

Computing and Systems Technology Division 2015

Core Programming Area at the 2015 AIChE Annual Meeting

Salt Lake City, Utah, USA
8-13 November 2015

Volume 1 of 2

ISBN: 978-1-5108-1856-9

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© (2015) by AIChE
All rights reserved.

Printed by Curran Associates, Inc. (2016)

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

VOLUME 1

(38a) Optimization Models and Algorithms for Water Supply Chain Network Design and Operations in Shale Gas Production	1
<i>Jiyao Gao, Fengqi You</i>	
(38b) Metrics Driven Systems Analysis for Water & Energy Sustainability	2
<i>Arunprakash T. Karunanithi, Jonathan Dubinsky</i>	
(38c) An Industrial Ecology Approach for Managing Wastewater from Shale Gas Production	3
<i>Sakineh Tavakkoli, Radisav D. Vidic, Vikas Khanna</i>	
(38d) Integrated Optimization of Water Supply Systems Scheduling for Energy Efficient Operations	4
<i>Hanyu Shi, Fengqi You</i>	
(38e) Optimization of Complex Integrated Water and Membrane Network Systems	5
<i>Musah Abass</i>	
(38f) An MINLP Model for the Water Management in Shale Gas Operations	13
<i>Luis Fernando Lira-Barragán, José María Ponce-Ortega, Meadardo Serna-González, Mahmoud M. El-Halwagi</i>	
(60a) Overview of CAST Activities and Programming	14
<i>Nick Sahinidis, Raymond A. Adomaitis</i>	
(60b) Systematic Computer-Aided Framework for Sustainable Chemical Product Design	15
<i>Stefano Cignitti, Lei Zhang, Sawitree Kalakul, Rafiqul Gani</i>	
(60c) Multiparametric Dynamic Programming – Recent Advances and Future Challenges	16
<i>Richard Oberdieck, Nikolaos A. Diangelakis, Efstratios N. Pistikopoulos</i>	
(60d) Mixed-Integer Model Predictive Control for Online Scheduling of HVAC Equipment in Commercial Buildings	17
<i>Michael Risbeck, Christos T. Maravelias, James B. Rawlings, Robert Turney</i>	
(60e) Dynamic Modeling of the Nitrogen Cycle in Biochar Amended Soils: A New Approach for Rapid Screening of Designer Biochars	19
<i>Kyriacos Zygourakis, Caroline A. Masiello, Hao Sun</i>	
(60f) Smart Grid: Opportunities for the Process Industries	21
<i>Iiro Harjunkoski, Lennart Merkert, Ernst Scholtz, Xiaoming Feng</i>	
(91a) Novel Processes for the Production of Olefins and Aromatics from Methane Via Methanol: A Comprehensive Process Synthesis and Global Optimization Approach	22
<i>Alexander M. Niziolek, Onur Onel, Christodoulos A. Floudas</i>	
(91b) Process Design and Optimization of Chemicals' Production from Biomass Feedstocks	23
<i>Zhaojia Lin, Abhay Athaley, Vladimiro Nikolakis, Marianthi G. Ierapetritou</i>	
(91c) A Review on Life Cycle Assessments of Prioritized Renewable Chemicals and Their GHG Reduction Potential	25
<i>Mahdokht Montazeri, George G. Zaimes, Vikas Khanna, Matthew J. Eckelman</i>	
(91d) Process Simulation Models Parameterizing Multi-Sector Technoeconomic Framework to Test Viability of Emerging Bioprocesses	28
<i>Sumesh Sukumara</i>	
(91e) Biolubricant: Lignin in Choline/Amino Acid Ionic Liquids	29
<i>Livren Mu, Jiahua Zhu</i>	
(156a) An Exposure Reconstruction MODEL for Environmental and Consumer Product Chemicals: Application on Bisphenol	30
<i>Dimosthenis Sarigiannis, Evangelos Handakas, Alberto Gotti, Spyros Karakitsios</i>	
(156b) Synthesis of Networks of Reactors Featuring Multiple Residence Time Distribution	32
<i>Abdulrahman Albassam, Vasilios Manousiouthakis</i>	
(156c) Small-Scale Gtl Processes for Utilizing Stranded Gas: Model Identification, Process Synthesis, and Global Optimization	33
<i>Onur Onel, Alexander M. Niziolek, Holly Butcher, Benjamin Wilhite, Christodoulos A. Floudas</i>	
(156d) Transient Analysis of Gaseous Contamination Dispersion on Offshore Facilities	34
<i>Jianxin Lu, Andrey Filippov, Fernando Marcanola, Victor Alcocer</i>	
(156e) Multi-Domain Modeling and Operation of a Steam Methane Reforming Furnace	35
<i>Liangfeng Lao, Andres Aguirre, Panagiotis D. Christofides</i>	
(156f) Integration of High-Fidelity CO2 Sorbent Models at the Process Scale Using Dynamic Discrepancy	36
<i>Kuijun Li, Priyadarshi Mahapatra, David Mebane</i>	
(156g) A Model-Based Approach for Predicting Gas Well Leaks from Cemented Annulus and Identifying Well Construction Factors Responsible for Such Leaks	37
<i>Shobhit Misra, Michael Nikolaou</i>	
(162a) Offset-Free Model Predictive Control with Explicit Performance Specification	39
<i>Matt Wallace, Prashant Mhaskar</i>	
(162b) Stiction Compensation through Economic Model Predictive Control	40
<i>Helen Durand, Panagiotis D. Christofides</i>	
(162c) Reformulating Nonrobust Nonlinear Model Predictive Control	41
<i>Devin Griffith</i>	

(162d) Bridging the Gap Between Multigrid, Hierarchical, and Receding-Horizon Control	42
<i>Victor M. Zavala</i>	
(162e) A Formulation of Advanced-Step Carleman Linearization-Based Nonlinear Model Predictive Control	43
<i>Yizhou Fang, Antonios Armaou</i>	
(162f) Approximation of Closed-Loop Dynamics for Dynamic Real-Time Optimization Calculations	44
<i>Mohammad Z. Jamaludin, Christopher L. E. Swartz</i>	
(162g) On the Use of Transient Information for Static Real-Time Optimization	47
<i>Alejandro Marchetti, Grégory François, Dominique Bonvin</i>	
(165a) On the Integration Role of Solvents in Process Synthesis-Design-Intensification: Application to Dmc/MeOH Separation	50
<i>Deenesh K. Babi, Rafiqul Gani</i>	
(165b) Equation-Oriented Optimization of Processes with Dividing-Wall Columns	52
<i>Richard Pattison, Michael Baldea, Akash Gupta</i>	
(165c) Multistream Heat Exchanger Modeling and Design	55
<i>Harry A. J. Watson, Kamil A. Khan, Paul I. Barton</i>	
(165d) Combined Model-Based Experimental Analysis and Process Design Leading to a Profitable Butadiene Telomerization Process	56
<i>Sebastian Recker, Christian Redepenning, Wolfgang Marquardt</i>	
(165e) Optimal Production of DME from Switchgrass Based Syngas Via Direct Synthesis	57
<i>Estela Peral, Mariano Martín</i>	
(165f) Comparative Analysis of Different Retrofit Methods for Heat Exchanger Networks	59
<i>Akpomiemie Mary Onome, Robin Smith</i>	
(165g) An Algorithm for Simultaneous Process Design and Control Under Process Disturbances and Parameter Uncertainty Using PSE Approximations	62
<i>Siddharth Mehta, Luis A. Ricardez-Sandoval</i>	
(165h) Natural Gas to Liquids, Olefins, and Aromatics: A Systematic Approach for the Optimal Production Trade-Offs	63
<i>Alexander M. Niziolek, Onur Onel, Christodoulos A. Floudas</i>	
(169a) A Transformation-Centric Approach to Analyzing and Solving Structured Optimization Problems	64
<i>John D. Siirola, John Siirola, William E. Hart, Jean-Paul Watson</i>	
(169b) A Software Framework for the Global Optimization of Nonconvex Two-Stage Stochastic Programs	65
<i>Rohit Kannan, Paul I. Barton</i>	
(169c) Solving MINLP with Heat Exchangers: Special Structure Detection and Large-Scale Global Optimisation	67
<i>Ruth Misener, Miten Mistry</i>	
(169d) Design, Implementation, and Evaluation of the Branch-and-Sandwich Algorithm for Nonlinear Nonconvex Bilevel Problems	68
<i>Remigijus Paulavicius, Polyxeni-M. Kleniati, Claire S. Adjiman</i>	
(169e) The Alamo Software for Model Building, Constrained Regression, and Intelligent Experimental Design	69
<i>Nick Sahinidis</i>	
(169f) Pop – the Parametric Optimization Toolbox	70
<i>Richard Oberdieck, Nikolaos A. Dangelakis, Maria M. Papanthasiou, Ioana Nascu, Muxin Sun, Styliani Avraamidou, Efstratios N. Pistikopoulos</i>	
(169g) A Platform Facilitating Workflow Management of Multi-Task, Multi-Scale Simulations for Distributed Computing Environments	73
<i>Heinz A. Preisig, Henrik Rusche, Sigve Karolius, Mandar Thombre</i>	
(169h) Procafd: Computer Aided Tool for Synthesis-Design & Analysis of Chemical Process Flowsheets	75
<i>Anjan K Tula, Mario Richard Eden, Rafiqul Gani</i>	
(173a) Designing Software for Chemical Engineers – A Product Developer's Perspective	76
<i>Marco A. Satyro, Ross Taylor</i>	
(173b) Designing Chimeric Peptides Using Swarm Intelligence Optimization for the Protein Folding Problem	77
<i>Kyle Boone, Candan Tamerler, K. V. Camarda</i>	
(173c) A New Optimization Model for Computer-Aided Molecular Design Problems	78
<i>Lei Zhang, Stefano Cignitti, Rafiqul Gani</i>	
(173d) Designing Optimal Mixtures Using Generalized Disjunctive Programming: Convex Hull Reformulation	87
<i>Suela Jonuzaj, Claire S. Adjiman</i>	
(173e) A COSMO-Based Approach to Computer-Aided Mixture Design	88
<i>Nick Austin, Nick Sahinidis, Daniel W. Trahan</i>	
(173f) Coupling Experiments and Computational Tools to Estimate Thermal Properties for Product Design in the Fat-Based Food Industry	89
<i>Moises Teles Dos Santos, Icaro S. Viana, Juliana N. R. Ract, Galo A. C. Le Roux</i>	
(173g) Multi Objective Molecular Design of Reactants and Products	91
<i>Vikrant Dev, Nishanth G. Chemmangattuvalappil, Mario Richard Eden</i>	
(180a) The Solar Integration National Dataset (SIND) Toolkit	92
<i>Andrew Weekley, Anthony Lopez, Marissa Hummon, Bri-Mathias S. Hodge</i>	
(180b) A Study on an Integration Framework of Multiple Renewable Energy Systems	93
<i>Soo Bin Lee, Jun-Hyung Ryu, In-Beum Lee</i>	
(180c) Securing Our Energy Supply: The Effect of Distributed Electricity Generation Using Natural Gas on the Interdependency of the Electric and Natural Gas Grids	94
<i>Cara Touretzky, Dana L. McGuffin, Jena Ziesmer, Michael Baldea</i>	

(180d) An Adjustable Robust Optimization Approach to Provision of Interruptible Load By Continuous Processes	95
<i>Qi Zhang, Michael F. Morari, Ignacio E. Grossmann, Arul Sundaramoorthy, Jose M. Pinto</i>	
(180e) Smart Grid Analysis of Centralized Power and Cooling for an Urban Community	96
<i>Donald J. Chmielewski</i>	
(180f) Energy Exchange in Autonomous Isolated Networks with Renewable Energy Sources Empowered By a Multi-Agent Internet of Things (IoT) Architecture.....	97
<i>Chrysovalantou Ziogou, Simira Papadopoulou, Spyros S. Voutetakis</i>	
(204a) Online Optimization for Grade Transitions in Polyethylene Solution Polymerization Process	98
<i>Jun Shi, Intan Hamdan, Lorenz T. Biegler</i>	
(204b) Real-Time Estimation of Plasma Insulin Concentration in Patients with Type 1 Diabetes.....	99
<i>Iman Hajizadeh, Kamuran Turksoy, Sediqeh Samadi, Jianyuan Feng, Ali Cinar</i>	
(204c) Information Theory-Based Sequential Parameter Estimation of Bioreactor	100
<i>Jung Hun Kim, Jong Min Lee</i>	
(204d) Moving Horizon Estimation Via Carleman Linearization and Stability Analysis.....	101
<i>Negar Hashemian, Antonios Armaou</i>	
(204e) Parameter Estimation and Nonlinear Model Predictive Control Using Meshless Modelling Framework	102
<i>Vivek Dua, Abiodun Owolaja</i>	
(204f) Stochastic Model Predictive Control with Bounded Inputs and Joint State Chance Constraints: Application to a Continuous Acetone-Butanol-Ethanol Fermentation Process	103
<i>Joel Paulson, Edward Buehler, Richard D. Braatz, Ali Mesbah</i>	
(204g) A New Approach to Solving Stochastic Optimal Control Problems.....	105
<i>Pablo T. Rodríguez-González, Vicente Rico-Ramírez, Urmila Diwekar</i>	
(204h) Integrating Lyapunov-Based Offset-Free Model Predictive Control with Subspace Identification Methods.....	106
<i>Masoud Kheradmandi, Prashant Mhaskar</i>	
(229a) Computer Aided Molecular and Process Design Using Complex Process and Thermodynamic Models: A Screening Based Approach.....	107
<i>Smitha Gopinath, Amparo Galindo, George Jackson, Claire S. Adjiman</i>	
(229b) A Multi-Actor Multi-Objective Framework for the Design of Economically Optimal Processing Networks	110
<i>Ana I. Torres, George Stephanopoulos</i>	
(229c) Incorporation of Inherent Safety and Environmental Aspects in Process Design and Supply Chain Optimization.....	111
<i>Chi Nguyen, Mahmoud M. El-Halwagi</i>	
(229d) Theoretical Analysis and Economic Evaluation of Draw Solution Assisted Reverse Osmosis Process.....	112
<i>Kiho Park, Do Yeon Kim, Dae Ryook Yang</i>	
(229e) New Insight for the Design of Networks with Heat Exchange, Compression and Expansion.....	121
<i>Chao Fu, Truls Gundersen</i>	
(229f) Applications of Pinch Analysis and Mathematical Programming Methods for Synthesizing Non-Isothermal Water Networks.....	135
<i>Elvis Ahmetovic, Zdravko Kravanja, François Marechal, Nidret Ibric, Maziar Kermani</i>	
(229g) Optimization of a Dividing Wall Batch and Semi-Batch Reactive Distillation Column for the Production of Methyl Acetate: Potential for Energy Savings	146
<i>Edna S. Lopez-Saucedo, Salvador Hernandez, Juan Gabriel Segovia, Ignacio E. Grossmann</i>	
(234a) A New Robust Scenario Approach to Supply Chain Optimization Under Uncertainty	147
<i>Niaz Chowdhury, Xiang Li</i>	
(234b) Supply Chain Optimization Tools for the Strategic Planning of Biorefining Systems	150
<i>Anna Panteli, Sara Giarola, Nilay Shah</i>	
(234c) Solution Approaches for Large-Scale Shale Gas Supply Chain Optimization Problems.....	153
<i>Andrés Joaquín Calderon Vergara, Omar J. Guerra, Lazaros G. Papageorgiou, Carl Laird, Gintaras Reklaitis</i>	
(234d) Exact Optimization Frameworks for Time-Consistent Distribution.....	154
<i>Anirudh Subramanyam, Chrysanthos E. Gounaris</i>	
(234e) Multi-Criteria Decision Making Supplier Selection and Auction Based Procurement in Supply Chain Management.....	156
<i>Nihar Sahay, Marianthi Ierapetrítou</i>	
(234f) Centralized Versus Distributed Manufacturing: A Continuous Location-Allocation Problem.....	159
<i>Cristiana L. Lara, Ignacio E. Grossmann</i>	
(234g) Non-Cooperative Games for the Optimization of Multi-Enterprise Chemical Supply Chains under Uncertainty.....	160
<i>Kefah Hjaila, José Miguel Laínez, Luis Puigjaner, Antonio Espuña</i>	
(234h) Supply Chain Network Design Under Outsourced Transportation and Warehousing.....	166
<i>Braulio Brunaud, Ignacio E. Grossmann, John M. Wassick, Anshul Agarwal, Matt Bassett</i>	
(242a) Numerical Simulation of Delayed Coking Reactor	167
<i>Fabian A. Diaz</i>	
(242d) Sample Imbalance and Its Role in Understanding Drug Network Characteristics	177
<i>Jason E. Shoemaker</i>	
(242h) Using Functional Programming and GPU Parallel Computing to Improve Stochastic Optimization.....	178
<i>Peter Muehlebach, Andrew Gill, K. V. Camarda</i>	
(242e) Optimization of Primary Separation Rate of Magnesium Electrolysis Cell Based on Thermo-Electro-Magneto-Hydrodynamics Coupling Model	179
<i>Cheng-Lin Liu, Ze Sun, Mengjie Luo, Gui-Min Lu, Xing-Fu Song, Jian-Guo Yu</i>	

(242f) Matrix Formulation of Unifac/Uniquac Models for the Construction of Residue Curve Maps.....	186
<i>Tomas Co, Mathkar Alharthi</i>	
(242b) Nonlinear Control of a Tubular Reactor with Recycle Using Modified APOD and Deim	187
<i>Manda Yang, Antonios Armaou</i>	
(242j) Structural Similarity Between the Ordered Pairs of Primes and Non-Primes Via the Process Systems Engineering Approach.....	188
<i>Taekyoon Park, Yeonsoo Kim, Jong Min Lee</i>	
(242g) Modelling Base to Design Controlled Release Fertilizer Matching with Nitrogen Uptake of Rice Plant.....	198
<i>Thanh H. Trinh, Kuzilati Kushaari</i>	
(242c) Prediction of the Impact of Water Fraction on Emulsion Behavior Using Quantitative Structure-Property Relationship (QSPR) Modeling.....	203
<i>Menelik Negash, Deepika Venkataramani, Ashwin Kumar, Clint P. Aichele, Nicholas Briggs, Steven Crossley, B. J. Neely</i>	
(242i) Algorithm to Deal with Very Large and Very Small Numbers to Enable Utilization of Analytical Solution of Free Radical Polymerization during Gel Effect	204
<i>Dhiraj Garg, Christophe Serra, Yannick Hoarau</i>	
(243a) Elastic Net with Monte Carlo Sampling for Data-Based Modeling in Biopharmaceutical Manufacturing Facilities.....	208
<i>Kristen Severson, Jeremy G. Vanantwerp, Venkatesh Natarajan, Chris Antoniou, Jörg Thömmes, Richard D. Braatz</i>	
(243f) Ensemble Locally-Weighted Partial Least Squares Model and Its Application to Industrial Plants.....	212
<i>Hiromasa Kaneko, Kimito Funatsu</i>	
(243j) PSO-Optimized BP Algorithm for Prediction of Gasoline Yield of FCC Unit.....	213
<i>Li Peng, Yingya Wu, Xin Su, Xingying Lan, Jinsen Gao</i>	
(243h) Improvement of Artificial Immune System in Fault Detection and Diagnosis of Chemical Process.....	214
<i>Liang Ming, Jinsong Zhao</i>	
(243d) Sensor Modeling	215
<i>Ravendra Singh, Charles Sam Cherian, Rohit Ramachandran</i>	
(243k) Opportunities in Spectroscopic Analysis: Chemometrics++	217
<i>Jacob Albrecht</i>	
(243m) Dynamic Causal Modelling and Its Application to an Acid Gas Removal Unit.....	218
<i>Temitayo Bankole, Debangsu Bhattacharyya</i>	
(243c) A Multi-Scale Simulation Platform Facilitating Interactions Using Model-Based Design of Experiments and Surrogate Models.....	219
<i>Heinz A. Preisig, Henrik Rusche, Sigve Karoliuss, Pratik Sheth, Mandar Thombre</i>	
(243e) Gibbsian Game Theory for Competitive Decisions.....	220
<i>Darrell Velegol</i>	
(243i) Event Driven Multivariate Analysis of Eye Gaze Data for Behavior Analysis in Process Operations.....	221
<i>Madhu Kodappully, Babji Srinivasan, Rajagopalan Srinivasan</i>	
(244a) Design of Decoupling Model-Predictive Control for Multivariable Systems.....	223
<i>Jyh-Cheng Jeng</i>	
(244b) Quantifying EV Battery Lifespan and Its Impact on Battery Warranty Strategy through a Battery Aging Model and a Micro-Level Transportation Network.....	224
<i>Xiaohui Liu, Shubham Agrawal, Xing Jin, Ashish Vora, Srinivas Peeta, Gregory Shaver, Joseph Pekny</i>	
(244l) Robust Compromise Optimization Tuning Technique for MPC.....	225
<i>Andre S. Yamashita, Darci Odloak</i>	
(244c) Flexibility Issues and Controllability Analysis of a Post-Combustion CO2 Capture Plant Integrated with a Coal FIRED POWER Plant	232
<i>Evgenia Mechleri, Niall Mac Dowell</i>	
(244k) Kinetic Modelling of Secondary Cracking of Gasoline Adopting Non Selective Catalyst Deactivation Approach	234
<i>Ashwath Arunbabu, Arvind Sharma, Karthick Ramalingam</i>	
(244e) Bioethanol Production: Design and Control of an Alternative Extractive Distillation System	235
<i>Salvador Tututi-Avila, Nancy Medina-Herrera, Juergen Hahn, Arturo Jiménez-Gutiérrez</i>	
(244f) Efficient Decision Making Based on a Hybrid Power Distribution Strategy - Application to a Fuel Cell Electric Vehicle	236
<i>Chrysovalantou Ziogou, Damian Giaouris, Christos Yfoulis, Fotis Stergiopoulos, Panos Seferlis, Spyros S. Voutetakis, Simira Papadopoulou</i>	
(244m) Noninvasive Ultrasound Measurements of Temperature Distribution and Heat Fluxes Across Containments of Extreme Environments	237
<i>Yunlu Jia, Mikhail Skliar</i>	
(244g) Unknown Input Observer-Based Nonlinear Model Predictive Control	238
<i>Xinghua Pan, M. Nazmul Karim</i>	
(244q) Exergy Analysis and Comparison of Traditional and Modified APCI Cycles Used for Natural Gas Liquefaction	239
<i>Hugo Araujo, Jose Dangelo, Thalles Andrade</i>	
(244o) Statistical Process Control Applied to Continuous Processes.....	240
<i>Caio Felipe Curitiba Marcellus, Mauricio Bezerra De Souza, Argimiro Resende Secchi</i>	
(244p) Batch Process Monitoring By Dynamic Time Warping and k-Means Clustering	241
<i>Adel Basli, Ajit Gopalakrishnan, Sudhir Kulkarni, Tim Poludniak, Brian Besancon</i>	

(244i) Modeling and Control of Reversible Addition-Fragmentation Chaintransfer (RAFT) Polymerization Reaction in a Batch Reactor	242
<i>Arturo Ortiz-Arroyo</i>	
(244s) Fault Detection and Diagnosis in Batch and Fed-Batch Bioreactor System Using PCA, PCR, PLS with Glr Method	243
<i>Chiranjivi Botre, Maria Stefany Angarita Gomez, Majdi Mansouri, Mohamed Nounou, Hazem Nounou, M. Nazmul Karim</i>	
(244t) Steam Load Shedding System Design Using Dynamic Simulation	244
<i>Yogesh Kurle, Qiang Xu</i>	
(244d) Optimal Pump Network Reconfiguration Scheduling Considering Time-of-Use Electricity Prices	245
<i>David Yang Shu, Nael H. El-Farra, Ahmet Palazoglu</i>	
(244r) Modeling, Optimisation and Control of Solar Absorption Air-Conditioning System	246
<i>Simon Ocheme</i>	
(244j) A Data-Knowledge Hybrid Framework for Process Monitoring and Fault Detection with the Combined Use of Big Data	247
<i>Sanghun Ahn, Dongil Shin</i>	
(244u) Condition-Based Cleaning of Refinery HEAT Exchangers Undergoing Crude OIL Fouling	248
<i>Emilio Diaz-Bejarano, Laura Lanchas, Francesco Coletti, Sandro Macchietto</i>	
(245g) Dynamic Manipulation of a SOFC/GT Hybrid Power Generation System Subject to Low Carbon Emissions	249
<i>Wei Wu</i>	
(245p) Process Design and Optimization for Etherification of Glycerol with Isobutene	250
<i>Jingjun Liu, Prodromos Daoutidis, Bolun Yang</i>	
(245s) Deriving Value from Integrating Operations Control and Optimization into Engineering Design	251
<i>Livia Wiley</i>	
(245d) Use of Exergy in Energy-Efficient Process Design Methodology for Sub-Ambient Processes	252
<i>Danahe Marmolejo-Correa, Truls Gundersen</i>	
(245r) How Simulation Based Product Design in High-Pressure Polymerization Technology Leads Back to the Roots of Fundamental Science	253
<i>Markus Busch</i>	
(245i) Impact of Thermo-Physical Data on the Modelling of High Pressure Polymerizations	254
<i>Kristina Zentel, Markus Busch</i>	
(245a) Production of Bio-Butanol from Wheat Straw: A Proposal for Sustainable Design	256
<i>Dorothee Luise Kurz, Randi Neerup, Anders Lodberg, Anjan Kumar Tula</i>	
(426c) Sustainable Design for Production of Dimethyl Carbonate from Ethylene Oxide, CO2 and Methanol	257
<i>Erik Haastrup, Rishika Chatterjee, Nipun Garg</i>	
(426d) Achieving a More Sustainable Design for the Production of Di-Methyl Carbonate Via CO2 Utilization	259
<i>Spardha Jhamb, Dane Hurley, Pawel Sobczyk, Amata Anantpinijwatna</i>	
(245m) Dynamic Simulation of a Cryogenic Air Separation Unit	260
<i>Tong Li</i>	
(245k) Modeling, Simulation and Optimization of Crude Distillation Unit	261
<i>Subhajit Majumder, Amanpreet Singh</i>	
(245b) Sustainable Design for Production of Styrene from Benzene and Ethylene	262
<i>Matias Falk Bjerregaard, Jonas Richard Foelsby, Michael Roland Larsen</i>	
(245e) Achieving a More Sustainable Process Design for the Production of Methanol	264
<i>Cristina Calvera Plaza, Marta Gonzalez Garcia</i>	
(245n) A Geometric Method to Calculate the Minimum Reflux of Complex Columns Using Enthalpy-Composition Diagram	266
<i>Angel Castro, José D. Olguin, Arturo Ortiz, Fernando Pérez</i>	
(245o) Olefin Furnace System Scheduling with the Consideration of Relay Cracking of Recycled Ethane/Propane	267
<i>Min Chen, Honglin Qu, Qiang Xu</i>	
(245q) Molecular Design of Reactants and Products - A Multi-Objective Approach	268
<i>Vikrant Dev, Nishanth G. Chemmangattuvalappil, Mario Richard Eden</i>	
(245t) A Semi-Parametric Independent Component Analysis Method for Multivariate Process Monitoring	269
<i>Taha Mohseni Ahooyi, Jeffrey E. Arbogast, Masoud Soroush</i>	
(245l) Design and Development of a High Temperature PEM Fuel Cell System for Charging of Li-Ion Battery Stacks	270
<i>Chrysovalantou Ziogou, Damian Giaouris, Simira Papadopoulou, Spyros S. Voutetakis</i>	
(245f) Sustainable Production of Butanol – Evaluation of a Bio-Based Process	271
<i>Ana-Sofia Sanchez-Arcilla, Lorena Blanco, Jonas Bisgaard, Anjan K Tula</i>	
(245c) Characterization of Microfluidic CO2 Absorption in Water By Computational Fluid Dynamics	272
<i>Chongwei Xiao, Hariganesh Bheema</i>	
(246a) Scheduling Optimization for Regeneration of Ion Exchange Resin in a Demineralized Water Treatment Facility	280
<i>Brenno C. Menezes, Jeffrey D. Kelly, Marcel Joly</i>	
(246b) Scheduling and Optimization for Industrial Cogeneration Plants	282
<i>Rahul Bindlish, Heidi Holmes</i>	
(246m) Maintaining Higher Efficiency of LPG Butane Boil-Off Gas Re-Liquefaction in LPG Butane Storage Tanks Using Unsteady State Process Simulation	284
<i>Ronggo Ahmad Wikanswasto, Yazid Bindar, Hary Devianto</i>	
(246r) Optimal Design of Process Systems Under Uncertainty	295
<i>Guenadi Ostrovsky, Nadir Ziyatdinov, Lapteva Lapteva</i>	

(246j) Model Based Optimization of Microalgae Cultivation in a Raceway Pond	297
<i>Kyung Hwan Ryu, Boeun Kim, Jay H. Lee</i>	
(246f) Compact MILP Formulation for Scheduling of Multipurpose Batch Plants: Rigorous Sequencing of Tasks	298
<i>Esmael Reshid Seid, Thokozani Majazi</i>	
(246t) Multi-Agent Optimization Framework (MAOP) for Large Scale Process System Engineering Optimization Problems	299
<i>Berhane H. Gebresslassie, Urmila M. Diwekar</i>	
(246u) Title: An Agent-Oriented Software Framework for Real Time Optimization Solutions Implementation	301
<i>Elyser Estrada Martínez, Galo Antonio Carrillo Le Roux, Fabio D. S. Liporace</i>	
(246s) Constrained Zonotopes: A New Tool for Set-Based Computations	304
<i>Joseph Scott, Davide M. Raimondo, G. Roberto Marseglia, Richard D. Braatz</i>	
(246n) Vcap: A Software Platform for the Assessment of Biorefinery Value Chains	307
<i>Nikolaos Trokanas, Franjo Cecelja, Madeleine J. Bussemaker, Geoffrey Drage, Kenneth Day</i>	
(246h) Simultaneous Scheduling of Front End Crude Transfer and Refinery Processing	308
<i>Jialin Xu, Shujing Zhang, Jian Zhang, Qiang Xu</i>	
(246q) Dynamic Model and Estimator Development for a Smart Refractory Brick with Embedded Sensors for Gasifier Applications	309
<i>Qiao Huang, Prokash Paul, Debangsu Bhattacharyya, Ed Sabolsky</i>	
(246v) An Ant Colony Optimization Based Methodology for the Design of Vacuum Transfer Line	310
<i>Zongxian Zhao, Xiaoming Xiao, Luhong Zhang</i>	
(246g) Hierarchic Cyclic Hoist Scheduling for Multi-Stage Material Handling Processes	311
<i>Honglin Qu, Qiang Xu</i>	
(246i) Reactive Scheduling for Optimal Decoking Operation of Ethylene Cracking Furnace System	312
<i>Shujing Zhang, Qiang Xu</i>	
(246o) Ethylene Splitter Startup Strategy Development through the Integration of Dynamic Simulation and DCS Control System	313
<i>Ziyuan Wang, Qiang Xu, Thomas C. Ho</i>	
(246l) Optimal Synthesis of Natural Gas Reforming Based Hydrogen Production	314
<i>Patricia Pichardo, Vasilios Manousiouthakis, Jeremy Conner</i>	
(246p) Modeling of Batch Process for Tributyl Citrate Production	315
<i>Juan D. Fonseca, Abderrazak Latifi, Alvaro Orjuela, Iván D. Gil, Gerardo Rodriguez</i>	
(246k) A Strategy for Improving the Competitiveness of Small Scale Biofuel Supply Chain	316
<i>Jun-Hyung Ryu</i>	
(246e) Planning and Scheduling of Nanogrids with Multiple Generatation and Multiple Storage	317
<i>Rajab Khalilpour, Anthony Vassallo</i>	
(264a) Numerical Simulation of Dense Gas-Solid Flow in a Loop Seal Based on an Improved EMMS Bubbling Model	318
<i>Meng Zhao, Nan Zhang, Xinhua Liu, Wei Du</i>	
(264b) A Transient Thermal Near-Wellbore and Completion Hydraulics Simulator for Completion Design	319
<i>Jianxin Lu, Andrey Filippov, Vitaly Khoriatkov</i>	
(264c) Numerical Modelling and Simulation of Semi-Batch Free Radical Polymerization Reactor Operation Using Analytical Solution with AK Gel Model	320
<i>Dhiraj Garg, Christophe Serra, Yannick Hoarau</i>	
(264d) Efficient Computation of Cyclic Steady States in Periodic Adsorption Processes Using the Jfnk Method	324
<i>Richard Pattison, Pieter Schmal, Constantinos C. Pantelides</i>	
(264e) 3D Simulations of Fracture Dissolution Using the Openfoam Toolkit	326
<i>Vitaliy Starchenko, Anthony J. C. Ladd</i>	
(264f) Scale Bridging and Uncertainty Propagation in Chemical Process Modeling with Bayesian Nonparametric Regression	328
<i>Evan Ford, Fernando V. Lima, David Mebane</i>	
(264g) Nonlinear Resonances and Anti-Resonances in Engineered Granular Crystals	329
<i>Dmitry Pozharskiy, Yijing Zhang, Matthew Williams, D. Michael McFarland, Panayotis G. Kevrekidis, Alexander F. Vakakis, Ioannis G. Kevrekidis</i>	
(264h) A Rejection-Free Markov Chain Monte Carlo to Simulate the Dynamics of Molecular Systems	330
<i>Liborio Ivano Costa</i>	
(282a) Improved a Priori Probabilistic Guarantees for Robust Counterpart Optimization	331
<i>Yannis A. Guzman, Logan R. Matthews, Christodoulos A. Floudas</i>	
(346a) Integrated Process Design and Control: Novel Applications in Energy and Environment	332
<i>Mahdi Sharifzadeh, Nina F. Thornhill, Nilay Shah</i>	
(282b) Natural Gas to Liquid Transportation Fuels: Process Synthesis Under Feedstock and Product Pricing Uncertainty Using Robust Optimization	334
<i>Logan R. Matthews, Onur Onel, Yannis A. Guzman, Alexander M. Niziolek, Christodoulos A. Floudas</i>	
(282c) Paroc - A Unified Framework Towards the Optimal Design, Operational Operation and Model-Based Control of Process Systems	335
<i>Efstathios N. Pistikopoulos, Richard Oberdieck, Nikolaos A. Dangelakis, Maria M. Papathanasiou, Ioana Nascu</i>	
(282d) On the Relation between Flexibility Analysis and Robust Optimization	338
<i>Qi Zhang, Ricardo M. Lima, Ignacio E. Grossmann</i>	
(282f) A Method of Evaluating Plant Models to Predict Safety-System Failure Probabilities	339
<i>Ian Moskowitz, Warren D. Seider, Ulku G. Oktem, Jeffrey E. Arbogast, Masoud Soroush</i>	

(282g) Restriction-Based Algorithms and Kkt-Based Bounding Procedures for Semi-Infinite Programming	340
<i>Hatim Djelassi, Carlos Nohra, Alexander Mitsos</i>	
(308a) Control-Relevant Decomposition of Process Networks Using Hierarchical Clustering Methods	341
<i>Seongmin Heo, Prodromos Daoutidis</i>	
(308b) Event-Triggered Fault-Tolerant Control of Networked Process Systems	342
<i>Da Xue, Nael H. El-Farra</i>	
(308c) Simultaneous Control of Safety Constraint Sets and Process Economics Using Distributed Economic Model Predictive Control	345
<i>Anas Alanqar, Fahad Albalawi, Helen Durand, Matthew Ellis, Panagiotis D. Christofides</i>	
(308d) Distributed Moving Horizon State Estimation of Two-Time-Scale Nonlinear Systems	346
<i>Xunyuan Yin, Jinfeng Liu</i>	
(308e) A Centralized/Decentralized Control Approach for the Multicolumn Countercurrent Solvent Gradient Purification (MCSGP) Process	355
<i>Maria M. Papathanasiou, Muxin Sun, Fabian Steinebach, Thomas Mueller-Spaeth, Massimo Morbidelli, Athanasios Mantalaris, Efstratios N. Pistikopoulos</i>	
(308f) Flexible Residential Energy: Making the Case for Home Energy Management	358
<i>Krystian X. Perez, Michael Baldea, Thomas F. Edgar</i>	
(308g) Model Based Distributed Model Predictive Control of Hydrogen Standalone Combined Heat Cooling and Power System	359
<i>Simon Ocheme</i>	
(326a) Integration of Wind and Solar Energy within Continental Biorefinery Supply Network	360
<i>Lidija Cucek, Mariano Martín, Zdravko Kravanja</i>	
(326b) Multi-Scale Exploration of the Technical, Economic, and Environmental Dimensions of Bio-Based Chemical Production	361
<i>Kai Zhuang, Markus J. Herrgård</i>	
(326c) The Impact of Natural Gas and Natural Gas Liquids Supplies on the United States Chemical Manufacturing Industry	362
<i>Sean Derosa, David T. Allen</i>	
(326d) Multi-Objective Optimization Applied to Sustainable Rain-Fed and Irrigated Crop Production: A Case Study of Wheat Production in Spain	363
<i>Ángel Galán Martín, Pavel Vaskan, Gonzalo Guillén-Gosálbez, Assumpció Antón Vallejo, Laureano Jiménez Esteller</i>	
(326e) 3E (Engineering-Environmental-Economic) Triangle Model for Optimization of High-Gravity Carbonation Process: Establishment of Waste-to-Resource Supply Chain	364
<i>Shu-Yuan Pan, Ana Maria Lorente Lafuente, Yupo J. Lin, Shu-Hui Hung, Pen-Chi Chiang</i>	
(326f) Using Sustainability Footprint in Optimization Framework for Prospective Design of Chemical Processes	365
<i>Alessandra R. Carreon, Rajib Mukherjee, Subhas Sikdar, Mahmoud El-Halwagi</i>	
(326g) A Pseudo-Equilibrium Approach for Process-to-Planet Design Under Environmental Tax Policies	366
<i>Rebecca Hanes, Bhavik R. Bakshi</i>	
(341a) Dynamic Simulation and Multi-Objective Optimization of Flavor and Processing Time in Beer Fermentation	381
<i>Alistair D. Rodman, Hilary Jones, Dimitrios I. Gerogiorgis</i>	
(341b) A System Identification Enhanced Phenotype Phase Plane Analysis	382
<i>Kyle Stone, Matthew Hilliard, Q. Peter He, Jin Wang</i>	
(341c) Nonlinear Data Mining and Parameter Reduction in Complex Reaction Networks	385
<i>Alexander Holiday, Antonios Zagaris, Ioannis G. Kevrekidis</i>	
(341d) Simulations of Stochastic Chemical Reaction Networks	386
<i>Michail Vlysidis, Yiannis N. Kaznessis</i>	
(341e) Sensitivity Analysis for Nonsmooth Hybrid Systems	387
<i>Kamil A. Khan, Paul I. Barton</i>	
(341f) Time Scale Decomposition in Complex Reaction Systems: A Graph Theoretic Analysis	388
<i>Udit Gupta, Seongmin Heo, Prodromos Daoutidis, Aditya Bhan</i>	
(341g) Sensor Placement for Fault Diagnosis in Large-Scale Networks	389
<i>Parham Moberd, Jeevan Maddala, Debangsu Bhattacharyya, Raghunathan Rengaswamy</i>	
(341h) Impact of Spatial Segregation in Coupled Reactors with Catalytic and Autocatalytic Reactions	390
<i>Satish J. Parulekar</i>	
(345a) Planning of Industrial-Scale Integrated Petrochemical Plants Using a Big-Data Analysis and Global Optimization Framework	391
<i>Fani Boukouvala, Jie Li, Xin Xiao, Christodoulos A. Floudas</i>	
(345b) Early Warning System Design: The Combination of Expert Knowledge and Historical Data	392
<i>Hangzhou Wang, Faisal Khan, Salim Ahmed</i>	
(345c) Data-Driven Modeling of Sequential Batch-Continuous Process	394
<i>Jungup Park, Michael Baldea, Thomas F. Edgar</i>	
(345d) Best Practices on Creating Soft Sensor Models for Batch Processes Utilizing Multi-Way Partial Least Squares (MPLS)	407
<i>Ivan Castillo, Leo H. Chiang, Bo Lu</i>	
(345e) Applying Predictive Analytics to Detect and Diagnose Impending Problems in Electric Submersible Pumps Used for Lifting Oil from Wellbores	408
<i>Supriya Gupta, Michael Nikolaou, Luigi Saputelli, Shyam Panjwani</i>	
(345f) Data Mining and Monitoring for Industrial Scale Chemical Processes	411
<i>Michael C. Thomas, Jose A. Romagnoli</i>	

(345g) Learning Models of Unspecified Functional Form through Symbolic Regression	419
<i>Alison Cozad, Zachary Wilson, Nick Sahinidis</i>	
(345h) Use of Fenceline Monitoring for Root Cause Analysis and Corrective Action	420
<i>Steven Ramsey, Brian Adair, Ram Hashmoncy</i>	
(345i) An Integrated Scheme for Oscillation Detection and Diagnosis from Industrial Data	421
<i>Shu Xu, Willy Wojsznis, Mark Nixon, Michael Baldea, Thomas F. Edgar</i>	
(345j) Process Data, Is More Better? A Case Study to Improve the Chemical Manufacturing Operation	428
<i>Swee-Teng Chin, Ivan Castillo, Anna McClung, Matthew Mengel, Erin Johnson, Leo H. Chiang</i>	
(346b) A Linear Programming Based Scenario Reduction Approach Using Transportation Distance	429
<i>Zhuangzhi Li, Zukui Li</i>	
(346c) Bayesian Inference of Complex Chemical Process Using Reduced Order Modeling	431
<i>Jayashree Kalyanaraman, Yoshiaki Kawajiri, Matthew Realf</i>	
(346d) On the Use of Multistage Stochastic Programming for the Design of Grid Scale Energy Storage Systems	432
<i>Oluwasanmi Adeodu, Donald J. Chmielewski</i>	
(282e) A Graph-Theory Approach for Efficient Non-Anticipativity-Constraint Reduction in Multistage Stochastic Programming Problems Involving Endogenous and Exogenous Uncertainties	433
<i>Robert M. Apap, Ignacio E. Grossmann</i>	
(346e) MINLP Combined with the Analytic Hierarchy Process for the Design of Chemical Processes Under Uncertainty: Application to the Synthesis of Heat Exchanger Networks	434
<i>Dauda Ibrahim, Gonzalo Guillen-Gosalbez, Megan Jobson</i>	
(346f) Solution of Large Scale Stochastic Programming Problems for Optimal Placement of Booster Stations in Water Networks	435
<i>Arpan Seth, Gabriel Hackebeil, Katherine A. Klise, Carl Laird</i>	
(346g) A Multistage Stochastic Program to Evaluate Feedstock/Technology Development for Chemical Process Industry	436
<i>Brianna Christian, Selen Cremaschi</i>	
(347a) Generalized Derivatives of Dynamic Systems with Lexicographic Linear Programs Embedded	438
<i>Jose A. Gomez, Kai Höffner, Kamil A. Khan, Paul I. Barton</i>	
(347b) Local Optimization of Dynamic Systems with Guaranteed Feasibility of Path Constraints	439
<i>Johannes M. M. Faust, Jun Fu, Benoit Chachuat, Alexander Mitsos</i>	
(347c) A Parallel Multiperiod Optimization Approach for Large-Scale Dynamic Systems Under Uncertainty	440
<i>Ian D. Washington, Christopher L. E. Swartz</i>	
(347d) Solving Large-Scale Dynamic Optimization Problems in Parallel By Exploiting Structure	442
<i>Bethany Nicholson, Shivakumar Kameswaran, Lorenz T. Biegler</i>	
(347e) Improved Interval Bounds on the Solutions of General Nonlinear ODEs Using Lifted Models with Manufactured Solution Invariants	443
<i>Kai Shen, Joseph Scott</i>	
(347f) Using Dynamic Simulation to Drive Process Design, Control, and Optimization	444
<i>Livia Wiley</i>	
(393a) Solving Multicomponent Reaction-Transport with Coupled Cellular Trajectories and Data-Driven Cellular Activation Models	455
<i>Yichen Lu, Mei Yan Lee, Scott L. Diamond, Talid R. Sinno</i>	
(393b) Dynamics of Cell Induction in Enterococcus Faecalis in Controlled cCF10 and iCF10 Environments	456
<i>Vu Tran, Arpan Bandyopadhyaya, Gary M. Dunny, Doraiswami Ramkrishna, Wei-Shou Hu</i>	
(393c) A Kinetic Model-Based Approach to Identify Malfunctioned Components in Signal Transduction Pathways from Data	466
<i>Xianhua Li, Nicholas Ribaudo, Zuyi (Jacky) Huang</i>	
(393d) Stochastic Optimal Control for Prediction of Robust Drug Dosing Policies in Superovulation Stage of in-Vitro Fertilization	467
<i>Kirti Yenkie, Urmila Diwekar</i>	
(393e) Modeling Signaling Interactions Controlling Heterogeneity and Fate Choice of Human Embryonic Stem Cells	470
<i>Shibin Mathew, Hikaru Mamiya, Sankaramanivel Sundararaj, Kelly Donovan, Bodhisatva Biswas, Samantha Heidlebaugh, Ipsita Banerjee</i>	
(393f) A Study on the Effects of Mechanoelectric Feedback and Mechanical Perturbation Approach on the Electrical Properties Using a Bidomain Model of Cardiac Tissue	472
<i>Azzam Hazim, Stevan Dubljevic, Youssef Belhamadia</i>	
(393g) A Probabilistic Approach to Robust Experiment Design for Simultaneous Model Discrimination and Parameter Estimation: A Wnt Signaling Case Study	473
<i>Marc Martin-Casas, Ali Mesbah</i>	
(393h) Redesigning the Response of T Cell Signaling Networks Using in silico Evolution	475
<i>Aaron M. Prescott, Steven M. Abel</i>	
(399a) Integrated Scheduling and Dynamic Optimization of a Cryogenic Air Separation Unit Subject to Time-Varying Electricity Prices	476
<i>Cara Touretzky, Ted Johansson, Richard Pattison, Ilro Harjunkoski, Michael Baldea</i>	
(399b) Optimal Campaign Continuous Manufacturing	477
<i>Ali M. Sahlodin, Paul I. Barton</i>	
(399c) Flare Minimization for Cracking Gas Replacing Process of Ethylene Plant Start-up Via Dynamic Simulation	478
<i>Shengfu Zhang, Tong Qiu, Jinsong Zhao</i>	

(399d) The SEM Study and Molecular Dynamic Simulations of Nanosilica Grafted By Copolymer	479
<i>Shanshan Dai</i>	
(399e) Plantwide Model-Based Optimization of a Large Scale Second Generation Biorefinery	482
<i>Remus M. Prunescu, Mogens Blanke, Jon G. Jakobsen, Gürkan Sin</i>	
(399f) Forward-Backard Contractor in Verified Simulation Using Interval Analysis for Dynamic Optimisation	484
<i>Carlos Perez Galvan, I. David L. Bogle</i>	
(408a) Sensitivity Analysis of Molecular Design Problem for the Development of Novel Working Fluids for Power Cycles	485
<i>Gürkan Sin, Jerome Frutiger, Jens Abildskov</i>	
(408b) A Framework for the Preliminary Screening of Mixtures As Post-Combustion CO2 Capture Solvent Candidates	486
<i>Theodoros Zarogiannis, Athanasios I. Papadopoulos, Panos Seferlis</i>	
(408c) Computer-Aided Molecular Design of Water Compatible Dentin Adhesive System	487
<i>Farhana Abedin, Qiang Ye, Paulette Spencer, Kyle Camarda</i>	

VOLUME 2

(408e) Ontology Engineering Approach to Support Process Model Integration	499
<i>Linsey Koo, Franjo Cecelja, Nikolaos Trokanas</i>	
(408f) Constructing Ontologies for Controlled Plants	501
<i>Heinz A. Preisig, Arne Tobias Elve</i>	
(427a) Optimal Operation of an Austenitization Furnace	502
<i>Vincent R. Heng, Michael Baldea</i>	
(427b) Run-to-Run Control of PECVD of Thin Film Solar Cells	503
<i>Marquis Crose, Joseph Sangil Kwon, Panagiotis D. Christofides</i>	
(427c) Nonlinear Model Predictive Control of a Bubbling Fluidized Bed Adsorber for Post-Combustion Carbon Capture	504
<i>Mingzhao Yu, Lorenz T. Biegler</i>	
(427d) Simultaneous Multi-Parametric Hybrid Model Predictive Control and Estimation with Application to the Intravenous Anaesthesia	505
<i>Ioana Nascu, Richard Oberdieck, Efstratios N. Pistikopoulos</i>	
(427e) Model-Based Optimal Feedback Control of Colloidal Self-Assembly	508
<i>Xun Tang, Bradley Rupp, Yuguang Yang, Michael A. Bevan, Martha A. Grover</i>	
(427f) Optimal Control of a Fed-Batch Bioreactor for Maximized Carotenoids Productivity	509
<i>Jonathan P. Raftery, Maria Carolina Ordoñez Franco, Tejasvi Jaladi, M. Nazmul Karim</i>	
(427g) Glucose Control in the Intensive Care Unit: Controller Design and Alarm Layer Performance Evaluation in silico	510
<i>Timothy Knab, Gilles Clermont, Robert S. Parker</i>	
(427h) Nonlinear Model Predictive Control of Managed Pressure Drilling Based on Hammerstein-Wiener Piecewise Linear Models	514
<i>Junho Park, Seyed Mostafa Safdarnejad, Reza Asgharzadeh Shishavan, John D. Hedengren, Reza Rastegar, Adrian Snell</i>	
(449a) Closing the Gap Between Multiparametric Disaggregation and Piecewise McCormick Relaxations for Miqcps	517
<i>Pedro M. Castro</i>	
(449b) A New Portfolio of Relaxations for Global Optimization of NLPs and Minlps	525
<i>Nick Sahinidis, Mustafa Kilinc</i>	
(449c) Convex Envelopes of Product-Separable Edge-Concave Functions for Global Optimization	526
<i>Yannis A. Guzman, Christodoulos A. Floudas</i>	
(449d) McCormick Relaxations: Extension to Multivariate Outer Function and Analysis of Convergence Rates	527
<i>Jaromil Najman, Alexander Mitsos</i>	
(449e) Convergence-Order Analysis of Branch-and-Bound Algorithms for Constrained Problems	528
<i>Rohit Kannan, Paul I. Barton</i>	
(449f) Enhancing the Performance of the Abb Algorithm through the Use of Interval and Convexity Tests	529
<i>Nikolaos Kazazakis, Claire S. Adjiman</i>	
(449g) Modeling Abstractions and Frameworks for Optimization Problems with Differential Equations in Pyomo	530
<i>Bethany Nicholson, Victor M. Zavala, John Sirola, Jean-Paul Watson, Lorenz T. Biegler</i>	
(453a) Thin-Film Deposition Process Dynamics on Manifolds and Graphs	531
<i>Raymond A. Adomaitis</i>	
(453b) Distributed Extremum-Seeking Control over Networks of Dynamically Coupled Unstable Dynamic Agents	533
<i>Martin Guay</i>	
(453c) Integrated Platform for System Design and Operation Based on Optimization	534
<i>Rui Huang</i>	
(453d) On Multiscale, Multidomain Modeling and Parallel Computation: Application to Crystal Shape Prediction in Crystallization	549
<i>Joseph Sangil Kwon, G. Orkoulas, Panagiotis D. Christofides</i>	
(453e) Recent Advances in Uncertainty Analysis and Control in Multiscale Process Systems with an Application to Thin Film Deposition	550
<i>Luis A. Ricardez Sandoval</i>	

(454a) Improved Performance Via the Inverted Classroom	552
<i>Randy D. Weinstein</i>	
(454b) A Collection of Virtual Experiments with Tracking of Student Interaction Data	553
<i>Anthony Edward Butterfield, Kyle Branch</i>	
(454c) The Energy Sustainability Remote Laboratory (ESRL)	554
<i>Kerry M. Dooley, F. Carl Knopf, Robert Boehm, Jaren Lee, Franz S. Ehrenhauser</i>	
(454d) Use of Interactive Online Videos to Enhance Student Understanding of Thermodynamic Efficiency	555
<i>Faizan Zubair, Cynthia Brame, Paul Laibinis</i>	
(454e) Scenari + Moodle = Self-Training Module for a Flipped Classroom in Distance Lifelong Learning or in Traditional Teaching	556
<i>Marie Debacq</i>	
(454f) Progress on the SMART-CN Education Modules for Engineering Curriculum	557
<i>Alessandra R. Carreon, Yinlun Huang, Thomas F. Edgar, Mario Richard Eden, Cliff Davidson, Mahmoud M. El-Halwagi</i>	
(463a) Multi-Scale Optimization Methods for Oxycombustion Power System Design	558
<i>John P. Eason, Alexander W. Dowling, Jinliang Ma, David C. Miller, Lorenz T. Biegler</i>	
(463b) Wet Vs. Dry Cooling for the Operation of Concentrated Solar Plants	559
<i>Mariano Martín, Lidia Martín</i>	
(463c) Stochastic Scheduling for Microgrid Power Systems with Constrained External Power Exchange	560
<i>Michael Zachar, Prodomos Daoutidis</i>	
(463d) Optimization of Chemical-Looping Combustion Fixed-Bed Reactors in Natural Gas-Fired Combined Cycle Power Plants	561
<i>Lu Han, Chen Chen, Zhiquan Zhou, George M. Bollas</i>	
(463e) Integrated Process Design for Efficient Solar Thermal Hydrogen and Power Production	562
<i>Emre Gençer, Mohit Tawarmalani, Rakesh Agrawal</i>	
(463f) A Systematic Sensitivity Analysis Approach for the Design of Organic Rankine Cycles and the Selection of Efficient Working Fluids Under Operational Variability	563
<i>Paschalia Mavrou, Athanasios I. Papadopoulos, Panos Seferlis, Patrick Linke, Spyros S. Voutetakis</i>	
(463g) Parallel Solution of the Contingency-Constrained Acopf Problem	565
<i>Jianfeng Liu, Jia Kang, Jean-Paul Watson, Carl Laird</i>	
(463h) Electrothermal Electricity Storage Using Organic Rankine Cycles	566
<i>Annelies Vandersickel, Amir Aboueldahab, Martin Schade, Hartmut Spliethoff</i>	
(481a) Optimization of Continuous Crystallization Processes to Maintain Content Uniformity	574
<i>Christopher L. Burcham, Niall Mitchell</i>	
(481b) Application of Raman and ATR-UV/Vis Spectroscopy for a Model-Free and Model-Based Active Polymorphic Feedback Control of Crystallization Processes	587
<i>Elena Simone, Zoltan K. Nagy</i>	
(481c) Mass-Count Framework for Crystal Size Control	596
<i>Daniel Griffin, Martha Grover, Yoshiaki Kawajiri, Ronald W. Rousseau</i>	
(481d) Nonlinear Model Predictive Control of a Batch Crystallization Process	608
<i>Yankai Cao, David Acevedo, Zoltan K. Nagy, Carl Laird</i>	
(481e) Modeling of Crystallization of Melt-Based Oral Dosages in a Drop-on-Demand Manufacturing System	609
<i>Elçin İçten, Zoltan K. Nagy, Gintaras V. Reklaitis</i>	
(481f) Towards Predictive Modeling of Crystallization Fouling: Taking into Account Fouling Layer Structures	610
<i>Jie Xiao</i>	
(481g) Modeling Crystallization in Hydrogels Under Double-Diffusion Conditions	611
<i>Gopichand Mallam, Marina Tsiannou</i>	
(482a) Distributed Renewable Fuel and Power: Challenges and Opportunities	612
<i>Andrew Allman, Prodomos Daoutidis</i>	
(482b) A Model-Based Framework for Fault-Tolerant Dispatch of Distributed Energy Resources	613
<i>James Allen, Nael H. El-Farra</i>	
(482c) Data-Driven Optimal Design of Combined Heat and Power for Residential Neighborhoods	615
<i>Abigail Ondeck, Michael Baldea, Thomas F. Edgar</i>	
(482d) Reduction in Cycling of the Boilers By Using Large-Scale Energy Storage of Cryogenic Carbon Capture	616
<i>Seyed Mostafa Safdarnejad, John D. Hedengren, Larry Baxter</i>	
(482e) Electrochemical Impedance Spectroscopy Analysis of Polymer-Electrolyte Dye Sensitized Solar Cells Using First-Principles Macroscopic Modeling	619
<i>Yuriy Y. Smolin, Kenneth K. S. Lau, Masoud Soroush</i>	
(482f) Design of Advanced Controllers for Post-Combustion CO2 Capture Process Integrated with a Supercritical Pulverized Coal Plant	620
<i>Qiang Zhang, Debangsu Bhattacharyya, Richard Turton</i>	
(482g) Stabilization of Biogas Production in a Two-Stage Reactor Process	621
<i>Mariano Nicolas Cruz Bournazou, Costas Kravaris, Stefan Junne, Peter Neubauer</i>	
(482h) A Generic Framework for the Robust Control of Fuel Cell Energy System	622
<i>Amit M. Manthanwar, Efstratios N. Pistikopoulos</i>	
(508a) Surrogate Based Derivative Free Optimization Methodology for Supply Chain Management	623
<i>Nihar Sahay, Marianthi Ierapetritou</i>	
(508b) Constrained Grey-Box Global Optimization of High Dimensional Problems	625
<i>Fani Boukouvala, Christodoulos A. Floudas</i>	
(508c) Branch-and-Model: A Model-Based Derivative-Free Global Optimization Algorithm	626
<i>Atharv Bhosekar, Nick Sahinidis, Luis Miguel Rios</i>	

(508d) Bifurcation and Stability Analysis of Nonlinear Dynamic Systems Using Complete Search	627
<i>Mario E. Villanueva, Hugo Sant'Ana Pereira, Jai Rajyaguru, Rob Krams, Benoit Chachuat</i>	
(508e) Experiments with Distributed Optimization for Non-Convex Optimization Problems	629
<i>Shivakumar Kameswaran, Frank Curtis, Stuart Harwood</i>	
(508f) A Cross Decomposition Method for Stochastic Nonconvex Mixed-Integer Nonlinear Programming	630
<i>Emmanuel Ogbe, Xiang Li</i>	
(510a) Computer-Aided Tools for Teaching Sustainable Product-Process Design	633
<i>Deenesh K. Babi</i>	
(510b) Sage Math - an Open Source Computer Algebra System	635
<i>Brandon S. Curtis</i>	
(510c) Developing Graphical Interfaces for Solving Distillation Problems Trough Graphical and Short-Cut Methods	636
<i>Francisco Lopez-Villarreal, Juan Barajas-Fernández, María A. Olán-Acosta, Mayra Guadalupe Hernández Jiménez, Mayra Agustina Pantoja-Castro</i>	
(510d) Using Vanderbilt's Chemical Process Innovation Center for Immersive Chemical Engineering Design and Laboratory Courses	637
<i>Russell F. Dunn, Scott A. Guelcher</i>	
(510e) Population Balances in Undergraduate Education in Chemical Engineering	638
<i>Priscilla Hill</i>	
(510f) Using Templates for Demonstrating Good Programming Practices	639
<i>Mordechai Shacham, Michael B. Cutlip</i>	
(510g) Teaching Aspen Plus and Other Engineering Software through Video at the University of Delaware	648
<i>Mark Shiflett, Prasad S. Dhurjati</i>	
(544a) Optimal Scheduling of Demand Responsive Industrial Production with Hybrid Renewable Energy Systems	649
<i>Xiaonan Wang, Ahmet Palazoglu, Nael H. El-Farra</i>	
(544b) Power Management of Microgrids: Multiparametric Programming Approach to Improved Handling of System Uncertainties	660
<i>Eva Umeozor, Milana Trifkovic</i>	
(544c) On the Optimal Sizing and Dispatch Problem for Microgrids with Stochastic Generators – When Is the Expected-Cost Differentiable?	671
<i>Alphonse Hakizimana, Joseph Scott</i>	
(544d) Model Predictive Control of Integrated Gasification Combined Cycle Power Plants with Membrane Reactors for Carbon Capture	672
<i>Xin He, Rishi Amrit, Richard Turton, Fernando V. Lima</i>	
(544e) A MULTI-Objective Optimization Approach to Optimal Sensor Location Problem in IGCC POWER Plants	673
<i>Pallabi Sen, Kinnar Sen, Urmila Diwekar</i>	
(544f) Smart Grid Coordination of an IGCC Plant: Comparison of Multi-Stage Stochastic Programming and Empec	674
<i>Jin Zhang, Donald J. Chmielewski</i>	
(544g) Deployment of a Search Space Reduction Algorithm to an NMPC Problem - Comparative Experimental Analysis to a Fuel Cell System	675
<i>Chrysovalantou Ziogou, Efstratios N. Pistikopoulos, Michael C. Georgiadis, Spyros S. Voutetakis, Simira Papadopoulou</i>	
(544h) Addressing Control Challenges of Discontinuous Processes with Multi-Fidelity Model Predictive Control	676
<i>Ammon Eaton, Logan Beal, Eithan Janis, Sam Thorpe, Casey Hubbell, John D. Hedengren</i>	
(545a) Mathematical Modeling of Electrohydrodynamic Flow in Tumor Cells for Tumor Treating Fields (TTF) Therapy	678
<i>Leora Maxwell, Jennifer Pascal, Yung Way Liu</i>	
(545b) Mathematical Modeling of the Extracellular Matrix in Cancer Metastasis	679
<i>Kapil Gumte, Ashlee N. Ford Versypt</i>	
(545c) Computational Model of Single Cell Transcriptional Regulation and Cellular Networks Driving Liver Regeneration Following Surgical Resection	680
<i>Aalap Verma, Daniel Cook, Sirisha Achanta, Babatunde A. Ogunnaike, Jan Hoek, Rajanikanth Vadigepalli</i>	
(545d) Modeling the Dynamics of Neuroendocrine-Immune Interactions in Collagen-Induced Arthritis	681
<i>Rohit Rao, Debra Dubois, Richard R. Almon, William J. Jusko, Ioannis P. Androulakis</i>	
(545e) Development of a Hypertensive Ovine Model to Study Implantation of Autologous Arteries and Veins	684
<i>Sindhu Row, Maxwell T. Koobatian, Aref Shahini, Carmon Koenigsnecht, Stelios T. Andreadis, Daniel D Swartz</i>	
(545f) Development of Modeling Approaches to Predict Effects of Facilitated Wound Closure on Scarring	685
<i>Stephanie Jorgensen, J. Robby Sanders</i>	
(545g) A Collision Model of Red Blood Cell Aggregates in Shear Flow	694
<i>Suresh Ahuja</i>	
(545h) Big Data Analysis for Selecting Clinically Relevant Biomarkers: A Global Optimization Framework	703
<i>Yannis A. Guzman, Christodoulos A. Floudas</i>	
(546a) Atomic Layer Deposition Processes: Understanding the Algebraic and Geometrical Structure of Dynamic Reaction Models	704
<i>Raymond A. Adomaitis, David Arana-Chavez</i>	
(546b) Nonlinear Analysis of the Surface Morphological Evolution of Stressed Crystalline Materials and Heteroepitaxial Thin Films	705
<i>Lin Du, Dwaipayan Dasgupta, Dimitrios Maroudas</i>	

(546c) Investigation of Film Porosity and Hydrogen Content Dependence on Deposition Conditions in a PECVD Process Using a Multiscale Model.....	706
<i>Marquis Crose, Joseph Sangil Kwon, Panagiotis D. Christofides</i>	
(546d) Stochastic Nonlinear Model Predictive Control Applied to an Epitaxial Thin Film Growth Process Under Uncertainty.....	707
<i>Shabnam Rasoulian, Luis A. Ricardez-Sandoval</i>	
(546e) Development of a Multiscale Simulation Approach for Modeling Nanostructured Si-Based Anodes in Lithium Ion Batteries.....	708
<i>Justin B. Hooper, Dmitry Bedrov, Chris Gritton, Yanyan He, Martin Berzins, Robert M. Kirby</i>	
(546f) A Cellular Automaton Approach for Modeling Biomass Pyrolysis.....	709
<i>Michael Adenson, Joseph J. Biernacki</i>	
(546g) Coding and Decoding Using Microfluidic Loops: An Analytical Approach.....	710
<i>Santhoshreddy Sandiri, Laya Das, Jeevan Maddala, Danny Raj M, Raghunathan Rengaswamy</i>	
(555a) Temperature Control of Microchannel Reactors Using Bimetallic Thermally-Actuated Valves.....	711
<i>Richard Pattison, Akash Gupta, Melissa Donahue, Michael Baldea</i>	
(555b) Advanced Control Strategies Towards the Intensification of Monoclonal Antibody Production.....	714
<i>Maria M. Papathanasiou, Ana Quiroga Campano, Fabian Steinebach, Thomas Mueller-Spaeth, Massimo Morbidelli, Athanasios Mantalaris, Efstratios N. Pistikopoulos</i>	
(555c) Modeling and Analysis of Heat Recirculating Microreactor for Catalytic Combustion of Propane.....	717
<i>Niket S. Kaisare, Amit Kunte</i>	
(555d) An Integrated, Multi-Stage, Multi-Scale Framework for Achieving Sustainable Process Synthesis-Intensification-Control.....	718
<i>Deenesh K. Babi, Anjan K Tula, Seyed Soheil Mansouri, Rafiqul Gani</i>	
(555f) On Quantification of the Attainable Region for Separator Networks with Varying Network Outlet Flowrates.....	720
<i>Jeremy A. Conner, Abdulrahman Albassam, Vasilios Manousiouthakis</i>	
(555g) Multi-Model Operability Approach As a Tool for Process Intensification: Application to a Membrane Reactor for Direct Methane Aromatization.....	721
<i>Juan C. Carrasco, Fernando V. Lima</i>	
(555h) Synthesis of Azeotropic Reactive Distillation Networks Involving Quaternary Mixtures.....	723
<i>Flavio Da Cruz, Vasilios Manousiouthakis</i>	
(568a) Lagrangean Disjunctive Branch and Bound for Linear Generalized Disjunctive Programs.....	724
<i>Francisco Trespalacios, Ignacio E. Grossmann</i>	
(568b) Interior Point Regularization Strategies for Mathematical Programs with Equilibrium Constraints.....	725
<i>Wei Wan, Lorenz Biegler</i>	
(568c) Algorithmic Innovations and Software for the Dual Decomposition Method Applied to Stochastic Mixed-Integer Programs.....	726
<i>Kibaek Kim, Victor M. Zavala</i>	
(568d) Solving General Mixed Integer Bilevel Linear Programs (MIBLP): A Decomposition Algorithm.....	739
<i>Dajun Yue, Fengqi You</i>	
(568e) A Branch and Bound Algorithm for Discrete Bilevel Optimization.....	740
<i>Pablo Garcia-Herreros, Carlos Florensa Campo, Ignacio E. Grossmann</i>	
(568f) The Exact Solution of Multiparametric Mixed-Integer Quadratic Programming Problems.....	741
<i>Richard Oberdieck, Efstratios N. Pistikopoulos</i>	
(568g) Robust Optimization Under Correlated Uncertainty within a Single Constraint and Across Multiple Constraints.....	743
<i>Yuan Yuan, Zukui Li, Biao Huang</i>	
(569a) On the Role of Constraints in Economic Model Predictive Control.....	745
<i>Matthew Ellis, Panagiotis D. Christofides</i>	
(569b) Dual Model Predictive Control (DMPC): State of the Art.....	746
<i>Tor Aksel N. Heirung, Juan E. Morinelly, Bjørne Foss, B. Erik Ydstie</i>	
(569c) Output Feedback Lyapunov-Based Stochastic Nonlinear Model Predictive Control.....	747
<i>Vinay Bavdekar, Edward Buehler, Ali Mesbah</i>	
(569d) Constructing Constrained Control Lyapunov Functions for Control Affine Nonlinear Systems.....	748
<i>Tyler Homer, Prashant Mhaskar</i>	
(569e) Passivity Based Control of Chemical Reactors Using Reaction Invariants.....	749
<i>Ngoc Hoang, Denis Dochain, Ruxin Wei, B. Erik Ydstie</i>	
(569f) Design and Implementation of a Biomimetic Control Strategy for Chemical Processes Based on Efficient Ant Colony Optimization.....	750
<i>Gaurav V. Mirlekar, Berhane H. Gebreslassie, Urmila M. Diwekar, Fernando V. Lima</i>	
(569g) Adaptive Output Feedback Control of Transport-Reaction Processes Via Two Layer System Adaptations.....	752
<i>Davood Babaei Pourkargar, Antonios Armaou</i>	
(583a) Estimation of Spatially Distributed Processes Via Adaptive Model Reduction Using Mobile Sensors Network.....	754
<i>Davood Babaei Pourkargar, Antonios Armaou</i>	
(583b) Sensor Fault Estimation and Accommodation in Networked Distributed Processes.....	756
<i>Nael H. El-Farra, Di Peng</i>	
(583c) Single-Step Formulation of Feedback Control for an Exothermic Plug-Flow Reactor.....	757
<i>Qingqing Xu, Stevan Dubljevic</i>	
(583d) Observations and Analysis of Index Infinity Dae Systems Describing Reactors and Reacting Flows.....	765
<i>Vemuri Balakotiah, Ram R. Ratnakar</i>	

(583e) Slow-Manifold Order Reduction of Reaction-Diffusion Equations with Dirichlet Boundary Conditions	766
<i>Jason R. Picardo, S. Pushpavanam</i>	
(583f) Simulation and Development of an Estimation Technique for a Bi-Component Aggregation Systems	767
<i>Negar Hashemian, Antonios Armaou</i>	
(583g) A New Computationally Efficient Data Assimilation Approach for Finite Element Models	768
<i>Jeffrey J. Heys, Prathish Rajaraman</i>	
(583h) Nonlinear Observer Design for a Class of Hyperbolic PDE Systems	769
<i>Xiaodong Xu, Stevan Djuljevic</i>	
(590a) ISA-95 Based Scheduler Using Flexible Heuristics	778
<i>Iiro Harjunkoski, Reinhard Bauer</i>	
(590b) A Generalized Disjunctive Programming Model for Simultaneous Scheduling and Heat Integration of a Vegetable Oil Refinery	779
<i>Pedro M. Castro, Henrique A. S. Matos, Bruno Custódio</i>	
(590c) Optimal Design of Natural Gas Dryers	785
<i>Yasser Al Wahedi, Arwa Rabie, Prodromos Daoutidis</i>	
(590d) Enabling Bioprocess Development Using Virtual Plant Technology	791
<i>John D. Bomberger, Tracy L. Clarke-Pringle</i>	
(590e) Dynamic Modeling, Advanced Control, Diagnosis and Optimization of Large-Scale Lignocellulosic Biorefineries	799
<i>Remus M. Prunescu, Mogens Blanke, Jon G. Jakobsen, Gürkan Sin</i>	
(590f) Efficient Real-Time Operation of an Industrial Gas Network through Global Optimization	801
<i>Yash Puranik, Nick Sahinidis, Tong Li, Ajit Gopalakrishnan, Brian Besancon</i>	
(590g) Mixed-Integer Programming Solution Methods for Inventory Routing Problems	802
<i>Yachao Dong, Christos T. Maravelias, Jose M. Pinto, Arul Sundaramoorthy</i>	
(639a) Optimal Integration of a Self Sustained Algae Based Facility with Solar and/or Wind Energy	803
<i>Mariano Martín, Ignacio E. Grossmann</i>	
(639b) Biomass to Liquid Transportation Fuels Utilizing Biological and Thermochemical Conversion: Process Synthesis and Global Optimization	804
<i>Logan R. Matthews, Alexander M. Niziolek, Onur Onel, Neesha Pinnaduwege, Mark Holtzapple, Christodoulos A. Floudas</i>	
(639c) Design and Assessment of Novel Thermochemical Lignocellulosic Biomass to Butanol Process Configurations	805
<i>Chinedu Okoli, Thomas A. Adams</i>	
(639d) Conceptual Process Design with Energetic Analysis for a Bio-Based 2-Butanone Production	815
<i>Daniel Penner, Christian Redepinning, Kirsten Ulonska, Jörn Viell, Alexander Mitsos</i>	
(639e) Systematic Design and Synthesis of Integrated Multi-Product Biorefinery Processes	817
<i>Zhihong Yuan, Bernardo Lousada, Pengcheng Li, Mario Richard Eden</i>	
(639f) Techno-Economic Analysis of a Direct Coal-Biomass to Liquids (CBTL) Plant with CO2 Capture and Storage (CCS)	818
<i>Yuan Jiang, Debansu Bhattacharyya</i>	
(647a) An Integrated Framework for Scheduling and Control Using Fast Model Predictive Control	819
<i>Jinjun Zhuge, Marianthi G. Ierapetritou</i>	
(647b) On the Alleviation of Inventory Creep in Process Scheduling	820
<i>Donald J. Chmielewski, Jin Zhang</i>	
(647c) Fault Detection-Based Triggers for Rescheduling of Batch Process Operations	821
<i>Cara Touretzky, Iiro Harjunkoski, Michael Baldea</i>	
(647d) Closed-Loop Properties of a Mixed Scheduling and Control Problem	823
<i>Douglas A. Allan, James B. Rawlings, Thomas A. Badgwell</i>	
(647e) Simultaneous Design, Control and Operational Optimisation of a Domestic CHP System	825
<i>Nikolaos A. Diangelakis, Efstratios N. Pistikopoulos</i>	
(647f) Integrating Scheduling and Control for a Mixed-Mode Process	828
<i>John M. Wassick, Yisu Nie, Bao Lin, Bryan Matthews, Rob Hoogerwerf</i>	
(662a) Data-Based Modeling and Control of Batch Emulsion Polymerization	829
<i>Brandon Corbett, Prashant Mhaskar</i>	
(662b) Development and Validation of a Reduced-Index Dynamic Model of an Industrial High-Purity Column	832
<i>Jose O. A. Matias, Misagh Ebrahimpour, Fabio D. S. Liporace, Ardsan Dos Santos Vianna, Galo A. C. Le Roux</i>	
(662c) Dynamic Modeling with Correlated Inputs: Theory, Method and Experimental Demonstration	833
<i>Derrick K. Rollins, Amy K. Roggenbort, Yiyang Khor, Yong Mei, Peggy Lee, Stephanie Loveland</i>	
(662d) Spatiotemporal Modeling and Identification of CO2 Adsorption Columns	834
<i>Davood Babaei Pourkargar, Seyed Mehdi Kamali Shahri, Robert M. Rioux, Antonios Armaou</i>	
(662e) Identification of a Reduced Order Data-Driven Model of a Hydrogen Production Plant	836
<i>Abhinav Garg, Prashant Mhaskar, Gangshi Hu, Jesus Flores-Cerrillo</i>	
(662f) Feedforward Control with Block-Oriented Modeling with Demonstration to Nonlinear Parametrized Wiener Modeling	837
<i>Derrick K. Rollins, Stephanie Loveland, Nidhi Bhandari</i>	
(662g) Development of a Recursive Time Series Model for Growth of Mammalian Cells Used in Monoclonal Antibody Production	839
<i>Jingwei Gan, Satish J. Parulekar, Ali Cinar</i>	
(662h) Modeling & Simulation Trends and Application of Optimization in Polymerization Processes	841
<i>Nikhil Prakash</i>	

(663a) Actuator and Sensor Fault Isolation of Nonlinear Systems Subject to Uncertainty	842
<i>Hadi Shahnazari, Prashant Mhaskar</i>	
(663b) Detection and Isolation of Batch-to-Batch Parametric Drift in Protein Crystallization	843
<i>Joseph Sangil Kwon, Michael Nayhouse, Panagiotis D. Christofides</i>	
(663c) Systematic Fault Detection and Classification in Semiconductor Manufacturing Process	844
<i>Daegeun Ha, Junmo Koo, Danda Park, Chonghun Han</i>	
(663d) Fault Detection and Accommodation in Sampled Data Process Systems with Measurements and Actuation Errors.....	845
<i>Shilpa Narasimhan, Nael H. El-Farra</i>	
(663e) Data Reconciliation in Open Reaction Systems Using the Concept of Extents.....	848
<i>Sriniketh Srinivasan, Julien Billeter, Shankar Narasimhan, Dominique Bonvin</i>	
(663f) State Observer for Process Monitoring of Melt Polycondensation Reactors	851
<i>Chen Ling, Costas Kravaris</i>	
(663g) A Data-Driven Multidimensional Visualization Technique for Process Fault Detection and Diagnosis.....	853
<i>Shriram Gajjar, Ahmet Palazoglu</i>	
(663h) A Method of Proactive Model-Based Alarm System Design	862
<i>Taha Mohseni Ahooyi, Jeffrey E. Arbogast, Warren D. Seider, Ulku G. Oktem, Masoud Soroush</i>	
(687a) A Methodology for a Sustainable CO₂ Capture and Utilization Network.....	863
<i>Rebecca Frauzem, Kasper Fjellerup, Rafiqul Gani</i>	
(687b) Design and Techno-Economic Analysis of a Carbon Capture and Storage By Mineralization (CCSM) Process Using NaOH As an Alkaline Feedstock.....	875
<i>Seung Hwan Oh, Dabin Jung, Kosan Roh, Jong In Han, Jay H. Lee</i>	
(687c) Carbon Dioxide Utilization in the Polyurethane Supply Chain: An Environmental Perspective	876
<i>Leonard Müller, Niklas Von Der Assen, Andre Sternberg, Arne Kätelhön, Andre Bardow</i>	
(687d) Systems Design and Analysis of Direct Air Capture (DAC) of CO₂ Via Temperature Vacuum Swing Adsorption	877
<i>Anshuman Sinha, Yoshiaki Kawajiri, Matthew J. Realff</i>	
(687e) Comparison of Various Technological Options in a Smr-Hydrogen Plant in Refineries for Supplying CO₂ Feedstock to Combined Reforming and Dry Reforming of Methane Based CO₂ Conversion Processes	878
<i>Kosan Roh, Hyungmuk Lim, Seongbin Ga, Jay H. Lee</i>	
(687f) Optimal Design of Solvent-Based Post-Combustion CO₂ Capture Plants Using Phase-Change Solvents	880
<i>Theodoros Damartzis, Athanasios I. Papadopoulos, Panos Seferlis</i>	
(687g) Dynamic Model Development and Validation of a MEA-Based CO₂ Capture System	882
<i>Anderson Soares Chinen, Joshua Morgan, Benjamin Omell, Debangsu Bhattacharyya, David C. Miller</i>	
(692a) Vector-Based Sustainability Analysis: A Fundamental Study on Sustainable Development	883
<i>Majid Moradi Aliabadi, Yinlun Huang</i>	
(692b) Statistical Algorithm for Sustainability Measurement and Decision Making	884
<i>Rajib Mukherjee, Alessandra R. Carreon, Subhas Sikdar</i>	
(692c) Multi-Objective Optimization Combined with Input-Output and Eco-Cost Assessment for Decarbonizing the European Economy	885
<i>Daniel Cortés-Borda, Laureano Jiménez, Gonzalo Guillén-Gosálbez</i>	
(692d) Assessing Sustainability By Life Cycle Assessment Versus Techno-Ecological Synergy	888
<i>Xinyu Liu, Varsha Gopalakrishnan, Bhavik R. Bakshi, Guy Ziv</i>	
(692e) Life Cycle Analysis of Three Methods to Treat Primary Clarifier Effluent: Aerated Activated Sludge Bed, Hrad Combined to a Trickling Filter and Trickling Filter.....	890
<i>Michael Cooney</i>	
(701a) A More Efficient Formulation for the Multiperiod Blending Problem.....	891
<i>Pedro M. Castro</i>	
(701b) A Multi-Time-Scale Approach for the Integrated Maintenance and Production Scheduling of Multipurpose Process Plants.....	898
<i>Matteo Biondi, Guido Sand, Ilro Harjunkoski</i>	
(701c) Adjustable Robust Optimization for Scheduling Multipurpose Batch Plants Under Uncertainty	899
<i>Nikolaos Lappas, Chrysanthos E. Goumaris</i>	
(701d) Robust Optimization for Production - Distribution Coordination of Industrial Gases Supply-Chains Under Uncertainty	901
<i>Miguel Zamarripa, Ignacio Grossmann, Irene Lotero, Ajit Gopalakrishnan, Brian Besancon, Tejinder Singh</i>	
(701e) Optimal Procurement Contract Selection with Price Optimization Under Uncertainty for Process Networks.....	902
<i>Bruno A. Calfa, Ignacio Grossmann</i>	
(701f) Changeover Formulations for Discrete-Time Mixed-Integer Programming Scheduling Models.....	903
<i>Sara Velez, Yachao Dong, Christos T. Maravelias</i>	
(701g) A Hybrid Scheduling Formulation for Integrated Scheduling and Process Control Using Discrete-Time Dynamic Models	904
<i>Cara Touretzky, Ilro Harjunkoski, Michael Baldea</i>	
(701h) Preprocessing and Tightening Methods for Time-Indexed Mixed-Integer Programming Chemical Production Scheduling Models	905
<i>Andres F. Merchan, Christos T. Maravelias</i>	
(702a) Using Prior Knowledge for Multivariable Model Identification for Integral Controllability	907
<i>Shyam Panjwani, Michael Nikolaou</i>	
(702b) Generalization of a Parameter Set Selection Procedure for Nonlinear Systems.....	910
<i>Daniel P. Howson, Wei Dai, B. Wayne Bequette, Juergen Hahn</i>	

(702c) A Robust Data-Driven Reduced-Order Model for Real-Time Optimization of Steam-Methane Reformers Under Distributed Sensing	913
<i>Ankur Kumar, Michael Baldea, Thomas F. Edgar</i>	
(702d) On Identification of Well-Conditioned Nonlinear Systems: Application to Economic Model Predictive Control of Nonlinear Processes	914
<i>Anas Alanqar, Helen Durand, Panagiotis D. Christofides</i>	
(702e) Validation and Sensitivity Analysis of a Continuous Lumping Model for Hydrocracking on a Zeolite Catalyst	915
<i>Per Julian Becker, Benoit Celse, Victor Costa, Denis Guillaume</i>	
(702f) A Meal Detection Algorithm Based on Continuous Glucose Measurements for Use in Artificial Pancreas Systems	916
<i>Sediqeh Samadi, Kamuran Turksoy, Jianyuan Feng, Iman Hajizadeh, Ali Cinar</i>	
(702g) A Novel Insulin Delivery Approach Capable of Substantially Tight Variation of Blood Glucose Level	918
<i>Derrick K. Rollins, Yong Mei</i>	
(703a) Sensor Error Detection and Functional Redundancy for Continuous Glucose Monitoring	921
<i>Jianyuan Feng, Kamuran Turksoy, Sediqeh Samadi, Iman Hajizadeh, Ali Cinar</i>	
(703b) Error Detection for Chemical Plant Automation Logic Using Model Checking and Supervisory Control Theory	922
<i>Blake C. Rawlings, John M. Wassick, B. Erik Ydstie</i>	
(703c) Quality-Relevant Fault Detection and Identification for Batch Processes Based on Stochastic Programming	923
<i>Feifan Shen, Nael H. El-Farra, Ahmet Palazoglu</i>	
(703d) Development of a Novel EKF-GA Approach for Distributed Sensor Placement – Application to WGSR in an IGCC Plant	924
<i>Parham Mobed, Sudhakar Munusamy, Debangsu Bhattacharyya, Raghunathan Rengaswamy</i>	
(703e) Built-in-Tests for Thermal Fluid Systems of Aerospace Applications	925
<i>William T. Hale, Kyle A. Palmer, George M. Bolas</i>	
(703f) A Novel Plant-Model Mismatch Estimation Method for Model Predictive Control	926
<i>Siyun Wang, Michael Baldea, Leo H. Chiang, Ivan Castillo, Rahul Bindlish, David Stanley</i>	
(703g) Visualization and Data-Driven Monitoring of Batch Processes	927
<i>Ray Wang, Michael Baldea, Thomas F. Edgar, Mark Nixon, Willy Wojsznis, Ricardo Dunia</i>	
(703h) Performance Monitoring of Control Room Operators through Eye Gaze Analysis	928
<i>Punitkumar Bhavsar, Babji Srinivasan, Rajagopalan Srinivasan</i>	
(721a) Modelling Template for the Development of the Process Flowsheet	930
<i>Marina Fedorova, Rafiqul Gani</i>	
(721b) A Systematic Approach of Using Material Properties Data for Pharmaceutical Process Simulation	931
<i>Jun Zhang, Frances Pereira, Ravendra Singh, Sean Bermingham, Rohit Ramachandran, Fernando J. Muzzio, Marianthi Ierapetritou</i>	
(721c) Unleashing the Potential of PAT with Real Time Knowledge Management and Quality Based Control	932
<i>Martin Gadsby</i>	
(721d) Attention Aware Systems in Process Control Rooms through Real-Time Pupillometry	933
<i>Punitkumar Bhavsar, Sweta Parmar, Babji Srinivasan, Rajagopalan Srinivasan</i>	
(721e) Organization of MongoDB Database in Modena Project	935
<i>Heinz A. Preisig, Cansu Birgen</i>	
(721f) Process Safety - A Systems Perspective	936
<i>Warren D. Seider, Jeffrey E. Arbogast, Ulku G. Oktem, Masoud Soroush</i>	
(721g) Prediction of Mineral Scales in Oil & Gas Production Systems Using a Machine Learning Approach	938
<i>Jesús D. Arrieta, Raúl Ramos, Cristian Blanco, Luis F. Carrillo, Wilson Cañas, Nicolás Santos Santos</i>	
(721h) Applying Batch Data Principles to Continuous Manufacturing for the Purposes of Data Management, Batch Reporting, Analytics and Traceability	939
<i>Bob Engel, Paul Brodbeck, Ravendra Singh</i>	
(733a) Closed-Loop Average Economic Performance Under Real-Time Economic Model Predictive Control	946
<i>Matthew Ellis, Panagiotis D. Christofides</i>	
(733b) Computationally Efficient Economic Model Predictive Control: Stability, Performance, Convergence	947
<i>Su Liu, Jinfeng Liu</i>	
(733c) Application of Approximate Infinite Horizon Economic MPC to Electric Power Networks with Energy Storage	948
<i>Oluwasanmi Adeodu, Donald J. Chmielewski</i>	
(733d) Integrated Real-Time Optimization and Control of Multiunit Batch Processes	949
<i>Francesco Rossi, Daniel Casas Orozco, Gintaras Reklaitis, Flavio Manenti</i>	
(733e) A New Framework for Dynamic Parameter Estimation and Optimization of Batch Distillation Columns	951
<i>Seyed Mostafa Safdarnejad, Jonathan Gallacher, John D. Hedengren</i>	
(733f) Moving Horizon Based Real Time Optimization and Advanced Hybrid Model Predictive Control of Continuous Pharmaceutical Manufacturing Process	954
<i>Ashish Shah, Rohit Ramachandran, Ravendra Singh</i>	
(735a) Whole-System Optimisation of Integrated Wind-Electricity-Hydrogen Networks for Decarbonising the Domestic Transport Sector in Great Britain	955
<i>Sheila Samsatli, Nouri Samsatli, Nilay Shah</i>	
(735b) Accurate Simulation of Natural Gas Liquefaction Processes	971
<i>Harry A. J. Watson, Donghoi Kim, Truls Gundersen, Paul I. Barton</i>	

(735c) Integrated Biomass and Natural Gas Refineries for the Co-Production of Liquid Fuels, Olefins, and Aromatics: Optimization Under Uncertainty	972
<i>Onur Onel, Alexander M. Niziolek, Logan R. Matthews, Christodoulos A. Floudas</i>	
(735d) Mixed-Integer Programming Models for Long-Term, Quality-Sensitive Shale Gas Development	973
<i>Markus G. Drouven, Ignacio E. Grossmann</i>	
(735e) Optimal Design and Synthesis of Shale Gas Processing and NGLs Recovery Process	975
<i>Jian Gong, Fengqi You</i>	
(735f) Design and Economical Evaluation of Polygen Process to Co-Produce Synthetic Natural Gas (SNG) and Ammonia	977
<i>Bor-Yih Yu, I-Lung Chien</i>	
(735g) Application of Exergy Efficiencies in Complicated Cryogenic Processes	978
<i>Donghoi Kim, Truls Gundersen</i>	
(745a) Hybrid Models of Distillation Units for Planning, Scheduling, and Real Time Optimization of Refinery Operations	979
<i>Vladimir Mahalec, Gang Fu, Fahad Al Juhani</i>	
(745b) Robust Refinery Planning Under Uncertainty	980
<i>Matthew Colvin, Robert M. Apap, Dimitrios Varvarezos</i>	
(745c) Refinery Planning Under Uncertainty Integrated with a Nonlinear Crude Distillation Unit Model	981
<i>Yu Yang, Paul I. Barton</i>	
(745d) Integrated Gasoline Blending and Delivery Operations: Short-Term Scheduling Via a Novel Unit-Specific Event-Based Continuous-Time Formulation and Global Optimization Approach	982
<i>Jie Li, Christodoulos A. Floudas</i>	
(745e) Bitumen Upgrading and Synthetic Crude Oil Blending Optimization	985
<i>Hossein Shahandeh, Zukui Li</i>	
(745f) Modelling Liquid Drug Product Manufacturing: Method and Case Study	987
<i>Lukas Eberle, Elisabet Capon, Hirokazu Sugiyama, George Tien, Andreas Graser, Rainer Schmidt, Konrad Hungerbuehler</i>	
(745g) Flexible Turnaround Planning in Integrated Chemical Site Networks	988
<i>Sreekanth Rajagopalan, Nick Sahinidis, Bikram Sharda, Satyajith Amaran, Scott J. Bury</i>	
Author Index	