

Process Development Division 2021

Held at the 2021 AIChE Annual Meeting

Boston, Massachusetts, USA and Online
7 - 11 November and 15 - 19 November 2021

ISBN: 978-1-7138-5707-5

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© (2021) by AIChE
All rights reserved.

Printed with permission by Curran Associates, Inc. (2022)

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

Effect of Pyrolysis Conditions on Producing Mesophase Pitch from Varying Ranks of Coal and Correlating Their Product Properties with Machine Learning Models.....	1
<i>Joshua Malzahn, Madison Cooley, Shikai Fang, Sudhanshu Sane, Shandian Zhe, Robert M. Kirby, Eric Eddings</i>	
Mild Solvolysis Liquefaction of Low-Rank Coal into a Feedstock of Value-Added Carbon Materials.....	2
<i>Wenjia Wang, Ignacio Preciado, Joshua Malzahn, Eric Eddings</i>	
Modular Processing of Flare Gas for Carbon Nanoproducts.....	3
<i>Jessica Hauck, Kent J. Warren, Gage Sowell, Mija H. Hubler, Theodore Champ, Andrew Broerman, Linfei Li, Boning Wang, Robert L. Anderson, Alan Weimer</i>	
Innovative Conceptual Design for an Industrial Complex Coupling Allam Power Cycle, Air Separation Unit, Ammonia Production, and Fertilizer Manufacturing Processes	4
<i>Song Wang, Ying Liu, Qiang Xu</i>	
Parametric Study on Physicochemical Properties of Ozone Microbubble - Applications to Fresh Produce Washing.....	5
<i>Haknyeong Hong, Jiakai Lu</i>	
Predicting the Diameters of Droplets Produced in Turbulent Liquid-Liquid Dispersion	6
<i>Francesco Ricci, John Thomas, Brian DeVincentis, Johannes Wutz</i>	
Computational Fluid Dynamics Study to Develop a Scale-Up Strategy for Non-Newtonian Fluids in Pharmaceutical Industry	7
<i>Nikhil Srivastava, Saurav S. Rath, SVB Janardhan Garikipati, Birendra K. David</i>	
Modelling the Effect of Ice Nucleation Stochasticity on Batch Heterogeneity of Freezing Processes of Vials on a Shelf	9
<i>Leif-Thore Deck, Marco Mazzotti</i>	
API Crystallization Process Development for Improved Consistency, Bulk Properties, and to Enable Downstream Processing	12
<i>Justin Quon, Landon Durak, Charles D. Papageorgiou</i>	
Loss-In-Weight Control of a Low Dose Powder Feeding System.....	13
<i>Julia Kruisz, Sarah Fathollahi, Jakob Rehr, Stephan Sacher, Johannes G. Khinast</i>	
A Generalized Framework for Reactor Network Synthesis: A Graph Theoretic Approach.....	14
<i>Arthur Eduardo Pastore De Lima, Christos Maravelias</i>	
Modeling and Performance Assessment of Rotating Packed Beds for the Production of Precipitated Carbonate Nanoparticles	15
<i>Marianthi Dimoliani, Athanasios Papadopoulos, Panos Seferlis</i>	
Process Synthesis and Intensification for Shale Resources Valorization	18
<i>Zewei Chen, Edwin Andres Rodriguez Gil, Rakesh Agrawal</i>	
A Short-Cut Method for Synthesis of Solvent-Based Separations	19
<i>Shuang Xu, Anjan K. Tula, Selen Cremaschi, Mario Eden</i>	

Discrete-Steepest Descent: A Solution Method for Process Synthesis Generalized Disjunctive Programs.....	21
<i>David Bernal, Daniel Ovalle, David A. Linan, Luis Ricardez-Sandoval, Jorge Gomez, Ignacio Grossmann</i>	
Optimization of Natural Gas Liquefaction Process Using Detailed Differential Algebraic Equation Based Multi-Stream Heat Exchanger Design	24
<i>Saif R. Kazi, Rahul Gandhi, Lorenz Biegler</i>	
Ensuring Process Safety of Heat Exchanger Networks Under Uncertainty	25
<i>Ahmed Harhara, M M Faruque Hasan</i>	
Use of Dimensionality Reduction and Transfer Learning in Deep Reinforcement Learning Controller for Hydraulic Fracturing	27
<i>Mohammed Saad Faizan Bangi, Joseph Kwon</i>	
Harnessing Cognitive AI Technology in Refining to Enhance Operator Decisions.....	29
<i>Leslie Rittenberg</i>	
Regression Model for Tool Wear Monitoring in Precision Machining	30
<i>Seulki Han, Nasir Mannan, George Bollas</i>	
Selection of Combined Index Weights to Optimize Anomaly Detection in Big Area Additive Manufacturing	32
<i>Monique McClain, Dhrubajit Chowdhury, Kris Villez</i>	
Keynote Talk - Topological Data Analysis: Concepts, Computation, and Applications in Manufacturing	35
<i>Alexander Smith, Victor Zavala</i>	
Keynote Talk - Platforms and Algorithms for Digitally-Enabled Next-Gen Manufacturing	36
<i>R Donald Bartusiak, Thomas Badgwell, John B. Vicente</i>	
High-Throughput Measurement of a Machine Learning Model for Polyester Biodegradation.....	38
<i>Sarah Av-Ron, Katharina Franssen, Dylan Walsh, Wontae Joo, Bradley Olsen</i>	
Buffering Effects on the Solution Behavior and Hydrolytic Degradation of Poly(β -Amino Ester)s.....	39
<i>Mara Kuenen, James Mullin, Rachel Letteri</i>	
Reducing Moisture Sensitivity of Protein-Based Thermosets Through Protein Charge Modification and Melt Polymerization with Hydrophobic Monomers	40
<i>Wui Yarn Daphne Chan, Emil Andersen, Sarah Av-Ron, Bradley Olsen</i>	
Growing Silk Fibroin in Advanced Materials for Food Security.....	41
<i>Hui Sun, Benedetto Marelli</i>	
Engineering Charged Silk Conjugates for Ionically Crosslinked Hydrogels.....	42
<i>Sanyukta Patil, Rachel Martineau, Danielle Heichel, Kelly Burke</i>	
Renewable Polymers Via Direct Functionalization of Lignocellulosic Sugars	43
<i>Lorenz Manker, Graham Dick, Adrien Demongeot, Maxime Hedou, Christele Rayroud, Irina Sulaeva, Yves Leterrier, Antje Potthast, Veronique Michaud, Harm-Anton Klok, Jeremy Luterbacher</i>	

Grazing-Incidence Diffraction Reveals Cellulose Lattice Contraction with Dehydration of Plant Primary Cell Wall.....	45
<i>Joshua Del Mundo, Sintu Rongpipi, Hui Yang, Dan Ye, Sarah N. Kiemle, Stephanie L. Moffitt, Charles L. Troxel, Michael F. Toney, Chenhui Zhu, James D. Kubicki, Daniel J. Cosgrove, Esther W. Gomez, Enrique D. Gomez</i>	
Golem: A Probabilistic Approach to Robust Experiment and Process Optimization Based on Regression Trees	47
<i>Matteo Aldeghi, Florian Häse, Riley J. Hickman, Isaac Tamblin, Alán Aspuru-Guzik</i>	
Learning Based Scheduling of Industrial Hybrid Renewable Energy Systems	48
<i>P S Pravin, Zhiyao Luo, Xiaonan Wang</i>	
Keynote Talk: Modelling and Monitoring with Dynamic Auto-Regressive Latent Variable Methods.....	50
<i>Qinqin Zhu, Bo Xu, Haitian Zhang</i>	
Phase Separation Kinetics in Liquid-Liquid Extraction and Settler Design	52
<i>Pornprapa Bol, Georg Rudelstorfer, Jan Bernd Bol, Matthaeus Siebenhofer, Annika Graftschafter</i>	
Three Phase Flow and Four Phase Flow in the Taylor Couette Disc Contactor for Combination of Liquid-Liquid Extraction and Chemical Reaction.....	54
<i>Georg Rudelstorfer, Susanne Lux, Matthaeus Siebenhofer, Annika Graftschafter</i>	
New Developments in Membrane Solvent Extraction	55
<i>Lydia Rodrigues, Kamallesh Sirkar, Kirk R. Weisbrod, John C. Ahern, Uwe Beuscher</i>	
Oil Recovery from Dilute Oil-Water Mixtures Via Hydrophobic Hollow Fiber Membranes	56
<i>Carolyn Cooper, Lynn E. Katz, Kerry Kinney, Albert Seibert</i>	
Cellulose Nanocrystals- And Lignin Magnetic Nanocomposites Enhance the Ethanol Extraction from Aqueous Solution Using Castor Oil as the Extractant	57
<i>Peng Chen, Mohammad Jahid Hasan, Abhishek Saini, Sarah J. Watzman, Esteban E. Urena-Benavides, Erick Vasquez</i>	
Replacement of Fluorinated Aqueous Fire-Fighting Foams (AFFF).....	58
<i>William Barrett</i>	
Green and Sustainable Processes for Critical Metal Recovery Using Oxalate Chemistry	59
<i>Ankit Verma, Alexander J. Henne, David R. Corbin, Mark Shiflett</i>	
Evaluating Green Solvent Nanoparticle Production Via Supercritical Fluid Synthesis	60
<i>Mary Kate Lane, Julie B. Zimmerman</i>	
Green Solvent Selection Using End-Of-Life Metrics.....	61
<i>Lindsay Soh, Sasha Neefe</i>	
Emergy and SPI Assessment of Solvent Recovery Pathways	62
<i>Emmanuel A Aboagye, John Chea, Austin Lehr, Jake Stengel, Kayla Heider, C. Stewart Slater, Mariano J. Savelski, Kirti Yenkie</i>	
Modeling and Comprehensive Analysis for an Industrial Complex Coupling Allam Power Cycle, Air Separation Unit, and Ammonia Manufacturing Process	65
<i>Song Wang, Qiang Xu</i>	

Application of Mathematical Algorithms for Real Time Optimization of Continuous Flow Extraction Processes	66
<i>Eric Gauthier, Boubacar Diallo</i>	
Advanced Operating Strategies to Enhance the Performance of Chemical Looping Natural Gas Reforming Processes	67
<i>Fanhe Kong, Mandar Kathe, Andrew Tong, L.-S. Fan</i>	
Data-Driven Predictive Model and Optimization Based on Machine Learning on Steam Reforming Process.....	68
<i>Jaewon Lee, Seokyoung Hong, Youngjin Kim, Hyungtae Cho, Myungjun Kim, Hyungjoon Yoon, Junghwan Kim, Il Moon</i>	
Use of Bayesian Modeling for Failure Risk Analysis and Control Strategy Design	69
<i>Adam Freitag, Amanda Rogers, Jose Tabora, Daniel S. Treitler</i>	
Accelerated Process Design and Optimization for a Small Molecule COVID-19 Therapeutic	70
<i>Michelle Zheng, Rachel Bade, Kevin Stone, Patrick Fier, Gilmar Brito, Steve Castro</i>	
A Digital Twin of Flexible Modular Continuous API Manufacturing Process	71
<i>Ravendra Singh, Jin-Ping Lim, Nathan Collins, Fernando Muzzio</i>	
Quality-By-Control of a Novel Unit for Continuous Integrated Filtration-Drying of Drug Substances	72
<i>Francesco Destro, Mesfin Abdi, Xin Feng, Vivian Wang, Erin Wood, Massimiliano Barolo, Zoltan Nagy</i>	
Data Pre-Treatment Analysis of Residence Time Distribution (RTD) Profiles for Pharmaceutical Manufacturing Applications	74
<i>Sonia M. Razavi, Pooja Bhalode, Andres Roman-Ospino, Huayu Tian, Shashwat Gupta, Atul Dubey, Marianthi Ierapetritou, Fernando Muzzio</i>	
Methanol Synthesis Processes	76
<i>Sascha Kleiber, Matthaeus Siebenhofer, Susanne Lux</i>	
Systematic Approaches for Discovering Innovations to Enable a Sustainable Circular Economy	77
<i>Vyom Thakker, Bhavik Bakshi</i>	
Shaping the Future with a Hydrogen Value Chain Simulation Platform.....	79
<i>Ian Willetts, Cal Depew</i>	
Nutrient Circularity to Abate Nitrogen Pollution: Techno-Economic Assessment of Nitrogen Recovery Systems for Livestock Facilities.....	94
<i>Edgar Martin Hernandez, Gerardo Ruiz-Mercado, Mariano Martin</i>	
Optimal Design of an Open-Cycle Ocean Thermal Energy Conversion System for Energy and Water Supply Considering Multiple-Objectives.....	96
<i>Ilse María Hernández-Romero, Fabricio Nápoles-Rivera, Luis Fabian Fuentes-Cortes, Antonio Flores-Tlacuahuac</i>	
High Yield and Economical Extraction of Rare Earth and Critical Elements from Coal Ash.....	97
<i>Bryan E. Sharkey, David Gamliel, Dorin V. Preda, Prakash B. Joshi, James C. Hower, Jack Groppo, Todd Beers, Mike Schrock, Brad Perrine, Russell Lambert, Jeffrey Yee</i>	
Gambling on Innovation.....	98
<i>Darrell Velegol</i>	

Process Development of Organosilicon Compounds	99
<i>Michael Depierro</i>	
Biorefinery Synthesis-A Route Towards Engineered Advanced Fuels	109
<i>Juan Manuel Restrepo-Florez, Joonjae Ryu, David Rothamer, Christos Maravelias</i>	
Molecular Design Targets and Optimization of Low-Temperature Thermal Desalination Systems.....	110
<i>Alejandro Garciadiego, Tengfei Luo, Alexander Dowling</i>	
Energy Integration Through Retrofitting of Heat Exchanger Network at Equinor Kalundborg Oil Refinery	112
<i>Niels Sørensen, Lars Erik Ebbesen, Haoshui Yu, Gürkan Sin, Jesper Vester Leihof Nielsen</i>	
Simultaneous Synthesis of Metabolic and Process Engineering for the Production of Muconic Acid	114
<i>Konstantinos Dimitriou, Antonios Kokosis</i>	
Process Design for the Production of Xylitol in a Multi-Product Biorefinery	115
<i>Nikolaus Vollmer, Krist V. Gernaey, Gürkan Sin</i>	
Digital Design of a Lomustine Manufacturing Process Using Pharmacy	117
<i>Daniel Casas-Orozco, Daniel Laky, Inyoung Hur, Jaron Mackey, Ahmed Mufti, Gintaras V. Reklaitis, Zoltan Nagy</i>	
SPICE_ED: A Framework for Simultaneous Materials Screening and Process Synthesis for Extractive Distillation.....	119
<i>Mohammed Sadaf Monjur, Ashfaq Iftakher, M M Faruque Hasan</i>	
Electromagnetic Simulations Aided Stable Microwave Reactor Configuration.....	121
<i>Abhinav Malhotra, Weiqi Chen, Weiqing Zheng, Pedro Plaza-Gonzalez, Jose M. Catala-Civera, Jesus Santamaria, Dionisios Vlachos</i>	
Decoupling MW Sensitivity and Reactivity: Towards Understanding Fe-ZSM-5@SiC as Effective Microwave Catalyst for Methane Dehydro-Aromatization	122
<i>Sanjana Karpe, Xinwei Bai, Jianli Hu, Goetz Vesper</i>	
Controlling Homogeneous/Heterogeneous Reactions in Alkane Dehydrogenation	123
<i>Weiqi Chen, Kewei Yu, Abhinav Malhotra, Weiqing Zheng, Pedro Plaza-Gonzalez, Jose M. Catala-Civera, Raul Lobo, Dionisios Vlachos</i>	
Microwave Heating of Liquid-Liquid Biphasic Systems	124
<i>Montgomery Baker-Fales, Tai-Ying Chen, Himanshu Goyal, Dionisios Vlachos</i>	
Microwave Fluidized Bed and Microwave Hybrid Fixed Bed Reactor for the Ethane Dehydroaromatization Reaction	125
<i>Brandon Robinson, Ashley Caiola, Jianli Hu</i>	
Modeling, Engineering, and Integration of a Smart Moisture Absorbing Foam (SMAF) into a Man-Portable Atmospheric Water Extraction Device.....	126
<i>Travis Emery, Peter Warren, Sean Torrez, John Kidd, Jacob Miske, Tiffany Yu, John Grimble, Todd Emrick, Ian Norris, Paul Smith, David Gamliel</i>	
Multi-Level Modelling of Low-Carbon Heating Systems: Integrating Household-Level Cost-Benefit Analysis with National-Level Value Chain Optimisation.....	127
<i>Jennifer Penman, Sheila Samsatli</i>	

Energy Integration for Waste Heat in Industrial Plants Through a Metaheuristic-Deterministic Approach	128
<i>Francisco J. López-Flores Sr., Luis Germán Hernández-Pérez, Luis Fernando Lira-Barragán III, Eusiel Rubio-Castro, Jose Ponce-Ortega</i>	
A Recycle/Reuse Network for the Optimal Water Management in Hydraulic Fracturing Operations.....	136
<i>Tania I. Serrano-Arevalo Jr., Luis Fernando Lira-Barragán III, Jose Ponce-Ortega, Mahmoud El-Halwagi</i>	
Simulation-Based Comparison Between Three Different Clean-In-Place Configurations Regarding Their Cleaning Efficiency and Water Use.....	144
<i>Hossam Metwally, Muhammad Sami, Kathleen Brown</i>	
Laser-Irradiated Holey Graphene-Supported Single-Atom Catalyst Towards Hydrogen Evolution and Oxygen Reduction	147
<i>Kishwar Khan, Zhengtang Luo, Khalil Amine</i>	
Analysis of Transformed Bioprocess Data and Application of Hybrid Modeling Approaches to Enhance Upstream Process Development	148
<i>Kristina Mathis, Boung Wook Lee, Dave Stevenson</i>	
Challenges in the Pharmaceutical Development of Lipid Nanoparticle Therapeutics.....	149
<i>Nelia Viza, Angela Wagner, Yong Liu, Agnes Zhao, Amy Doty, Katelyn Smith, Xiujuan Jia, Jameson Bothe, Yongchao Su, Mingyue Li, Eric Kemp, Adam Socia, Erin Guidry, Marian Gindy</i>	
Dynamic Optimization of an Ultrafiltration System for the Concentration of Monoclonal Antibody Solutions Under Uncertainty	151
<i>Francesco Rossi, Jessica Zuponic, Eduardo Ximenes, Steven Geng, Yinying Tao, Vincent Corvari, Michael Ladisch, Gintaras V. Reklaitis</i>	
Confocal Imaging of Protein Gel Layer Formation During Tangential Flow Filtration to Inform Process Conditions Reducing Protein Losses and Increasing Protein Concentration.....	153
<i>Jessica Zuponic, Francesco Rossi, Eduardo Ximenes, Norvin Bruns, Steven Geng, Yinying Tao, Vincent Corvari, Gintaras V. Reklaitis, Michael Ladisch</i>	
Multiscale Modeling of Spray Coating of Perovskite QDs: Understanding the Role of Molecular Interactions in Particle Aggregation.	155
<i>Niranjan Sitapure, Joseph Kwon</i>	
Findings and Conclusions from a Mobile Worker and Augmented Reality Enabled Continuous Manufacturing Skid Project.....	157
<i>Iiro Esko, Katelyn Kelsey, Andrew Nachenberg, Leon Grossman</i>	
Practical Issues in Cybersecurity: From Encryption to Images	159
<i>Dominc Messina, Kathryn Tyrrell, Minhazur Rahman, Kip Nieman, Keshav Kasturi Rangan, Henrique Oyama, Samantha Cherney, Arlan Bonislowski, Helen Durand</i>	
Keynote Talk: Machine Learning and AI Applications in the Chemical Industry	161
<i>You Peng, Leo Chiang</i>	
Keynote Talk: Deploying AI for Automated Monitoring of Physical Infrastructure	162
<i>Prateek Joshi</i>	
Kinetic Model and Autothermal Reactor Design for the Oxidative Dehydrogenation of Ethane	163
<i>Jiakang Chen, Praveen Bollini, Vemuri Balakotaiah</i>	

Single Reactor Design Concepts for Achieving an Autothermal Operation of Exothermic Oxidative Coupling of Methane and Endothermic Methane Dehydroaromatization Reaction	164
<i>Muhammad Umar Jamil, Mamoun Al-Rawashdeh</i>	
Effect of Cavitation Intensity on Thermal Efficiency and Reactive Performance of a Hydrodynamic Cavitation Reactor	167
<i>Nasser Al Azri, Riddhesh Patel, Hari Mantripragada, Robert M. Enick, Goetz Vesper</i>	
Continuous Biphasic Microreactor for Production of Hydrogen Peroxide Via Non-Thermal Atmospheric Pressure Plasma	168
<i>Fabio Cameli, Tai-Ying Chen, Panagiotis Dimitrakellis, Dionisios Vlachos</i>	
Zero-D Thermodynamic Model as a Simple Tool for Screening Chemical Reaction Candidates and Benchmarking of the Piston Reactor Technology	169
<i>Aya Abousrafa, Mamoun Al-Rawashdeh</i>	
Modeling a Fluidized Bed Reactor for Particle Atomic Layer Deposition with CFD-DEM.....	173
<i>Davis Conklin, Julia Hartig, Alan Weimer</i>	
Carbon Capture Technology and Natural Gas Treatment.....	174
<i>Margaret Greene, Justin Pan, Brian Houston</i>	
From Discovery to Deployment of an Aromatic Transalkylation Catalyst	175
<i>Christina Elia, Joshua Cutler, Joseph E. Gatt, Anna Ivashko, Kathy Keville, Frank Lai, Brett Loveless, Michel Molinier, Hari Nair, Nicholas Rollman, Bob Tinger, Dominick Zurlo</i>	
Integrated Capture and Conversion of CO ₂ into Materials (IC3M); A Multi-Product Technology for Ccus	176
<i>Jotheeswari Kothandaraman, Johnny Saavedra-Lopez, Yuan Jiang, Robert A. Dagle, David Heldebrant</i>	
Developing Biomass Valorization Technologies Based on Functionalization Chemistry	177
<i>Jeremy Luterbacher</i>	
Heavy Oil Reforming in a Dual Circulating Fluidized Bed Reactor	178
<i>Girish Srinivas, Steve Schwab, Steven Gebhard</i>	
Catalyst Development and Process Intensification of a Bio-Renewable Surfactants Platform	180
<i>Cameron Moore, Xiaokun Yang, Troy Semelsberger, Shawn Eady, Christoph Krumm</i>	
Test Tubes to Tons: De-Risking Pyran's Novel Catalytic Pathway to Bio-Based 1,5-Pentanediol.....	181
<i>Daniel J. McClelland, Nikhil Victor, George Huber, Kevin Barnett</i>	
Technology Transfer for Producing Sustainable Aviation Fuels from Wet Waste.....	182
<i>Derek Vardon</i>	
Enhancing the Dielectric Breakdown Strength of Solid-State Polymer Capacitors by Chain End Manipulations.....	183
<i>Maninderjeet Singh, Saumil Samant, Mei Dong, David Tran, Nihar Pradhan, Dharamraj Raghavan, Karen Wooley, Alamgir Karim</i>	
Electropolymerization of Polypyrrole by Photosystem I.....	184
<i>Joshua Passantino, Inaya Molina, David Cliffel, G. Kane Jennings</i>	
Development of Electrically Reversible Ion Exchange (ERIE) Electrodes for Desalination and Aqueous Deionization	185
<i>Michael Mullins, Janet Metsa</i>	

A Multi-Scale Approach to Evaluate the Relationship Between Rheological and Textural Properties of Oil-In-Water Cosmetic Emulsions	187
<i>Fernando Calvo, Ingrid Gomez, Jorge M. Gomez, Luis Ricardez-Sandoval, Oscar Alvarez</i>	
Cyclic Carbonate Plasticizers to Improve Li-Ion Conductivity in Solid Polymer Electrolytes	190
<i>Anthony Engler, Habin Park, Emily Brooks, Nian Liu, Paul A. Kohl</i>	
Design and Application of Hydrophobic 2,2,4-Trimethyl-1,3-Pentandiol Deep Eutectic Solvents for Boron Extraction	191
<i>Narjis Awaja, Ghaiath Almustafa, Ahmad S. Darwish, Ioannis Zuburtikudis, Hadil AbuKhalifeh, Hassan Arafat, Inas AlNashef</i>	
Nonlinear Predictive Control of an Industrial Selective Catalytic Reduction Unit with Time-Varying Time Delay	199
<i>Elijah Hedrick, Katherine Reynolds, Debangsu Bhattacharyya, Stephen E. Zitney, Benjamin P. Omell</i>	
Mechanistic Modelling of Reactive Liquid-Liquid Extraction Towers Using Polar PC-SAFT: Industrial Validation and Optimization of Fat/Oil Hydrolysis	202
<i>Pieter Nachtergaele, Gürkan Sin, Steven De Meester, Ewout Ruysbergh, Jeroen Lauwaert, Jo Dewulf, Joris Thybaut</i>	
A Multi-Agent and Distributed Cloud Computing Approach for Industrial Production Scheduling Model Development and Deployment.....	205
<i>Adam Kelloway, Hojae Lee, Apoorva Sampat, John Wassick</i>	
A Surrogate-Based Topological Compartment Model for Counter-Current Spray Dryers.	207
<i>Borja Hernández, Mark Pinto, Mariano Martin</i>	
Optimal Design and Operation of an Organic Rankine Cycle (ORC) System Driven by Solar Energy with Sensible Thermal Energy Storage.....	210
<i>Haoshui Yu, Truls Gundersen, Gürkan Sin</i>	
Keynote Talk: Online Measurements for the Petrochemical Industry: Industry 4.0 Trends and Unmet Needs	211
<i>Sherine George, James Tate, Paul Cammarata, Eric G. Schmidt, Rod Spitler, John Thibodeaux</i>	
Woodchip Moisture Content Estimation Using Short-Range Iot Wi-Fi for the Pulp & Paper Industry.....	212
<i>Kerul Suthar, Jin Wang, Zhihua Jiang, Q. Peter He</i>	
Gradient-Weighted Class Activation Mapping (Grad-CAM) Based Explanations for Process Monitoring Results from Deep Neural Networks.....	214
<i>Abhijit Bhakte, Bairi Sai Vasista, Rajagopalan Srinivasan</i>	
A Deep Learning Vision System for Classification of Manufacturing Defects.....	216
<i>Christopher Hanselman, Asit Tiwari, Mamta Venugopal, Lingrui Cai, Yuanfang Guan, Edwin Comparini, Bo Zhang, William R. Prucka</i>	
Magnesium Oxychloride Formation Kinetics and Enhanced Water Stability for Sustainable Building Materials Applications.....	217
<i>Christopher Kitchens, Saumye Vashishtha</i>	
Optimization of TEG Dehydration Process in Natural Gas Processing Under Metamodel Uncertainty	218
<i>Rajib Mukherjee, Urmila Diwekar</i>	

Mapping Environmental and Economic Analysis of Decentralized Cogeneration Energy Management Centers	219
<i>Nina Monteiro, Thomas Adams II</i>	
Development of an Interactive Software Tool for Designing Industrial Solvent Recovery Processes.....	221
<i>Jake Stengel, John Chea, Emmanuel A Aboagye, Michael Mackley, James Geier, Kirti Yenkie</i>	
High Flux CO ₂ Selective Membranes for Renewable Natural Gas and CO ₂ Capture.....	224
<i>Christine Parrish, Hannah Murnen, Sudip Majumdar, Ning Shangguan</i>	
Optimizing Energy Efficiency of Ammonia Production Via Electrochemical Reaction and Haber-Bosch Process.....	225
<i>Gbemisola Ojo, Kyle Camarda</i>	
Development of Expanded PTFE Structured Adsorbents with Parallel Channels	226
<i>Sulaimon Adegunju, Ryan Sanders, Charles E. Holland, Armin Ebner, Guo Shiou Foo, Bob Grasso, Steve K. Stark, Joe W. Henderson, Jeff A. Knopf, James A. Ritter</i>	
Analysis of Direct Air Capture Process Conditions on Adsorptive Performance of 3D-Printed Aminosilica Monoliths	227
<i>Kyle Newport, Shane Lawson, Ali Rownaghi, Fateme Rezaei</i>	
Development of a MOF-Textile Composite for Chemical Defense	228
<i>Meagan A. Bunge, Erick Pasciak, Jonglak Choi, Luke Haverhals, W. Matthew Reichert, Thomas Glover</i>	
Demonstration of Engineered Structured Sorbents in Various Adsorption Applications.....	229
<i>Kyle Hawley, Christian Junaedi, Codruta Zoican-Loebick, Subir Roychoudhury</i>	
Tvsa Cycle for Metabolic CO ₂ Removal from Spacecraft Cabins Using a Structured Adsorbent: Bench Scale Parametric Study.....	230
<i>Pravin B. C. A. Amalraj, Marjorie A. Nicholson, Armin Ebner, James A. Ritter</i>	
High-Efficient Crystal Particle Manufacture Via Microscale Process Intensification Technology.....	231
<i>Xiaobin Jiang, Gaohong He</i>	
Breakage Facilitated Mixed-Suspension, Mixed-Product-Removal (MSMPR) Crystallization.....	232
<i>Huayu Li, Yuantao Li, Fan Liu, Bing-Shiou Yang</i>	
Electrochemical Sensor-Integrated, Continuous Flow, Microfluidic Device for Real-Time Measurement of Supersaturation During Salt Screening.....	233
<i>Paria Coliaie, Aditya Prajapati, Manish Kelkar, Marianne Langston, Chengxiang Liu, Neda Nazemifard, Daniel Patience, Dimitri Skliar, Nandkishor K. Nere, Meenesh Singh</i>	
Periodic Forcing Via Temperature Cycles: Model-Based Study of Novel Continuous Configurations for Deracemization	234
<i>Brigitta Bodák, Marco Mazzotti</i>	
Continuous Flow Synthesis of the Metal-Organic Framework HKUST-1 in a Millifluidic Reactor	237
<i>Rajasi Shukre, Thomas Ericson, Anthony F. Cozzolino, Chau-Chyun Chen, Siva A. Vanapalli</i>	
Controlling the Effect of Slug-To-Slug Variation on the Crystal Size Distribution of Perovskite QDs: A CFD-Based Approach	238
<i>Niranjan Sitapure, Robert Epps, Milad Abolhasani, Joseph Kwon</i>	

Integrated Design and Model Predictive Control of Multiscale Systems Using a Multi-Fidelity Bayesian Optimization Approach.....	240
<i>Farshud Sorourifar, Naitik A. Choksi, Joel Paulson</i>	
Adjustable Robust Optimization for the Planning Operations of Integrated Refinery-Petrochemical Site Under Demand Uncertainty.....	243
<i>Zhang Lifeng, Zhihong Yuan, Bingzhen Chen</i>	
A Novel Hybrid Algorithm for Scheduling of Multipurpose Batch Process.....	244
<i>Dan Li, Dongda Zhang, Nan Zhang, Jie Li, Liping Zhang, Xin Xiao</i>	
Impact of Split Delivery in Minimizing LNG Procurement Cost.....	246
<i>Prashanth Ravula, Mohd Shahrukh, Rajagopalan Srinivasan, Iftexhar Karimi</i>	
Keynote Talk: Toward Autonomy for Safe and on-Demand Biomanufacturing on Mars.....	249
<i>Ali Mesbah</i>	
Keynote Talk: The Roadmap to an Autonomous Chemistry Lab.....	250
<i>Connor Coley</i>	
Exploring the Physical Aging Behavior of Hpmcas Via Thermal Analysis.....	251
<i>Yejoon Seo, Rodney Priestley</i>	
Accurate Temperature Prediction of the Freeze-Dried Cake During Secondary Drying Process in a Laboratory Scale Lyophilizer.....	252
<i>Kyu Yoon, Vivek Narsimhan</i>	
Physicochemical Modeling of Drug Stability in Multilayer Polymeric Films Containing an Aqueous Moisture Barrier Layer.....	253
<i>M. Arif Khan, Andie L. MacMillan, Aktham Aburub, Karthik Vaideeswaran, Sarah Clark, Mohamed ElSayed, Shekhar K. Viswanath, Thomas D. Dziubla</i>	
Development of an HME Based Extended-Release Formulation Using Experimental and in Silico Approach.....	254
<i>Josip Matic, Varun Kushwah, PM Martinez, Estelle Beguin, Manjeet Pimparade, Jeff Katstra, Amrit Paudel, Johannes G. Khinast</i>	
Multi-Objective Supply Chain Optimization in Personalized Healthcare.....	256
<i>Andrea Bernardi, Niki Triantafyllou, Athanasios Antonakoudis, Matthew Lakelin, Nilay Shah, Maria Papathanasiou</i>	
Robust Bioprocessing of Lignocellulose Using Microbial Tipping Points.....	258
<i>Katharine Hirl, Michael J. Shreve, John M. Regan, Tom L. Richard</i>	
Keynote: Multi-Objective Optimization, State Estimation, and Advanced Control of a Semi-Batch Process for the Enzymatic Conversion of Lactose into Value-Added Products.....	260
<i>Ronald Alexander, San Dinh, Guilhermina Schultz, Marcelo P. A. Ribeiro, Fernando V. Lima</i>	
Keynote: Virtual-Engineering Software Framework for Integrated Biomass Conversion Modeling.....	262
<i>Ethan Young, Hariswaran Sitaraman, Andrew Glaws, Andrew Bartling, James J. Lischeske, Jonathan Stickel</i>	
Enabling Low Carbon Hydrogen Production Using Resource Integration Approach.....	263
<i>Yasir Ibrahim, Dhabia Al-Mohannadi</i>	

The Effect of Geological Properties of Underground Storage on Its Suitability for Inter-Seasonal Storage of Hydrogen and Its Role in Achieving Net Zero.....	264
<i>Natasha Marino, Jennifer Penman, Sheila Samsatli</i>	
Stone-Wales Defect-Rich Carbon-Supported Dual-Metal Single Atom Sites for Zn-Air Batteries	265
<i>Kishwar Khan, Zhengtang Luo, Khalil Amine</i>	
Determination of Safety Parameters in Lithium-Ion Batteries	266
<i>Surendra Singh</i>	
Silica Gel/ MgSO ₄ Hybrids for Thermal Energy Storage	267
<i>Suboohi Shervani, F Handan Tezel</i>	
Thermochemical Heat Recuperation for Compressed Air Energy Storage	268
<i>Fuqiong Lei, Like Li, Eric Million, David Korba, Kelvin Randhir, Nick AuYeung</i>	
Exploring the Role and Value of Grid-Scale Energy Storage in Deep Decarbonisation.....	269
<i>Caroline Ganzer, Yoga Wienda Pratama, Niall Mac Dowell</i>	
Data-Driven Incipient Fault Management for Proton Exchange Membrane Fuel Cell	272
<i>Bhavana Bhadriraju, Joseph Kwon, Faisal Khan</i>	
Efficient Process for the Production of High Conductivity, Carbon-Rich Materials from Coal	274
<i>Min Song, Jake Herb, David Gamliel, Nathan Shipley, Gabrielle Aversa, Caitlin Bien, Christopher Lang, Zachary Whitemore, Jeffrey Yee, Dorin Preda</i>	
Modular Processing of Flare Gas for Hydrogen and Carbon Nanofibers.....	276
<i>Jessica Hauck, Kent J. Warren, Gage Sowell, Theodore Champ, Mija H. Hubler, Linfei Li, Boning Wang, Robert L. Anderson, Andrew Broerman, Alan Weimer</i>	
Modeling Particle Atomic Layer Deposition in a Fluidized Bed with CFD-DEM.....	277
<i>Davis Conklin, Julia Hartig, Alan Weimer</i>	
Study and Modeling the Wettability Contact Angle and Area Measurement for EOR in 2D Imaging Technology by Using Python Algorithm.....	278
<i>Hussain Alajaj, Ralph E. Flori Jr., Waleed Al-Bazzaz</i>	
Some Features of Ion Exchange Membranes in Complex Environments for Electrochemical Conversions	279
<i>Thomas Zawodzinski, Jing Peng, Kun Lou, Gabriel A. Goenaga</i>	
Molecular Engineering of Anion-Conducting Polymers for Electrochemical Energy Conversion Technologies	280
<i>Chulsung Bae</i>	
New Membranes for Solar Fuels Systems.....	281
<i>Daniel Miller, Sarah Dischinger, Shubham Gupta, Blaine Carter</i>	
CO ₂ -CO Energy Conversion Cycle Enabled by a CO ₂ -Selective Membrane.....	282
<i>Ruizhi Pang, Yang Han, Winston Ho</i>	
Model-Based Investigation of Upstream CHO Cell Culture Process for Production of Monoclonal Antibodies with Desired N-Linked Glycosylation	283
<i>Ou Yang, Jayanth Venkatarama Reddy, Katherine Raudenbush, Aron Gyorgypal, Shishir Chundawat, Marianthi Ierapetritou</i>	

Next-Generation Vaccines and Therapeutics: Towards Resilient Pharmaceutical Supply Chains.....	285
<i>Miriam Sarkis, Nilay Shah, Maria Papathanasiou</i>	
Systematic Decomposition & Evaluation of a Process Design Space for Monoclonal Antibody (mAb) Manufacturing.....	287
<i>Johann Kaiser, Maria-Ona Bertran, Janus Krarup, Manuel Pinelo, Ulrich Krühne, Deenesh K. Babi</i>	
Keynote Talk: Integrated Quality by Design in (Bio)Pharmaceutical Manufacturing	288
<i>Richard D. Braatz, Moo Sun Hong, Amos E. Lu, Weike Sun</i>	
Keynote Talk: An in Silico Approach for Monoclonal Antibody (mAb) Process Research & Early Development	289
<i>Johann Kaiser, Maria-Ona Bertran, Janus Krarup, Manuel Pinelo, Ulrich Krühne, Deenesh K. Babi</i>	
Optimization Framework for the Electroreduction of CO ₂ into Chemicals	291
<i>Ana Somoza Tornos, Omar J. Guerra, Wilson A. Smith, Bri-Mathias Hodge</i>	
Material Property Targets for Emerging Adsorptive Water Treatment and Resource Recovery Systems.....	293
<i>Elvis Eugene, William Phillip, Alexander Dowling</i>	
Integrated Waste-To-Energy and Energy Management Platform: A Demonstration in an Eco- Industrial Park	295
<i>Lanyu Li, Laura Ong, Mei Qi Lim, Markus Kraft, Xiaonan Wang</i>	
Design and Integration of Thermal Energy Storage Systems for Power Plants	296
<i>Mengdi Li, Akhilesh Gandhi, Manali S. Zantye, M M Faruque Hasan</i>	
A Multiscale Electro-Chemical Model for Simulating Dendrite Formation in Lithium-Ion Batteries.....	298
<i>Hyeonggeon Lee, Niranjan Sitapure, Maria Stefany Angarita-Gomez, Perla B. Balbuena, Sungwon Hwang, Joseph Kwon</i>	
Computationally Efficient Distillation Energy Targeting Model for Superstructure-Based Process Synthesis.....	300
<i>Joonjae Ryu, Christos Maravelias</i>	
Dynamic Simulation of an Ammonia Synthesis Plant Fed by Stranded Natural Gas in Aspen Hysys	302
<i>Laron Burrows, George Bollas</i>	
Sequence Modulates Polypeptoid Hydration Water Structure and Dynamics.....	304
<i>Sally Jiao, Audra DeStefano, Daniela Rivera-Mirabal, Rachel Segalman, Songi Han, M. Scott Shell</i>	
Role of Charge Patterning and Hydrophobicity in Peptide-Based Complex Coacervates	305
<i>Arvind Sathyavageeswaran, Jason Madinya, Charles Sing, Sarah L. Perry</i>	
Impact of Collagen-Like-Peptide (CLP) Triple Helix Design on CLP Melting Transition and Assembly: A Coarse-Grained Molecular Dynamics Simulation Study.....	306
<i>Phillip Taylor, April Kloxin, Arthi Jayaraman</i>	
Controlled Alignment of Collagen and Its Influence on the Proliferation of Human Schwann Cells	307
<i>Homa Ghaiedi, Luis Carlos Pinzon-Herrera, Jorge Almodovar, Karthik Nayani</i>	

Opto-Chemical Characterization and Determination of Nanostructural Organization in Complex Leafhopper Brochosome Protein Assemblies.....	308
<i>Gabriel Burks, Proгна Banerjee, Marianne Alleyne, Mostafa Nassr, Sarah Bialik, Elizabeth Bello, Benny D. Freeman, Jeffrey E. Barrick, Delia Milliron, Charles M. Schroeder</i>	
Mucus: Cactus-Like Conformations of Associative Polymers.....	309
<i>Scott Danielsen, PhD, Michael Rubinstein</i>	
Barrier Coatings Derived from Cellulose and Chitin.....	310
<i>J Carson Meredith, Meisha L. Shofner, Yue Ji, Zeyang Yu</i>	
Engineering Electrostatic Interactions Between Proteins and Biopolymers for Intracellular Phase Separation.....	311
<i>Vivian Yeong, Jou-wen Wang, Justin Horn, Allie Obermeyer</i>	
Kinetics of Soy Protein Adsorption at the Fluid Interface: Interfacial Rheology.....	312
<i>Farshad Nazari, Mohammad Reza Rahimpour</i>	
Cephalexin and Amoxicillin Crystal Shape Modification by Manipulating the Supersaturation and Wet Milling.....	313
<i>Hossein Salami, Patrick Harris, Andreas Bommarius, Martha Grover, Ronald Rousseau</i>	
Accelerated Early-Stage Enabling API Crystallization Process Development and Scale-Up.....	315
<i>Ryan Ellis, Moussa Boukerche, Collin Morris, Michael Lesslie, Jie Chen, James Stambuli, Nandkishor K. Nere</i>	
Development and Scale-Up of a Crystallization Process for a Kinetically-Unfavorable Polymorph.....	316
<i>Paul Larsen, Navraj Hanspal, Nicole Hough, Christian Lowe, Yamini Krishnan, Patrick McGough, Abraham Schuitman, Joseph Wei</i>	
Acid-Catalyzed Esterification Governs the Chain Elongation and the Oriented Attachment in Cof-5 Synthesis.....	317
<i>Rajan Bhawnani, Anish Dighe, Santanu Chaudhuri, Meenesh Singh</i>	
Enabling a Selective Dissolution Scheme for the Removal of Fines in Crystallization with a Hydrocyclone: Modeling and Experimental Validation.....	318
<i>Pietro Binel, Marco Mazzotti</i>	
Crystallization Modeling of a Pharmaceutical Compound for Digital Twin Based in-Silico Optimization with Experimental Validation.....	320
<i>Ayse Eren, Botond Szilagyi, Justin Quon, Charles D. Papageorgiou, Zoltan Nagy</i>	
Superstructure Optimization Enabled Design Heuristics and Material Property Targets for Continuous Diafiltration Membrane Cascades.....	322
<i>Elvis Eugene, Noah Wamble, William Phillip, Alexander Dowling</i>	
Optimal Integration of Process Design and Dynamic Transitions for Catalytic Distillation Columns: A Discrete-Steepest Descent Framework.....	324
<i>David A. Linan, Luis Ricardez-Sandoval</i>	
Novel Module-Based Design and Optimization Approach for Intensified Membrane Reactor Systems.....	327
<i>Brent Bishop, Fernando V. Lima</i>	
Techno-Economic Analysis of a Dynamic Packed Reactive Distillation Column for Renewable Biosurfactant Production.....	328
<i>Khalid Rashid, Christoph Krumm, Trenton Wilke, Babatunde A. Ogunnaike</i>	

Intensified Process Design Alternatives for the Diethyl and Ethyl-Methyl Carbonate Production	330
<i>Gloria Azucena Buitimea-Cerón, Nancy Medina-Herrera, Salvador Tututi-Avila</i>	
A Process Intensification Synthesis Framework for the Design of Divided Wall Columns.....	331
<i>Yuhe Tian, Vaishnav Meduri, Rahul Bindlish, Efstratios N. Pistikopoulos</i>	
Optimization Modeling for Advanced Syngas to Olefin Reactive Systems Under Parameter Uncertainty	333
<i>Can Ekici, Christopher R. Ho, Joseph DeWilde, Paul Witt, Lorenz Biegler</i>	
A Study of Thermal Management in Commercial Face Masks.....	334
<i>Nabila Shamim, Utomwen Irabor, Ariful Bhuiyan</i>	
Synthetic Biology Platforms for the Sustainable Production of Superior Flavor and Fragrance Ingredients	335
<i>Ernesto Simon</i>	
On the Quantitative Investigation of the Antimicrobial Efficacy of Grape Seed Extracts Against Food-Related Bacterial Pathogens.....	336
<i>Melina Kitsiou, Jorge Gutierrez-Merino, Katherine Costello, Simon Grewal, Eirini Velliou</i>	
Systematic Screening of Materials for Consumer Products Using Semantically Enabled LCA	338
<i>Melina Psycha, Christos Mihalopoulos, Filoipimin Lykokanellos, Antonios Kokosis</i>	
Innovating a Bendable Concrete Railroad Tie with Enhanced Fatigue Durability Via CO2 Utilization.....	339
<i>Weihsiu Hu, Duo Zhang, Victor C. Li, Brian R. Ellis</i>	
Managing Model and Data Alternatives Within the Design of Ionic Liquid Enabled Separations of High Global Warming Potential Hydrofluorocarbon Refrigerants	340
<i>Bridgette Befort, Alejandro Garciadiego, Gabriela Franco, Edward Maginn, Alexander Dowling</i>	
Data Analysis and Predictive Modeling for Wastewater Asset Management	342
<i>Jake Stengel, Phuong Le, Nicolas Altieri, Emmanuel A Aboagye, Matt DeNafo, Dylan Bakley, Kirti Yenkie</i>	
Regularized Bayesian Fusion for Toxin Concentration Estimation in an Industrial Wastewater Treatment Plant	345
<i>Eugeniu Strelet, Zhenyu Wang, You Peng, Ivan Castillo, Ricardo Rendall, Bea Braun, Mark Joswiak, Leo Chiang, Marco Reis</i>	
Model-Based Design of Experiments in Pyomo and Its Application to Adsorptive CO2 Capture Systems.....	347
<i>Jialu Wang, Alexander Dowling</i>	
Machine Learning-Based Soft Sensors for Vacuum Distillation Unit.....	349
<i>Kamil Oster, Stefan Güttel, Lu Chen, Jonathan L. Shapiro, Megan Jobson</i>	
Statistical Machine Learning for the DOW Data Challenge Problem	358
<i>S. Joe Qin, Siyi Guo, Zheyu Li, Leo Chiang, Ivan Castillo</i>	
Data-Driven Modeling and Optimization of an Industrial Scale Reverse Osmosis Desalination Plant	360
<i>Marcello Di Martino, Styliani Avraamidou, Efstratios N. Pistikopoulos</i>	

Objective Assessment of Operator Training Using Correspondence Analysis of Physiological and Behavioral Measures	362
<i>Mohammed Aatif Shahab, Babji Srinivasan, Rajagopalan Srinivasan</i>	
Multi-Scale Optimization of a Fixed-Bed Multi-Tubular Reactor for CO ₂ Methanation	365
<i>Son Ich Ngo, Young-Il Lim</i>	
Corning® Advanced-Flow™ Photo Reactors: A Light Touch to Continuously Improve Chemical Synthesis.....	366
<i>Alessandra Vizza, Philippe Roth, Gurkirat Singh</i>	
Systematic Evaluation of Isoflavone Extraction from Soybean Meal	367
<i>John Chea, Joseph Stanzione III, Kirti Yenkie</i>	
An Experimental Study of High-Pressure, Multi-Phase Reactions Between Sulfur and Hydrocarbons; Strategies to Enhance Reaction Rate for Process Intensification.....	370
<i>Peter Koronaios, Robert M. Enick, Hseen Baled, Goetz Vesper, Glenn Cormack, David Ertle, Ryan Weber, Riddhesh Patel</i>	
Scheduling for Dynamic Risk and Resource Management for Simultaneous Front-End Refinery Production and Maintenance	371
<i>Xingchun Wang, Qiang Xu</i>	
CFD Simulation of Wind Effect on the Flammable Gas Cloud Formation from Two-Phase Flow Release	372
<i>Natalya A. B. Almeida, Paloma L. Barros, José J. N. Alves</i>	
Simulation and Analysis of Hydrogen Refueling System	380
<i>Jung Byungchan, Youngsub Lim</i>	
Development of Heterogenous Equilibrium Model for Lithium Solvent Extraction Using Organophosphinic Acid.....	381
<i>Junnan Lu</i>	
Corrosion Under Insulation (CUI) – Out of Sight Should it Be Out of Mind?.....	382
<i>Deepak Sharma</i>	
Process Intensification of CO ₂ Capture by Low-Aqueous Solvent.....	383
<i>Gyoung Gug Jang, Joshua Thompson, Xin Sun, Costas Tsouris</i>	
Thermoplastic Polyurethane Gel Quality Improvement Based on Pilot Line Filter Evaluation.....	384
<i>Seth Alson, Joeri Plusnin, Jeffery Hauser, Kayla Ruslavage, Lyle Zyra, Glenn Cormack</i>	
Exploring Flammability Hazards from the Reactive Chemicals Perspective	385
<i>Jessica E. Nichols, Robert Bellair, Katie Mulligan</i>	
Integration of a Green and Efficient Synthesis Step Enables Enhanced Production of the Antimalarial Precursor Artemisinin from Plant-Based Extraction	386
<i>Susann Triemer, Andreas Seidel-Morgenstern</i>	
Designing Green Nanosilicas Using Statistical and Machine Learning Approaches	389
<i>Luc Dewulf, Mauro Chiacchia, Aaron S. Yearley, Robert A. Milton, Solomon F. Brown, Siddharth Patwardhan</i>	
Deposition of Solid Fabric Enhancers in the Domestic Clothes Dryer.....	391
<i>Chris Jones, Peter J. Fryer, Carlos Amador, Alessandro Corona III, Michael Fontaine</i>	

Characterization of the Spinnability of Cellulose/Ionic Liquid Spinning Dopes During a Dry-Jet Wet-Spinning Process Through in-Situ Rheo-Optic Techniques	393
<i>Jianyi Du, Pablo B. Sanchez, Crystal Owens, Gareth H. McKinley</i>	
Optimal Design of Controlled Environment Agricultural Systems Under Market Uncertainty	394
<i>Shaylin Cetegen, Matthew Stuber</i>	
Reproducible and Fast Mapping of Material Flows in Industrial Networks Using Plot Hub: A Novel Cloud Based Computational Tool	397
<i>William Farlessyost, Apoorva Bademi, Shweta Singh</i>	
Solid Oxide Fuel Cell – Thermal Energy Storage (SOFC-TES) Integrated System Modeling and Energy Efficiency Optimization	398
<i>DongJin Lee, Youngtak Cho, Sungwon Hwang</i>	
Upcycling Food Waste for Hydrogen Storage: Technoeconomic Assessment	400
<i>Al Ibtida Sultana, Toufiq Reza</i>	
Economic and Environmental Impact of Biochar Addition on Anaerobic Digestion Process	401
<i>Md Mosleh Uddin, Zhiyou Wen, Mark Mba Wright</i>	
Optimizing Syngas Production Process by Downdraft Gasifier Using Response Surface Methodology	402
<i>ASO Hassan, Hayder Alhameedi, Salih Rushdi, Hayder Al-Atabi, Zainab Al-Sharify, Joseph D. Smith</i>	
Techno-Economic Evaluation of Nano-Porous Silica Production from Rice Husk and Sand.....	403
<i>Semie Kim, Young-Il Lim</i>	
A Capital and Energy Efficient Alternative Emissions Control Technology for Controlling Emissions Using Bead Activated Carbon.....	404
<i>Kim Tutin, Harold Cowles, John Berger</i>	
Crystallization Design to Avoid Liquid-Liquid Phase Separation and Control Drug Substance Physical Properties	424
<i>Zhenshu Wang, Jeremy Merritt, David Remick, Daniel J. Jarmer</i>	
Material Sparing Approaches for Predicting Powder Flow Using Machine Learning Methods	425
<i>Stephen Thomas, Ana Ferreira, John Gamble, Ilgaz Akseli, Mike Tobyn</i>	
In-Depth Mechanistic Understanding of Pibrentasvir Agglomeration to Enable Successful Scale-Up	426
<i>Laurie Mlinar, Alessandra Mattei, Moiz Diwan, Daniel Crandall</i>	
Influence of the Rheology of Lactose Excipients on the Feeding Consistency in Tableting Processes	427
<i>Sebastien Depaifve, Aurelien Neveu, Pauline Janssen, Filip Francqui</i>	
Characterizing the Effect of Particle Properties and Surface Topography Towards Pharmaceutical Powder and Surface Adhesion Using the Enhanced Centrifuge Method	428
<i>Caralyn Stevenson, Jordan Monroe, Manuel Vazquez, Olivia Jones, Richael Zhang, Ethan Main, Josephine Upton, Andrew Vogt, Maxx Capece, William Ketterhagen, Stephen P. Beaudoin</i>	
Surfactant/Preservative Instability in Injectable Pharmaceutical Formulation	429
<i>Peter H. Gilbert, Zhenhuan Zhang, Ken K. Qian, David P. Allen, Rachel R. Ford, Norman J. Wagner, Yun Liu</i>	

Author Index