Don Han, Mark R. Nimlos, Steve Kelley, Sunkyu Park</i>	

516h Optimization and Evaluation of the Distribution of Fischer-Tropsch Products over a Cobalt-Based Catalyst Utilizing Design Expert Software	119
<i>Roick Chikati, Joshua Gorimbo, Diakanua Nkazi</i>	

HIGH-VALUE AND PLATFORM CHEMICALS FROM RENEWABLE RESOURCES AND WASTES

578a Producing a Portfolio of Commodity Chemicals from Lignin Bound P-Hydroxybenzoate	120
<i>Steven Karlen, Vitaliy Tymokhin, Canan Sener, Justin Mobley, John Ralph</i>	
578b Advances in the Biomass-to-Bioprocess Chain to Produce 2-Pyrone-4,6-Dicarboxylic Acid Via Reductive Catalytic Fractionation Followed By Microbial Funneling	121
<i>Canan Sener, Miguel Perez, German Umana, Steven Karlen, Christos Maravelias, John Ralph, Timothy J. Donohue, Daniel R. Noguera</i>	
578c Towards the Valorization of Waste-Stream Feedstocks into Value-Added Chemicals Using Genetically Engineered Yeasts	122
<i>Mohamed Nasr, Radhakrishnan Mahadevan</i>	
578d Chemical and Structural Characterization of Lactose-Derived Novel Galacto-Oligosaccharides – an in Vitro and In Vivo Prebiotic Activity Assessment	123
<i>Sonali Mohapatra, Meijun Zeng, Jee-Hwan Oh, Jan-Peter van Pijkeren, Xuejun Pan</i>	
578e Effects of Feedstock Preprocessing on the Wood Derived Organic Acid Yields	124
<i>Matthew Luce, Sampath Karunarathne, Ravikant Patil, Peter van Walsum, Stephanie Ossai, Eliezer A. Reyes Molina, C. Luke Williams, Sampath Gunukula, Clayton Wheeler</i>	
578f Catalytic Membrane Reactor for Conversion of Biomass Feedstocks to Levulinic Acid	125
<i>Nhiem Cao, Xianghong Qian, Ranil Wickramasinghe</i>	
578g Dynamic Effect of CO ₂ Concentration during Biosuccinic Acid Fermentation Process: Model Development on Glucose and Sugars-Rich Industrial Waste.	126
<i>Francesco Vigato, Irini Angelidaki, John Woodley, Merlin Alvarado-Morales</i>	
578h Platform Chemicals from Hardwood Black Liquor Via Hydrothermal Liquefaction: Influence of Process Conditions on Product Yields and Quality	128
<i>Harisankar S, Vinu Ravikrishnan</i>	

CELLULOSE NANO MATERIALS - CRYSTALLINE, FIBROUS, GELS, FILMS AND FOAMS FOR BROAD APPLICATIONS IN MEDICAL, ENERGY AND THE ENVIRONMENT.

549a Reaction Kinetics and Physical Properties of Carboxymethyl Cellulose-Based Hydrogel Blends.....	130
<i>Samudra Gupta, Javen Weston</i>	
549b Cellulose Nanofiber-Alginate Biotemplated Composite Co ₃ O ₄ Aerogels for Pseudocapacitor Electrodes	131
<i>Galen Mandes, Vani Verma, Anthony Presot, Claire Tsay, Felita Zhang, Paul Trackey, Rosemary L. Calabro, Enoch Nagelli, Joshua A. Maurer, Stephen F. Bartolucci, F. John Burpo</i>	
549c Aptes-Molecularly Imprinted Polymer Modified Cellulose Nanocrystals for Carbofuran Detection	132
<i>Sadat Kamal Amit, Diego Gomez-Maldonado, Tiana Bish, Maria Soledad Peresin, Virginia Davis</i>	

549d Functionalized Cellulose Nanocrystals in Agriculture: Synthesis and Characterization for Use As a Plant-Based Nanocarrier of Active Biomolecules	133
<i>Delaney Clouse, Elise Collins, Mariya Khodakovskaya, Virginia Davis</i>	
549e The Modification of Nanocellulose with Atomic Precise Metal Nanoclusters	134
<i>Zhaoxian Qin, Yue Yuan, Zhaohui Tong</i>	
549f Cellulose Nanocrystals Improve Pathogen Resistance in Plants	135
<i>Henry Squire, Autumn Lee, Natalie S. Goh, Jeffrey Wang, Cerise Wong, Markita Landry</i>	
549g Whole Biomass Aerogel-Based Triboelectric Nanogenerator for Energy Harvesting and Self-Powered Sensing	136
<i>Ruolin Wang, Zhenhui Jin, Haishun Du, Jiansong Chen, Longwen Li, Yi-Cheng Wang, Xuejun Pan</i>	
549i Production and Characterization of Holocellulose Micro and Nano Fibers in Alternative Solvents	137
<i>Samarthya Bhagia, Donna Johnson, Katie Copenhagen, Soydan Ozcan</i>	

BIOMASS CHARACTERIZATION, PRETREATMENT, AND FRACTIONATION II

503a Fractionation of Lignocellulose and Tandem Preservation of Lignin and Carbohydrates Using Aldehyde Sulfonic Acid	138
<i>Danni Xie, Qiang Yang, Yunxuan Wang, Chang Geun Yoo</i>	
503b Top-Down Synthesis of Potential Prebiotic Gluco- and Xylo-Oligosaccharides from Corn Stover Via Simultaneous Hydrolysis and Glycosylation in Concentrated Sulfuric Acid.....	139
<i>Meijun Zeng, Sonali Mohapatra, Jeehwan Oh, Jan Peter van Pijkeren, Xuejun Pan</i>	
503c Alkaline Pretreatment to Fractionate Industrial Hemp for Biochemical Conversion and the Effects on Polysaccharide and Lignin Recovery	140
<i>Ryan Stoklosa, Renee J. Latona, Charles A. Mullen, Bryan Berger, William Fahy, Michael P. Timko</i>	
503d High Solids Loading Processing of Hydrothermally Pretreated Miscanthus x Giganteus for Production of Anthocyanins, Sugars and Lignin-Rich Residue.....	141
<i>Shivali Banerjee, Bruce S. Dien, Erik J Sacks, Vijay Singh</i>	
503e Production of Low-Cost and Highly Fermentable Sugar from Corn Stover Via Chemical-Recovery-Free Deacetylation and Mechanical Refining (CRF-DMR) Process	142
<i>Xiaowen Chen, Junyong Zhu, Bin Yang, Joshua Yuan, Eric Tan, Ryan Davis, Nancy Dowe, Zhihua Jiang, Yudong Li, Jorge Arreola Vargas, Fernando Roberto Paz Cedeno, Carlos Driemeier, Michael E. Himmel</i>	
503f Switchgrass Deconstruction Mechanisms on Biomass Solubilization Elucidated through Characterization of Consolidated Bioprocessing Residues.	144
<i>Rohit Kousika, Yunqiao Pu, Arthur Ragauskas, Yannick J. Bomble</i>	
503g Corn Stover: Understanding the Impact of Anatomical Heterogeneity on Bioprocessing.....	145
<i>William Otto, Dylan Cousins, David Hodge</i>	

CATALYTIC AND THERMOCHEMICAL CONVERSION OF LIGNOCELLULOSIC MATERIALS II

536a Optimization of Biocrude Yield and Generated Wastewater Biodegradability in Hydrothermal Liquefaction of Corn Stover	146
<i>Isamu Umeda, Meicen Liu, Yi Zheng, Chandan Mahata, Jiefu Wang, Zhiwu Wang, Jeawan Yoon, Sandeep Kumar</i>	
536c Solvent Mediated Extraction of Fast Pyrolysis Bio-Oils for Isolating Phenolics	147
<i>Yaseen Elkasabi, Charles A. Mullen</i>	
536d Synthesis of Renewable Insecticides Possessing Tailored Functional Groups	148
<i>Tejas Goculdas, Sunitha Sadula, Dionisios Vlachos</i>	
536e Facile Conversion of Aqueous Phase Biomass Catalytic Pyrolysis Liquids into Hydrocarbons As a Wastewater Treatment Solution.....	149
<i>Foster Agblevor, Hossein Jahromi</i>	
536f Lignin Coupled with Catalyst Pyrolysis to Selective Production Chemicals: Influence of Lignin Structure and Properties of Catalyst.....	150
<i>Xiongjian Du, Shubin Wu</i>	
536g Development of a Method to Activate the By-Product (Biochar) of a Highly Porous Adsorption Substance Following Thermal Conversion of Biomass As a Renewable Energy Source	151
<i>Ahmet Erdem, Al-Dahhan Muthanna, Zeyad Zeitoun</i>	
536h Removal of By-Product VOCs from Biomass Gasification Catalyzed By Ni/HZSM-5 : Optimization of Process Conditions	153
<i>Liu Peng, Wenxuan Chen, Xueqin Li, Li Yanling, Yang Yantao, Sun Tanglei, Tingzhou Lei</i>	
536i Feasibility Assessment of Recycling Abandoned Aluminum Dross As Catalyst for Biomass Pyrolysis to Produce Hydrogen-Rich Gas	155
<i>Xueqin Li, Liu Peng, Huang Sheng, Li Yanling, Yang Yantao, Wu Shiyong, Wu Youqing, Tingzhou Lei</i>	

Author Index