

Education Division 2015

Core Programming Area at the 2015 AIChE Annual Meeting

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

ISBN: 978-1-5108-1857-6

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

(6cq) Study of the Performance Characteristics of a Stirred Tank Reactor Suitable for Diffusion Controlled Liquid-Solid Catalytic Reactions	1
<i>M. M. Taha, M.H. Abdel-Aziz, Y.O. Fouad, A.H. Konsowa, G.H. Sedahmed</i>	
(6it) Robust Adaptive Model Predictive Control of Chemical and Biological Systems	29
<i>Davood Babaee Pourkargar</i>	
(6dp) Preparation and Carbon Dioxide Separation Performance of a Hollow Fiber Supported Ionic Liquid Membrane	31
<i>Wenjie Lan, Shaowei Li, Jianhong Xu, Guangsheng Luo</i>	
(6iu) Shaping Catalysis Through Tailored Nanostructures: For Energy Conversion and Storage	32
<i>Yijin Kang, Christopher B. Murray, Eric A. Stach, Peidong Yang, Nenad Markovic, Vojislav Stamenkovic</i>	
(6iq) Rational Design of Catalytic and Hydrocarbon Trapping Materials to Meet Automotive Emissions Regulations	33
<i>Eleni A. Kyriakidou</i>	
(6cz) Smart Gating Membranes with K+-Responsive Pore Size and Surface Property	34
<i>Zhuang Liu, Xiao-Jie Ju, Rui Xie, Wei Wang, Liang-Yin Chu</i>	
(6ds) Solvent-Based Control over Nanostructure of Midblock Sulfonated Block Copolymers	35
<i>Kenneth Mineart</i>	
(6du) Design of Injectable Hydrogels for Regenerative Medicine	36
<i>Lei Cai, Sarah C. Heilhorn</i>	
(6dv) Molecular Interactions and Behavior in Complex Systems	37
<i>Blair Kathryn Brettmann</i>	
(6dx) Continuous and Oscillatory Multi-Phase Microscale Technologies for Pharmaceuticals, Materials and Energy	38
<i>Milad Abolhasani, Klavs F. Jensen</i>	
(6dy) Experimental and Computational Studies of Fluid-Particle Flow Systems	39
<i>Christopher M. Boyce</i>	
(6dz) Functional Polymers for Industrial and Bio-Applications: Synthesis, Properties & Engineering	40
<i>Manos Gkikas</i>	
(6ea) Electrocatalysis and Photocatalysis for Energy Sustainability	41
<i>James R. McKone, Héctor D. Abruña, Francis J. DiSalvo</i>	
(6eb) Design and Fabrication of Nanostructured Materails for Energy Applications and Functional Nanocoating	42
<i>Ling Fei</i>	
(6ec) Development of Next Generation of Energy-Efficient Separation Technologies through Advanced Tunable Materials	43
<i>Shouliang Yi</i>	
(6ed) Biomass Pretreatment Using Ionic Liquid and Glycerol Mixtures	44
<i>Joan G. Lynam</i>	
(6ee) From DNA to Polymer Membranes: Soft Materials for the 21st Century	45
<i>Douglas R. Tree</i>	
(6ef) Highly Active and Durable Extended Surface Electrocatalysts	46
<i>Shaun M. Alia</i>	
(6eg) Dynamic Modeling and Design of Colloidal Assembly	47
<i>Daniel J. Beltran-Villegas</i>	
(6eh) Towards the Computational Design of Monolayer (Hydroxy)Oxide-Metal Bifunctional Catalysts	48
<i>Zhenhua Zeng</i>	
(6ej) Application of the Technique of Chemical Vapor Deposition of Polymers to a Broad Spectrum of Research Projects – from Nuclear Fusion to Water Purification	49
<i>Aravind Suresh</i>	
(6eo) Nanobioelectronics in Healthcare: From Nanobots to Wearable Biosensors	50
<i>Wei Gao</i>	
(6dw) Theoretical Approaches to the Design of Clean-Energy Processes and Materials	51
<i>Peter C. Psarras</i>	
(6ek) Design and Synthesis of Functional Polymers for Industrial, Environmental and Energy Applications	54
<i>Hasan Zerze</i>	
(6el) Tuning the Ionic Conductivity of Polymerized Ionic Liquid Homo-, Random, and Block Copolymers	55
<i>Christopher M Evans, Rachel Segalman</i>	
(6em) Solid Formation in Flow: A Kinetic and Fluid Dynamic Approach	56
<i>Stefano Lazzari</i>	
(6ep) Micro and Nano-Rheological Methods for Interfacial and Bulk-Fluid Systems	57
<i>Joseph Samanik</i>	
(6er) High Performance Computing for Engineered Human Health Systems	58
<i>Andrew P. Spann</i>	
(6en) Fundamental and Applied Studies of Dynamic Self-Assembled Biomaterials	60
<i>Adrienne M. Rosales</i>	

(6et) The Physical Cell: Impact of Mechanics and Rheology on Cellular Function	61
<i>Elena F. Koslover</i>	
(6es) Engineering a Non-Enzymatic Analog of the Glycolysis Pathway.....	62
<i>Marat Orazov, Mark E. Davis</i>	
(6ex) Genetically Engineered Peptides and Proteins: A Platform for Programming Bio-Inspired Functional Materials and Analytical Assays.....	64
<i>Ali Ghoorjian</i>	
(6eu) Modeling Porous Materials and Confined Fluids from Atomistic to Continuum Scales	65
<i>Gennady Gor</i>	
(6ev) Development of Minimally Invasive Tools for Genetic Monitoring of Pancreatic Health	67
<i>Andrew J. Hilmer, Walter Park, R. Brooke Jeffrey, Chaitan Khosla</i>	
(6ew) Engineering Immunity: Design and Development of Customized Nanomaterials with Controlled Immunostimulatory Effects for Biomedical Applications	68
<i>Bingbing Sun</i>	
(6fa) Catalysis for Energy and Environmental Applications	69
<i>Zhenglong Li</i>	
(6ey) Directed Assembly at All Length Scales: The Pathway Towards Future Metamaterials.....	70
<i>Bhuvnesh Bharti, G.H. Findenegg, Orlin D. Velev</i>	
(6ez) Hybrid Nanomaterials for Energy Harvesting	71
<i>Ayaskanta Sahu, Rachel Segelman, Jeffrey Urban, David J. Norris</i>	
(6fc) Light-Activatable Nanoconstructs for Mechanism-Based Combination Therapy	72
<i>Huang Chiao Huang</i>	
(6fg) New Chemical and Biological Processes for Next Generation Biorefining.....	73
<i>Zhenglin Li</i>	
(6fi) Multiscale Design of Gas-Phase Synthesis of Nanomaterials	74
<i>Eirini Goudeli, Sotiris E. Pratsinis</i>	
(6fb) Engineering the Flow Properties of Colloidal Materials	75
<i>Lilian C. Hsiao</i>	
(6fd) First-Principals Modeling of Methanol Fuel Cells: Kinetics and Catalyst Design	76
<i>Glen Jenness</i>	
(6ff) From Fluorescence to Magnetic Resonance: Engineering Proteins for Molecular Imaging.....	77
<i>Arnab Mukherjee</i>	
(6fh) Soft Materials Engineering: From Colloids to Biological Interfaces.....	79
<i>Peter J. Beltramo</i>	
(6fj) Hierarchical, Nature-Inspired Nanomaterials for Electrochemical Energy Conversion/Storage Devices	80
<i>Panagiotis Trogadas</i>	
(6fk) Engineered Natural Biomaterials for Understanding the Interplay Between Cells and Their Environment	81
<i>Steven R. Caliari</i>	
(6fl) Exploring Structure-Function Correlations of Nanomaterials in Energy Conversion and Storage	82
<i>Weiqing Zheng</i>	
(6fn) Composite Nanoparticles for Energy Generation & Storage Applications	84
<i>Jeffrey J. Richards</i>	
(6fq) Multi-Physical / Multi-Scale Modeling for Nanotechnology Convergence Systems.....	85
<i>Pil Seung Chung</i>	
(6fo) Engineering Biomimetic Self-Assembled Materials	86
<i>Lorraine F. Leon</i>	
(6fp) Understanding Solar-Fuel Systems from the Nanoscale to the Device Level	87
<i>Miguel Modestino</i>	
(6ft) Next-Generation Bioengineering and Biodesign.....	89
<i>Wen Wang, Daniel I. C. Wang</i>	
(6fu) Accelerating the Speed and Scale of Metabolic Engineering in Challenging Biological Contexts	90
<i>Nathan Crook, Gautam Dantas, Hal Alper</i>	
(6fv) Accelerating Discovery of Advanced Materials through Simulation	91
<i>Qing Shao</i>	
(6fw) Towards the Next Generation of Magnetic Resonance Spectroscopy: Harnessing Light and Spin.....	92
<i>Jonathan King</i>	
(6fx) Systems and Synthetic Biology of Photosynthetic Organisms for Biorenewable Chemicals	93
<i>Rajib Saha</i>	
(6fr) First-Principles-Based Multiscale Modeling of Functional Nanomaterials	94
<i>Jonathan E. Mueller</i>	
(6fy) Multifunctional Electrocatalysts for Waste Utilization.....	95
<i>Sujan Shrestha, Elizabeth J. Biddinger, William E. Mustain</i>	
(6 fz) Engineering Faster Reactions: Catalysis and Transport from Energy to Pharmaceutics	96
<i>Andrew Teixeira</i>	
(6ga) Separation and Catalysis Using Nanoporous Materials: A Computational Approach	97
<i>Peng Bai</i>	
(6gb) Metal-Organic Framework (MOF) Thin Films for Functional Materials Enabled By Atomic Layer Deposition	98
<i>Junjie Zhao</i>	

(6gd) Rational Way of Designing Microfluidic Devices for Energy and Bioengineering Applications	99
<i>Jeevan Maddala</i>	
(6ge) Corona Phase Molecular Recognition of Fibrinogen	100
<i>Gili Bisker, Hoyoung Park, Nicole Iverson, Jiyoung Ahn, Justin Nelson, Markita Landry, Sebastian Kruss, Michael S. Strano</i>	
(6gf) Interfacial Interactions and the Design of Smart Materials	101
<i>Stephanie Lam</i>	
(6gg) Towards Accurate and Fast Discovery of Compound Materials As Catalysts: Lessons Learned from Oxides	102
<i>Zhongnan Xu</i>	
(6gh) Engineering Nanoparticles As Theranostic Probe and Understanding Their Interaction with the Lysosome-Autophagy System	104
<i>Gautam Das</i>	
(6gi) Design of New Materials and Understand Emergent Behavior Using Computational Methods	105
<i>Naga Rajesh Tummala</i>	
(6gk) Understanding and Predicting the Activity of Zeolite Catalysts	106
<i>Florian Göltl</i>	
(6gl) Model Colloid System for the Direct Observation of Interfacial Sorption Kinetics	107
<i>Paul F. Salipante</i>	
(6gm) Smart Membranes with Hygro-Responsive Surfaces for Efficient Separation of Liquid Mixtures	108
<i>Gibum Kwon</i>	
(6gn) Responsive Hydrogels for 4D Cell Culture and Controlled Drug Delivery	109
<i>Mark W. Tibbitt, Robert Langer</i>	
(6go) Recovery of Folded Heterologous Proteins in the Extracellular Space from Bacterial Culture	111
<i>Kevin James Metcalf, Elias Valdivia, Anum Azam, Sandy Rosales, Casey Finnerty, James Bevington, Brandon Yao, Michelle Reid, Danielle Tullman-Ercek</i>	
(6gp) Understanding and Controlling the Mechanical Properties of Polymeric Networks	112
<i>Shengchang Tang, Bradley D. Olsen</i>	
(6qq) Accelerated Computational Discovery of Materials for Production, Storage, and Efficient Use of Energy	113
<i>Diego A. Gomez Gualdrón</i>	
(6gr) Modeling Biomass and Its Conversion to Fuels and Specialty Chemicals	115
<i>Brooks D. Rabideau</i>	
(6gs) Dual Conduction Polymers for Energy Conversion and Storage	116
<i>Bhooshan C. Popere, Rachel Segalman</i>	
(6gt) Applied Synthetic Biology for Engineering Metabolism and Synthetic Microbial Communities	118
<i>Charles Rutter</i>	
(6gu) Programming Macromolecular Assemblies with Controlled Architecture and Size Towards Packaging and Delivery of Peptide-Based Therapeutics	121
<i>Nick Carroll</i>	
(6gv) Accelerating Materials Discovery with Data Science	122
<i>Yongchul G. Chung</i>	
(6gw) The Synthesis, Design, and Tunable Functionalization of Nano-Engineered Materials	123
<i>Laura Kraya</i>	
(6gx) Optoelectronic and Electronic Interfaces to the Brain	124
<i>Ramsey Kraya</i>	
(6gy) Unraveling the Chemistry of Energy Systems	125
<i>Nicole Labbe</i>	
(6gz) 3D, Self-Assembled, Membrane-Electrode Assemblies for Advanced Electrochemical Devices	127
<i>Samuel St. John</i>	
(6ha) Transition Metal-Oxides for Sustainable Energy Conversion and Storage: The Computational Catalysis Perspective	131
<i>Michał Bajdich</i>	
(6hb) Rational Design of Redox Materials and Catalysts for Conversion and Storage of Renewable Energy	132
<i>Ronald Michalsky</i>	
(6hc) Nanoscale Simulation and Design for Molecular Sensors and Reaction Engineering	133
<i>Zachary Ulissi</i>	
(6hd) Expanding the Genome Engineering Toolkit: Increasing Signal to Noise	134
<i>Nicholas R. Sandoval</i>	
(6he) Design Principles and Performance Metrics for Realizing Cost-Effective Electrochemical Technologies for Energy Storage	136
<i>Liang Su</i>	
(6hf) Optimization of Protein/Peptide Electrostatic Properties for Bioengineering Applications	137
<i>Chris A. Kieslich</i>	
(6hg) Non-Equilibrium Self-Assembly and Structures	138
<i>Amir Vahid</i>	
(6hh) Materials and Systems Engineering for Healthcare and Energy Applications – from Discovery to Design	141
<i>Meenesh R. Singh</i>	
(6hi) Pathway Engineering in Yeast: Overcoming Challenges in Design and Optimization By Scaling and Parallelizing Elements of the Design-Build-Test-Learn Cycle	144
<i>Eric M. Young, Johannes A. Roubos, Ben Meijrink, D. Benjamin Gordon, Christopher A. Voigt</i>	
(6hj) Data-Centric Optimization: Methods and Applications	145
<i>Fani Boukouvala</i>	

(6hk) Accelerating the Onset of the Hydrogen Economy	146
<i>Fernando Olmos</i>	
(6hl) Integrating Experimental and Computational Approaches to Discover and Design (Therapeutic) Proteins	147
<i>Robert J. Pantazes</i>	
(6hm) Molecular Simulations of Chemical Reactions	148
<i>Ryan Gotchy Mullen</i>	
(6hn) Engineering a Nano Display Platform from Bacterial Spore Coat Proteins	149
<i>Edward Y. Kim, Kumaran Ramamurthi, I-lin Wu</i>	
(6ho) Understanding Gas-Metal Interactions for Clean Energy Applications	150
<i>Kyoungjin Lee</i>	
(6hp) Applied Pharmaceutical Process System Engineering	153
<i>Ravendra Singh</i>	
(6hq) Computer-Aided Molecular Engineering of Crystallization: From Colloidal Assembly to Geoengineering	156
<i>Amir Haji-Akbari</i>	
(6hr) Functional Polymers for Widespread Energy Applications	158
<i>Shrayesh N. Patel</i>	
(6hs) Rational Design of High-Performance Catalysts for Sustainable Energy Conversion and Storage	159
<i>Max García-Melchor</i>	
(6ht) Investigation of Materials, Interfaces, and Processes Promoting Efficiency in Solar Energy Conversion Technologies	160
<i>Coleman Kronawitter</i>	
(6hu) Functional Polymeric Materials for Sustainable Energy and Biomedical Applications	161
<i>Shudipto Konika Dishari</i>	
(6hv) Developing Noble Metal/TiO₂ and Sn_xTiO₂ Composites to Improve Light Harvesting and Carrier Collection of Solar Cells	163
<i>Xiangnan Dang, Angela M. Belcher</i>	
(6hw) Exploring Biomolecular Engineering Strategies for Addressing Challenges in Therapeutic Design, Delivery and Purification	164
<i>Divya Chandra</i>	
(6hx) Heterogeneous Catalysis: Synthesis and Spectroscopy of Supported Metal Oxide Catalysts for Natural Gas Upgrading	165
<i>Carlos Carrero</i>	
(6hy) Synthetic Modification of Proteins to Create New Biomaterials	166
<i>Allie Obermeyer</i>	
(6hz) First-Principles Computational Chemistry Research in Sustainable Energy and Catalysis	167
<i>Peilin Liao</i>	
(6ia) Morphology and Ion Transport in Polymer Electrolyte Membranes	168
<i>Xi Chelsea Chen</i>	
(6ib) Rational Design of Catalytic Sites for Energy Applications	169
<i>Timothy Van Cleve</i>	
(6ic) Nano-Structured Catalysts for Clean Fuels and Chemicals: Directing Activity and Selectivity By Design	170
<i>Branko Zugic</i>	
(6id) Emerging Patterns in Soft Materials from Geometric Confinement	171
<i>Ya-Wen Chang</i>	
(6ie) Solids and Particulate Processing Applications	172
<i>Juan G. Osorio</i>	
(6if) Multi-Scale Modeling to Study Soft Matter	173
<i>Nav Nidhi Rajput</i>	
(6ig) Integrated Simulation Methods for Protein-Nanoparticle (NP) Interactions with Complex Surface/Solvent Environments	174
<i>Shuai Wei</i>	
(6ih) Design and Optimization of Nano- and Macro-Scale Biomaterials for Vaccines and Immunomodulation	175
<i>Talar Tokatlian</i>	
(6ii) Linear and Non-Linear Programming Techniques for Process Intensification	176
<i>Jeremy A. Conner</i>	
(6ik) Membranes for Energy-Efficient Separations	177
<i>Zachary P. Smith</i>	
(6il) Data Science and Omics Approaches for Network Biology	178
<i>Gautham V. Sridharan</i>	
(6im) Membrane Materials and Transport Studies for Sustainable Water, Energy and Life Sciences	179
<i>Ngoc Bui</i>	
(6in) Accelerating Ring-Polymer Molecular Dynamics Simulation - a Parallel-Replica Dynamics Approach	184
<i>Chun-Yaung Lu</i>	
(6io) Programmable Dynamic Materials As Information Carriers	185
<i>Fateme Sadat Emami</i>	
(6ip) Colloids with Valence: Design, Fabrication, and Directed Self-Assembly	186
<i>Yufeng Wang</i>	
(6eq) Efficient Accumulation of Carbohydrate in Microalgae and Its Utilization	187
<i>Jingliang Xu</i>	

(6dq) Engineering Non-Model Eukaryotes for the Production of Sustainable Fuels, Chemicals, and Pharmaceuticals.....	189
<i>Robert Jinkerson</i>	
(6dr) Nano-Engineered Functional Materials for Energy Storage and Biomimetic Applications	190
<i>Samanvaya Srivastava</i>	
(6dh) Novel Routes to the Synthesis of Fuels/Lubricants and Chemicals from Biomass Derived Synthons.....	192
<i>Shylesh Sankaranarayananpilla, Alexis T. Bell</i>	
(6di) Organ-on-a-Chip Platforms to Mimic Physiology for Drug Screening.....	193
<i>Shyam Sundhar Bale</i>	
(6dj) Toward Understanding the Atmospheric Chromium Chemistry	194
<i>Mehdi Amouei Torkmahalleh</i>	
(6dl) Study on Thermal Effects of Natural Gas Adsorption and Desorption in Activated Carbon	195
<i>Rafael A. Morales Ospino, Belarmino Torres Herrera, Luis Montero Machado</i>	
(6dm) Incorporation of Metal Oxides to Activated Carbon for the Adsorption of Acid Gases.....	196
<i>Jose Luis Altamirano-Corona, Ma. del Carmen Chávez-Parga, Horacio González-Rodríguez, Ma. Aida Béjar-Ubaldo, Jaime Espino-Valencia</i>	
(6dn) Ballistic Performance Assessment Is a Must for Shelf Life Assessment of Rocket Motors	204
<i>Mohammad H Sammour</i>	
(6dc) Accelerating the Development of Green Technologies for Chemical Production through Multiscale Life-Cycle Technology Assessment	205
<i>Yuan Yao</i>	
(6de) Performance Comparison of Ethanol and Butanol Production in a Continuous and Closed-Circulating Fermentation System with Membrane Bioreactor	206
<i>Chunyan Chen</i>	
(6df) A Study on the Liquid Phase Oxidation of Toluene By Pure Oxygen in a Mini-Channel Reactor	207
<i>Airong Li</i>	
(6dg) The Role of Microfluidic Interfaces in Metals Extraction, Soil and Fertilizers	208
<i>Davide Ciceri</i>	
(6cu) Carbon Capture and Sequestration Technology for Greenhouse Gas Mitigation	209
<i>Lokesh Khotele</i>	
(6cv) Hydrodynamic Simulation of a Bubbling Fluidized Bed with MP-PIC Method	210
<i>Fei Li, Meiyian Feng, Wei Wang, Jinghai Li</i>	
(6cw) The Effects of Leg Length on the Flow Field and Separation Process of Cyclone Separator	211
<i>Hui Ci, Guogang Sun, Xiao Han</i>	
(6cx) Mechanical Work Makes Important Contributions to Surface Chemistry	212
<i>Michael Francis</i>	
(6cy) Numerical Simulation of a Delayed Coking Reactor	213
<i>Fabian A. Diaz, Arlex Chaves, Maria Maraderi, David Fuentes</i>	
(6cr) Leveraging Supramolecular Interactions for Therapeutics	223
<i>Matthew Webber</i>	
(6ct) Effect of Salinity on Surfactant Enhanced Oil Recovery with Special Reference to Upper Assam Basin	224
<i>Kalpajit Hazarika, Subrata Gogoi</i>	
(6ck) Effect of Filler on Properties Bamboo Fiber Reinforced Epoxy Composites	233
<i>Anu Gupta</i>	
(6c) Sustainability Considerations in Production of Fluids from Shales.....	234
<i>Palash Panja</i>	
(6cl) Challenges and Progress for Cogeneration of Power and Hydrogen from Nested Carbon-Air/Carbon-Steam Fuel Cells	236
<i>S. Michael Stewart, Reginald E. Mitchell, Turgut Gur</i>	
(6cn) Engineering Therapeutics for Vascular Disease	238
<i>Donny Hanjaya-Putra</i>	
(6co) A New Approach to Predict the Dynamic Interactions Between an Air Bubble/Drop and a Flat Solid Surface	240
<i>Mansoureh Shahalam</i>	
(6cp) Orders of Magnitude of Sudden Increases of X-Ray Diffraction Intensity in Surfactant-Based Liquid Crystals Triggered By Co-Self-Assembly	241
<i>Yoon Seob Lee, James Rathman</i>	
(6d) Genome-Scale Models for Systems Biology and Combinatorial Drug Discovery	244
<i>Sriram Chandrasekaran</i>	
(6ce) Modeling the Impact of Bubbling Bed Hydrodynamic Oscillations on the Yield of Biomass Fast Pyrolysis Oil	247
<i>Qinggang Xiong</i>	
(6cf) Interface Engineering for Sustainability and Health Care	248
<i>Rong Yang</i>	
(6ch) Engineering Interleukin-2 Antibodies to Shape Immune Homeostasis.....	249
<i>Jamie B. Spangler, Jakub Tomala, Vincent C. Luca, Kevin M. Jude, Marek Kovar, K. Christopher Garcia</i>	
(6ci) Seeing Is Believing - Macrophage-Targeted Theranosis	252
<i>Rahul Keswani</i>	
(6cj) Novel Nanostructured Coatings for Use in Transport Applications.....	254
<i>Stephanos Nitidas, Paraskevi Mimigiani</i>	
(6e) Vine Copula-Based Dependence Description for Multivariate Multimode Process Monitoring.....	255
<i>Xiang Ren, Shaojun Li</i>	

(6f) Visualization of Transport Dynamics in Complex Fluids.....	256
<i>Hadi Mohammadigoushi</i>	
(6g) Rheology and Dynamics of Colloidal Superballs	258
<i>John R. Royer, George L. Burton, Daniel L. Blair, Steven D. Hudson</i>	
(6h) Discovering Novel Catalysts for Production of Renewable Energy and Fuels	259
<i>Xiaofang Yang</i>	
(6i) New Frontiers: Membrane Fouling Remediation for Sustainable Water & Industrial Wastewater Treatment Technologies.....	260
<i>Amira Abdelrasoul</i>	
(6j) Influence of Cu-Cr Layered Double Hydroxide (LDH) on the Rheological Properties and Thermal Degradation Kinetics of PMMA Nanocomposites	261
<i>Manish Kumar, Samarshi Chakraborty, Kelothu Suresh, G Pugazhenthi</i>	
(6k) Developing Advanced Solid Oxide Fuel Cell (SOFCs) Stacks and Systems	262
<i>Venkatesan V. Krishnan</i>	
(6l) Thermochemical Cycles for the Production of Essential Chemicals	266
<i>Timothy Davenport</i>	
(6m) Carbon Materials As High-Efficiency and Metal-Free Catalyst for the Synthesis of Cyclic Carbonates from CO₂ and Epoxides	267
<i>Shuangfeng Yin</i>	
(6n) Programming 3D Energy-Efficient Nano-Electronics at 2-Nm Resolution	268
<i>Wei Sun</i>	
(6o) Numerical Experiments of Density Driven CO₂ Saturated Brine Migration in Heterogeneous Geologic Fabric Materials.....	271
<i>Akand Islam</i>	
(6p) Systems Biology Approaches to Develop Precision Therapeutic Approaches to Overcome Drug Resistance in Cancer	272
<i>Mohammad Fallahi-Sichani</i>	
(6q) Integrating Computational Chemistry, Molecular Simulation, and Chemical Engineering	275
<i>David C. Cantu</i>	
(6r) Understanding and Harnessing Nature's Synthetic Potential to Advance Modern Drug Development.....	276
<i>Yanran Li, Yi Tang, Rustem Ismagilov, Christina D. Smolke</i>	
(6s) Material Preparation and Kinetic Study of Catalysts.....	277
<i>Takahiko Moteki</i>	
(6t) Hierarchical Nanostructured and Polymeric Materials for Energy Storage and Conversion	278
<i>Zheng Chen, Yunfeng Lu, Yi Cui, Zhenan Bao</i>	
(6v) Site-Specific Techniques for Identification of Active Sites of Supported Transition Metal Oxide and Late Transition Metal Catalysts	281
<i>Kunlun Ding, Peter C. Stair</i>	
(6w) Increasing Global Access to Diagnostic Testing Using Low-Cost, Non-Instrumented Paper-Based Microfluidics	282
<i>Bhushan J. Toley</i>	
(6x) Rational Design of Electrochemical Interfaces for Control over Separation and Catalytic Processes	286
<i>Xianwen Mao</i>	
(6y) A New Hybrid Modeling Strategy: Data-Driven Models with First-Principle Constraint	287
<i>Li Shaojun, Cheng Xiang</i>	
(6z) Ultrasound-Responsive Nanoparticles for Drug Delivery	288
<i>James J. Kwan, Rachel Myers, Susan Graham, Christian Covillejo, Robert Carlisle, Eleanor Stride, Constantin Coussios</i>	
(6aa) Application of New Explicit Correlation and Neural Network-Based Models for an Efficient Prediction of Natural Gas Compressibility Factor	289
<i>Mohammad Mehdi Zarei, Navid Azizi, Roberto Moreno-Atanasio</i>	
(6ab) The Applications of Spherical Polyelectrolyte Brushes.....	290
<i>Yu Cang, Rui Zhang, Xuhong Guo</i>	
(6ac) Sustainable Design through Process Integration, Control and Optimization.....	291
<i>Monzure-Khoda Kazi</i>	
(6ad) Engineering the Plant Microbiome to Complement Host Phenotype.....	295
<i>Collin M. Timm</i>	
(6af) Towards a Sustainable Energy Future: The Role of Science-Driven Modeling and Systems Analysis	298
<i>N.V.S.N. Murthy Konda</i>	
(6ag) Microfluidic Studies of Emulsions and Suspensions in Wall-Bounded Shear Flow.....	299
<i>Fateme Khalkhal, Susan J. Muller</i>	
(6ah) Computational and Experimental Studies for Advancement of Sustainable Energy Systems.....	300
<i>Pramod K. W. Harikumar Warrier</i>	
(6ai) Mesoscale Modeling of 2D Materials for Energy and Biomedical Applications	301
<i>Sanket A. Deshmukh</i>	
(6aj) Microstructure and Collective Dynamics of Cytoskeletal Assemblies	303
<i>Ehsan Nazockdast</i>	
(6ak) Conversion of Space Crew's Wastes into Biofuel Using Thermophiles.....	304
<i>Jia Wang, David R. Salem, Rajesh K. Sani</i>	
(6al) Computational Modeling and Experimental Investigation for Membranes at the Water – Energy Nexus.....	305
<i>Milad R.Esfahani</i>	

(6am) Multi-Scale Process Systems Engineering	306
<i>Bruno A. Calfa</i>	
(6an) Realistic and Affordable Ab Initio Calculations for Electrochemistry	309
<i>Kathleen Schwarz</i>	
(6ao) Control and Manipulation of Molecular Interactions for Nanobiotechnology, Energy, and Biopharmaceutical Applications: Control of Self-Assembly in Micro- and Nano-Scale Systems	310
<i>Nima Yazdan Panah</i>	
(6ap) Engineering Biomimetic Membranes	313
<i>Neha Kamat</i>	
(6aq) Micro/Nanoarchitected Materials of Novel Surface Properties	314
<i>Hadi Izadi</i>	
(6ar) Simulation of Concentrated Suspensions in Thin Film Processing	315
<i>Mahyar Javidi, Andrew N. Hrymak</i>	
(6as) Nature-Inspired Approaches to Catalytic Materials Design	317
<i>Michael M. Nigra</i>	
(6at) Simple, Novel and Applicable Strategies for Innovative Medical Solutions	318
<i>Shiyi Zhang, Robert Langer, Karen L. Wooley</i>	
(6au) Merging Electrochemical Devices, Protein Engineering and Tissue Engineering: A Multi-Disciplinary Approach to Electrode Structures and Stem Cell Culture	319
<i>Julie N. Renner</i>	
(6av) Advanced Materials for the Water-Energy Nexus	320
<i>Hossein Sojoudi, Gareth H. McKinley, Karen Gleason</i>	
(6aw) Development of Functional Materials for siRNA Delivery and Neural Tissue Engineering	321
<i>Metin Uz, Sacide Alsoy Altinkaya, Surya K. Mallapragada</i>	
(6ax) Rational Catalyst Design for Renewable Energy Technologies	323
<i>Samira Siabrostami</i>	
(6ay) Computational Catalysis Design for Fuel Synthesis	324
<i>Mohammadreza Karamad</i>	
(6az) Engineering Cell Metabolism for Better Health, Safe Environment and Efficient Fuels	325
<i>Peng Xu, Mattheos A.G. Koffas, Gregory N. Stephanopoulos</i>	
(6ba) Interfacial Processes in Energy Storage and Conversion Devices	326
<i>Hadi Tavassol</i>	
(6bb) Modeling-Inspired Membrane and Particle Devices for Solar Fuels and Environmental Remediation	327
<i>Shu Hu</i>	
(6bc) Microwave Assisted Heating of Human Blood at 2450 MHz Frequency Using Various Composite Supports	328
<i>Sujoy Kumar Samanta</i>	
(6bd) Multiphase Flow Research for Sustainable Production and Use of Energy, Chemicals and Water	329
<i>Bo Kong</i>	
(6be) Advanced Membrane Materials for Energy Efficient Separations	332
<i>Rajinder P. Singh</i>	
(6bf) Controlling the Metabolic Activity of Bacterial Cells By Physico-Chemical Factors	334
<i>Tagbo H.R. Niepa</i>	
(6bg) Development of Calcium-Based Liquid Metal Batteries for Grid Scale Energy Storage	335
<i>Takanari Ouchi</i>	
(6bh) Rational Materials Design for Energy Conversion and Storage Applications	336
<i>Jingmei Shen</i>	
(6bi) Engineering of the Corneal Epithelium	339
<i>Bernardo Yáñez Soto</i>	
(6bj) From Vapors to Films: Creating Smart Surfaces Via Vapor-Phase Depositions	342
<i>Do Han Kim</i>	
(6bk) Enabling Technologies for High-Throughput Synthetic Biology and Metabolic Engineering: From Engineering Genomes and Pathways to Genetic Circuits	345
<i>Lauren B. A. Woodruff</i>	
(6bl) Development of Novel Poly(Ionic Liquid) Membranes for Electrodialytic Separations and Desalination	346
<i>Alexander Lopez</i>	
(6bm) Applied Statistics and Data Analytics for Advanced Process Systems Engineering	347
<i>Aditya Tulsky</i>	
(6bn) Computational Models for Growth and Defects of Melt-Grown Crystals	350
<i>Gaurab Samanta</i>	
(6bo) High Resolution Carbon Nanotube Enantiomer Separation By Specific DNA Sequences	351
<i>Geyou Ao</i>	
(6bp) Polymer/Nanomaterial Structural Control Using Flow and Confinement: Modeling, Experiment, and Applications	352
<i>Jay Hoon Park</i>	
(6bq) Preparation of Multimetallic Catalytic Systems By Controlled Surface Reactions for Biomass Upgrading	353
<i>Canan Sener</i>	
(6br) A Systems Biology Definition of the Core Proteome of Metabolism and Expression	355
<i>Laurence Yang, Justin Tan, Edward J. O'Brien, Jonathan M. Monk, Donghyuk Kim, Howard Li, Pep Charusanti, Ali Ebrahim, Colton J. Lloyd, James T. Yurkovich, Bin Du, Andreas Dräger, Alex Thomas, Yuekai Sun, Michael A. Saunders, Bernhard O. Palsson</i>	

(6bs) Thermodynamics and Kinetics for Energy, Environment and Materials: A Comprehensive Research Initiative Based on Experimental and Theoretical Investigation.....	356
<i>Sanjoy Bhattacharia</i>	
(6bt) Hydrodynamics and Phase Separation in Complex Fluids	357
<i>John Frostad</i>	
(6bu) Porous Materials: A Unique Platform for Separations and Catalysis	358
<i>Gokhan Barin</i>	
(6bv) Phase Transitions and Self-Assembly of Block Copolymers, Colloids and Proteins	359
<i>Jens Glaser</i>	
(6bw) Polymerization within Porous Media: Transformative Coatings and Interfaces Lab (TCIL).....	360
<i>Siamak Nejati</i>	
(6bx) Design of Functional Polymeric Materials: From Ion Transport to Bio-Inspired Assembly	362
<i>Katherine P. Barteau</i>	
(6by) Structure, Deformation, and Flow of Soft Materials.....	364
<i>Vikram Jadhao</i>	
(6bz) Molybdenum Dioxide-Based Catalysts for the Generation of Electrical Power from Biofuels	366
<i>Oscar Marin-Flores, Qian He, Shreya Shah, Xiaoxue Hou, Byeong Wan Kwon, Su Ha, M. Grant Norton</i>	
(6ca) Polymeric Mechanical Amplifiers of Tumor Cell Death	367
<i>Michael J. Mitchell, Robert Langer</i>	
(6cb) Bottom-up Design of Nanostructured Thermoelectric Materials from Solution Phase Synthesized Nanowires, Nanocrystals and Heterostructures	369
<i>Haoran Yang, Yue Wu, Christopher B. Murray</i>	
(6cc) Bioengineered Personalized Disease Models for Precision Medicine	370
<i>Jen-Huang Huang</i>	
(6db) Responsible Environment and Energy Engineering; Systems, Complexity, Sustainability.....	371
<i>Cory Jensen</i>	
(6da) Metal-ion-based Materials Chemistry for Hydrocarbon Separations, Energy, and Electronics Applications.....	372
<i>Matthew G. Cowan</i>	
(6iv) Optimizing Metabolic Pathways for the Improved Production of Natural Products	375
<i>J. Andrew Jones</i>	
(6iw) First-Principles Approaches to Fuel Cell Catalyst Design	376
<i>Luke T. Roling</i>	
(6ix) Low Temperature Carbon Dioxide Reduction to Carbon Monoxide on Perovskite-type Oxides.....	377
<i>Yolanda Daza, John Kuhn</i>	
(6iy) Performance Advances in Electrochemical Energy Storage and GHG Recycling.....	378
<i>Damon Turney</i>	
(6iz) Photoelectrochemical Solar Energy Conversion System : New Materials and Concepts.....	379
<i>Aravind Kumar Chandiran</i>	
(6ja) Innovating Multiphase Contactor Design with Advanced Experimental and Simulation Tools	381
<i>Mayur Sathe</i>	
(6jc) Development of a Versatile Drop-based High-Throughput Single-Cell/Molecule Study platform.....	384
<i>Huidan Zhang</i>	
(6jb) Integrated Single-cell Genomics: Combined Epigenome and Transcriptome Sequencing of Single Cells to Understand Cellular Differentiation	385
<i>Siddharth Dey</i>	
(6jd) Water-Energy Nexus Focusing on the Application and Modification of Membrane-Based Desalination Processes.....	388
<i>Leila Karimi</i>	
(6je) Biomaterials--based Charge Storage Devices for Edible Electronics	390
<i>Young Jo Kim</i>	
(6jf) Porous Nano-Structured Doped Materials for Energy-Related Applications.....	391
<i>Maryam Peer</i>	
(6jg) Supramolecular Mesochemistry: Engineering Materials from the Bottom Up	393
<i>Carson J. Bruns</i>	
(6jh) Energy Storage Devices and Advanced Electrochemical Separation Processes	394
<i>Burcu Gurkan</i>	
(6ji) Integrated Design and Operation for Energy Security and Environmental Protection	397
<i>Mahdi Sharifzadeh</i>	
(6jj) Conducting (Flowable) Suspension Electrodes for Water and Energy Technologies	399
<i>Kelsey Hatzell, Yury Gogotsi</i>	
(6jk) Flowable Slurry Electrodes for Electrochemical Processes.....	400
<i>Enoch Nagelli</i>	
(6jl) Development of Advanced Polymeric Membranes for Water-Energy Nexus Challenges	403
<i>Pejman Ahmadiannamini</i>	
(6jm) Tissue Engineering: From Microfluidic Devices to Biopreservation	404
<i>Berk Usta</i>	
(6jn) Dynamic Properties of Interfaces in Soft Matter: Synthesis and New Characterization Techniques.....	405
<i>Jing Yu</i>	
(6jo) Layered Double Hydroxides as Anion Intercalation Electrodes for Battery-Inspired Water Desalination	406
<i>Matthias J. Young, Taylor J. Woehl, Nicholas M. Bedford, Lauren F. Greenlee</i>	

(6jp) Colloid and Nanoparticle Growth and Assembly Dynamics for Materials Design and Molecular Analogues	407
Taylor J. Woehl	
(6jq) Fundamental Modeling of Gas-Solid and Granular Flows	410
Aaron Morris	
(6jr) Innovative Applications in Tissue Engineering and Regeneration	413
Sumati Sundaram	
(6js) High Energy Batteries: Materials Design and Optical Diagnostic Tool Development.....	415
Nian Liu	
(6jt) Computationally Assisted Biofuel Production: Hydrodynamics, Optimization, and Heuristics	418
Justin Smith	
(6ju) Design of Hierarchical 3D Architectures for Energy, Electronic Applications	419
Po-Yen Chen	
(6jv) Research in Thermochemical Conversion of Biomass and Organic Wastes Into Renewable Fuels and High Value Co-products.....	421
Uma Kanta Jena	
(6gc) Advanced Biological Imaging Probes and Sensors Using the Intrinsic Optical Signals of Single-Walled Carbon Nanotubes.....	425
Daniel Roxbury	
(10b) Student Aiche/CACHE Mobile Device APP National Competition.....	426
Robert P. Hesketh	
(10c) The Chemical Engineering App	427
Jason E. Bara, John Patrick McLemore	
(10d) Tracking Students' Use of Online Simulation Applets	428
Anthony Edward Butterfield, Kyle Branch	
(10a) ChE App Help	429
Cory Jensen	
(32a) Providing the Whole Perspective for the Team Process Through an REU	431
Kevin Hadley, Stuart Kellogg, Robb M. Winter	
(32b) Coordination Between Multiple REU Sites	432
Kevin Hadley, Michael West, Bill Cross, Grant Crawford, Thomas Montoya	
(97a) Integration of Process Safety from Introduction to Chemical Engineering to Reaction Engineering.....	433
Jonathan E. Wenzel	
(97b) Safety Immersion Education Using Vanderbilt's Chemical Process Innovation Center	434
Russell F. Dunn, Scott A. Guelcher	
(97c) Process Safety Education Framework for Multidisciplinary Engineering Programmes	435
Ebenezer O. Ojo, Lawrence C. Edomwonyi-Otu	
(97d) From "Process Control" to "Process Control and Safety"	436
Joshua A. Enszer	
(97e) Incorporating Safety into the Undergraduate Laboratory and Capstone Design Course.....	437
Alan W. Weimer	
(97f) Integrating Simulation of Chemical Engineering Operations into Process Safety Education	438
Robert G. Bozic, Matthew B. Garvey, Donald C. Glaser	
(100a) Dual Phase Membranes for High Temperature CO ₂ Separation and Membrane Reactors	457
Kate Sciamanna, J. Douglas Way, Sean Lundin	
(100b) Activity Measurements and Modification of Lactate Dehydrogenase Enzyme with Covalent Addition of Poly(Ethylene Glycol).....	465
Dylan M. Rives, Robert Compton, Robert Chambers	
(100c) The Study of Surface Phases on Aluminide Coatings Using X-Ray Diffraction.....	478
Sutine Sujittosakul, Vilupanur Ravi	
(100d) Improving the Stability of Chitosan-Gelatin Based Injectable Hydrogel for Cardiac Regeneration Therapy	479
Carol Abraham, Christian Tormos, Sundararajan V. Madihally	
(100e) Healing Wounds with Self-Assembled Bioactive Films	480
Julia B. Sun	
(100f) Bisphenol a Exposure Affects Cognitive Development in Schmidtea Mediterranea during Head Regeneration	481
Mark Sharp, Elizabeth Green, Samantha Winterburn, Samantha Marino, Nicholas Costantini, Matthew Wyatt, Thomas Case, Kevin Dahn, Joseph Stanzione, Mary Staehle	
(100g) Distribution Profile of Spherical Drug Carriers and Red Blood Cells in Micro-Vessels.....	491
Alexander Golinski, Mariana Carrasco-Teja, Lola Eniola-Adefeso	
(100h) Effects of an Electric Field on Product Formation in the Steam Reforming Reaction over a Solid Nickel Catalyst	492
Jake T Gray, Jean-Sabin McEwen, Su Ha	
(100i) Benzocyclobutene Functionalized Polynorbornes: Directly Photopatternable Dielectrics	493
Paxton Thedford, Colin Hayes, Phillip Liu, C. Grant Willson	
Conversion of Invasive Species Biomass to Energy and Biochar through Pyrolysis and Torrefaction.....	494
Graham Hoffman, Andreia Y. Salazar, Catherine E. Brewer	
Evaluation of the Newlands Mashu Anaerobic Baffled Reactor and Anaerobic Filter.....	495
M.loffe, N. Melgoza, F. Pinongcos, H. Tegley, A. Bigelow, B. Pietruschka, M. Palomo, N. Mladenov	
Development of Dispersed Ceria on Alumina Support for Platinum Catalysts	496
N/A	

The Effect of Size on Nanoparticle Separation and Recovery Using Tunable Solvents	497
<i>N/A</i>	
Bifunctional Hydrogen Evolution Reaction Catalyst for Solid-State Alkaline Water Electrolysis	498
<i>Yanxin Li</i>	
Synthesis of Shape-Controlled Layered Lanthanum Nickelate Oxides with Enhanced Oxygen Exchange Properties	499
<i>N/A</i>	
Synthesis of Zeolitic Enwrapped Catalysts By Chemical Vapor Deposition	500
<i>Yijia Sun, Shoucheng Du, Chunxiang Zhu, George M. Bollas</i>	
Non-Precious Metal Oxides As Cathode Electrocatalysts for Lithium-Air Batteries	506
<i>Mariana Souza, Ayad Nacy, Suzana Meira, Eranda Nikolla</i>	
Electrochemical Evaluation of Non-Precious Metal Catalysts for Fuel Cell Applications	507
<i>N/A</i>	
Biodesulfurization of Petroleum	508
<i>Mohamed Turkmani, Derek Englert</i>	
Modified Ni-Based Catalyst for Dry Reforming of Methane	509
<i>Samarah Novaes, Ayad Nacy, Da Li, Stephanie L. Brock, Eranda Nikolla</i>	
Catalytic Non-Oxidative Coupling of Methane at Low Temperature	510
<i>Yasmeen Belhseine, Chukwuemeka Okolie, Carsten Sievers</i>	
Scale up Batch Reaction of Precision Polymers	511
<i>Jolie M. Lucero, Chester K. Simcock, Dale L. Huber</i>	
Experimental Analysis of Catalytic Gasification of Waste Polymers	512
<i>Samuel O. Sanya, Aliandra Barbutti, Eric M. Lange, Jade Moten, U. C. Obiako</i>	
An NMR Investigation into the Influence of Phase Transfer Catalyst Aggregation on Brust-Schiffrin Nanoparticle Final Size	513
<i>N/A</i>	
Effect of High Surface Area Carbon Addition to the Performance of a Non-Precious Metal Catalyst in a PEM Fuel Cell	514
<i>N/A</i>	
A Study of Process Scheduling for Smart Grid Coordination	515
<i>N/A</i>	
Protracted Colored Noise Dynamics in Atomically Detailed Simulations	516
<i>N/A</i>	
Modeling Competing Diffusion and Conductivity Effects in Infiltrated Solid Oxide Fuel Cells	517
<i>N/A</i>	
Comparing the Permeability of DPPC Bilayers in the Gel Phase When Surrounded By Water and Ethanol	518
<i>N/A</i>	
Modeling SOFC Performance Incorporating Particle Morphologies and Partial Conductivity	519
<i>Andrew J. L. Reszka, Ryan C. Snyder, Michael Gross</i>	
Determining the Octanol-Water Partition Coefficient of N-Nitrosodimethylamine	520
<i>N/A</i>	
Density Functional Theory Calculations of CO₂ Dissociation on Copper Surfaces	521
<i>Ashaen Patel, Liney Arnadottir</i>	
Elastomeric Bouncy Balls - a Module to Connect Real-World Concepts and Current Engineering Research to K-12 Education	522
<i>N/A</i>	
Spray Drying Laboratory for a Material and Energy Balances Course	523
<i>N/A</i>	
Checkup Mobile Application Abstract	524
<i>Ziad Ibrahim</i>	
Modeling Heat Transfer in a Chilled Twin-Screw Extruder: Towards a Better Understanding of Solid-State Shear Pulverization	525
<i>Evan V. Miu, James E. Maneval, Katsuyuki Wakabayashi</i>	
Using Metabolic Selectors to Facilitate the Development of Activated Sludge Granules	526
<i>Chau B. Le, William Miller, Kevin Gilmore</i>	
Towards Water Disinfection Using Silver Nanoparticle-Modified Ceramic Membranes	527
<i>Michael F. Desmarais, Vinka Oyanedel-Craver, Geoffrey D. Bothun</i>	
Investigation of the Impacts of “Seed” and “Ambient” Particles on the Formation and Characteristics of Secondary Organic Aerosols	528
<i>N/A</i>	
Passive Microrheology to Measure Microbial EPS Production in Situ	529
<i>N/A</i>	
In Vitro Cell-Free Synthetic Biology Techniques for Optimizing Protein Yields	530
<i>N/A</i>	
T4 Bacteriophage Behavior on Paper: Stability after Drying and Long-Term Storage	531
<i>N/A</i>	
Increased Penetrance of Magnetic Nanoparticles through Utilization of an Alternating Magnetic Field for Purposes of Drug Delivery	532
<i>N/A</i>	
High-Throughput Screening for Increased Oil Production in Camelina sativa	533
<i>N/A</i>	

Extraction, Purification, and Characterization of 2'hydroxybiphenyl-2-Sulfonate (HBPS) Desulfinase (DszB) from Rhodococcus Erythropolis.....	534
<i>Shannon G. Woolridge</i>	
Production of Glucose Oxidase Nanocomposite Electrodes for Enzymatic Biofuel Cell Operation.....	535
<i>N/A</i>	
A Computational Study of the Hydrophobic Effect of Organic Molecules in Aqueous Solutions.....	536
<i>N/A</i>	
Design of Layer-By-Layer Thin Films for pH-Triggered Release of Endosomolytic Nanoparticles.....	537
<i>N/A</i>	
Bovine Cartilage Digestion and Characterization of Cellular Surface Proteins Using Atomic Force Microscopy.....	538
<i>N/A</i>	
Platelet Hsp70 Promotes Platelet Spreading and Integrin αIIbb3 Activation.....	539
<i>N/A</i>	
Streamlined Production of Cell-Free Protein Synthesis Reactions Using Auto-Induction Media.....	540
<i>Christina Muhlestein</i>	
Microbial Response in a Synthetic Termite Gut Microenvironment with Micro-Oxygen Gradients	541
<i>N/A</i>	
Iterative Prototyping of Bioengineered Microenvironments Using 3D Printing.....	542
<i>N/A</i>	
Modular Tissue Engineering with GAG-Chitosan Complex Hollow Fibers.....	543
<i>Alexander J. Gagliardi, Howard W.T. Matthew</i>	
Role of Heparan Sulfate and Glycocalyx in Cancer Metastasis.....	544
<i>Michelle Zhang, Solomon Mensah, Eno Ebong</i>	
Combined Cycle Power Plants with Chemical Looping Combustion	546
<i>Kyle D. Such, Chen Chen, Lu Han, George M. Bollas</i>	
Metabolic and Process Engineering of Clostridium Tyrobutyricum for the Optimization of Butanol Production.....	549
<i>N/A</i>	
Bench Scale Evaluation of the Intramicron Desulfurization Technology Suite	550
<i>N/A</i>	
Analysis of Seed Corn Bio-Char	551
<i>N/A</i>	
Evaluation of Polymer-Supported Carbon Electrodes for Implantable Glucose Fuel Cells	552
<i>Fouad Karim, Eranda Nikolla, Howard Matthew</i>	
Pnipam Particles for Protein Delivery to Tumor-Associated Macrophages.....	553
<i>N/A</i>	
Peg Hydrogel with Controlled Degradation Properties for Drug Delivery	554
<i>N/A</i>	
Electrodeposition of Zinc Telluride Thin Films for Photovoltaic Applications	555
<i>N/A</i>	
Hybrid Organic-Inorganic Polyimide-SiO₂-TiO₂ Nanocomposite Gas Separation Membranes	556
<i>N/A</i>	
Iridescent Patterns and Flows in Vertical Foam Films	557
<i>Ewelina Wojcik, Subinuer Yilixiati, Krupa Shah, Brooke Seger, Vivek Sharma</i>	
Surface Functionalization of Thiol-Ene Elastomers for Biomaterial Applications.....	558
<i>N/A</i>	
Optimization of Chemical Vapor Deposition Method for Growth of MoS₂ Nanoflower Structures	559
<i>N/A</i>	
Defect Selective Etching of Bulk Hexagonal Boron Nitride (hBN)	560
<i>N/A</i>	
Characterization of Manganese Oxide Bi-Functional Catalyst for Study of Cathode-Electrode Materials in Zinc-Air Batteries	561
<i>N/A</i>	
A Software Pipeline for the Rational Design of Soft Materials	562
<i>Trevor J. Jones, Christoph Klein, János Sallai, Christopher R. Iacovella, Peter T. Cummings, Clare McCabe</i>	
Capillary Foams: Formation Stages and Effects of Process Parameters	564
<i>N/A</i>	
Lead Sulfide Quantum Dot Solar Cells.....	565
<i>N/A</i>	
Arsenic Removal from Water By Porous Polymers	566
<i>N/A</i>	
(114a) Poster Presentation Success: How to Prepare and Present a Winning Poster.....	567
<i>Alaina Levine</i>	
(129a) The Production of Science Comics to Improve Education for Visual Learners.....	568
<i>Lucas J. Landherr</i>	
(129b) Managing Expanding Class Sizes in an Expanding Chemical Engineering Laboratory	569
<i>Kyle Branch, Anthony Edward Butterfield</i>	
(129c) Teamwork and Teaching Large Sophomore Level Courses	570
<i>Matthew W. Liberatore, Charles Vestal</i>	
(129d) Leveraging Classroom Management Systems to Enhance the Large Class Experience	571
<i>Janet deGrazia, John L. Falconer</i>	

(129e) Utilization of a Game-Based Homework Platform to Personalize Learning within a Large Chemical Product Design Class.....	575
<i>Abigail Kulhanek, Cheryl A. Bodnar</i>	
(129f) Introduction of Collaborative Learning into a Senior Level Transport Phenomena Course.....	576
<i>Gerold A. Willing</i>	
(129g) Forming, Developing, Managing, and Mentoring Academic Teams for Innovation Driven Learning: A Case Study in STEM	577
<i>Dr. Pedro E. Arce, Andrea Arce-Trigatti, Lacy Loggins</i>	
(129h) Leveraging Your Best Students: An Undergraduate Leadership, Teaching, and Mentoring Program	578
<i>Daniel D. Burkey</i>	
(161a) NSF Overview	579
<i>JoAnn Lighty</i>	
(161b) Highlights of CBET Cluster on Chemical, Biochemical & Biotechnology Systems.....	580
<i>Rosemarie D. Wesson</i>	
(161c) Highlights of CBET Cluster on Bioengineering and Engineering Healthcare.....	581
<i>Friedrich Sirenc</i>	
(161e) Highlights on CBET Cluster on Environmental Engineering & Sustainability	582
<i>Gregory Rorrer</i>	
(161f) Highlights of CBET Cluster on Transport and Thermal Fluid Phenomena	583
<i>Dimitrios V. Papavassiliou</i>	
(161d) Interactive Question and Answer Session with NSF Program Directors.....	584
<i>Maria Burka</i>	
(221a) Proposal Writing Tutorial	585
<i>Ram B. Gupta</i>	
(221b) Interactive Breakout Panels	586
<i>JoAnn Lighty, Rosemarie D. Wesson, Athanassios Sambanis, Gregory Rorrer, Dimitrios V. Papavassiliou</i>	
(268a) Developing Engineering Education Publications through Teaching and Service Activities	587
<i>Kevin Dahm</i>	
(268d) The Editor's Secrets: Educational Papers That Are Published with Minimum Fuss.....	597
<i>Phillip C. Wankat</i>	
(290a) Shifting Student Behavior with Guided Activities in Flipped Classrooms.....	603
<i>Christopher Jabczynski, Paul Blowers</i>	
(290b) Show Them the Data: A Strategy to Engage Students in a Material and Energy Balances Course	604
<i>Monica H. Lamm, Shana K. Carpenter, Shuhbir Rahman, Patrick I. Armstrong, Clark R. Coffman, Robert D. Reason</i>	
(290c) Effects of Variability in Instructional Methods on Student Performance and Learning in Mass and Energy Balances	605
<i>Elif Miskioglu, David W. Wood</i>	
(290d) Enhancing Learning and Increasing Rigor in an Introductory Energy Balances Course	606
<i>Mary M. Staehle, Mariano J. Savelski</i>	
(290e) Anatomy of a Highly Structured Material Balances Course	607
<i>Jessie Keeler, Jeffrey A. Nason, Jana Bouwma-Gearhart, Milo D. Koretsky</i>	
(290f) The Beginning and End of a Web Native Textbook for Material and Energy Balances.....	608
<i>Matthew W. Liberatore</i>	
(322a) Opportunities for Chemical Engineering at Charter Schools	609
<i>Richard Long</i>	
(322b) Conversion of Penn State's Chemical Engineering Program Assessment and Evaluation Process	610
<i>Darrell Velegol</i>	
(349a) Combining Interactive Thermodynamics Simulations with Screencasts and Conceptests.....	611
<i>John L. Falconer, Nathan Nelson, Katherine McDanel, Rachael Baumann, Michelle Medlin</i>	
(349b) Flipping the Chemical Reaction Engineering Classroom	612
<i>Kristina Wagstrom</i>	
(349c) The Plug Flow Reactor: An Ad-Hoc Model or a Result of up-Scaling?	613
<i>Oluwatosin Owoseni, Pedro Arce</i>	
(349d) Chemical Engineering Laboratory at the University of Delaware	614
<i>Mark Shiflett, Prasad S. Dhurjati</i>	
(349e) Competitive Adsorption Experiment: Application to Wastewater Pollutant Removal	615
<i>Polly R. Piergianni</i>	
(349f) Process Control – Learning It and Doing It through Labview-Based Design	616
<i>Heidi B. Martin, R. Craig Virnelson</i>	
(349g) Modeling in Chemical Engineering Practice: Math, Science, and Something Different	617
<i>Milo D. Koretsky, Audrey Champagne, Erick Nefcy</i>	
(349h) Teaching Technical and Professional Communication in Chemical Engineering	618
<i>Elif Miskioglu</i>	
(383a) Updates and Insights	619
<i>Douglas K. Ludlow, Randy S. Lewis, Thomas R. Hanley, Ronald P. Danner, Gary K. Patterson</i>	
(423c) Using Board Games to Build Teamwork Skills	620
<i>Kevin Hadley</i>	
(423g) First Year Ranch: Introducing Chemical Engineering through Salad Dressing Design.....	621
<i>Margot Vigeant, Erin Jablonski</i>	

(423b) Development and Assessment of a “Unit Operations in Food Engineering” Course	622
<i>Polly R. Piergiovanni</i>	
(423d) Multidisciplinary Minor Program in Energy and Renewables	623
<i>Zhenglun Li, Kate Field</i>	
(423f) Assessing Student Learning through Student Developed Course Materials	624
<i>Kimberlyn Gray, Marcia Pool</i>	
(423e) Learning By Problem Design and Problem Solving	626
<i>Marcel A. Liauw</i>	
(423h) Professional Formation of Engineers: Revolution at OSU	627
<i>Milo D. Koretsky, Michelle Bothwell, Devlin Montfort, Susan Nolen, Jim Sweeney</i>	
(423j) Development of a Small Scale Fluidized Bed Dryer	628
<i>Luis Fernando Novazzi, Nathalia Vieira Fernandes, Lais Rosa Lanzieri, Camila Fernandes Deboletta, Ana Theresa Milanelli</i>	
(423k) Open Access and Open Source in Chemical Engineering	629
<i>Brandon S. Curtis</i>	
(423i) Development of Education Modules on Sustainable Materials; Natural Gas, Hydraulic Fracturing, Chemical Safety	630
<i>Cory Jensen</i>	
(423m) Integration of undergraduate Paper Science and Engineering and Chemical Engineering Education Using Students' Research Experiences, Teamwork Building Skills, and Classroom-Based Practices	631
<i>Tapas Das, Karyn Biasca</i>	
(423a) Developing and Assessing an Interdisciplinary Nano Tools Course Focused on Problem-Based, Hands-on Learning	632
<i>Geoffrey Bothun, Vinka Oyanadel-Craver</i>	
(454a) Improved Performance Via the Inverted Classroom	633
<i>Randy D. Weinstein</i>	
(454b) A Collection of Virtual Experiments with Tracking of Student Interaction Data	634
<i>Anthony Edward Butterfield, Kyle Branch</i>	
(454c) The Energy Sustainability Remote Laboratory (ESRL)	635
<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	636
<i>Faizan Zubair, Cynthia Brame, Paul Latbinis</i>	
(454e) Scenari + Moodle = Self-Training Module for a Flipped Classroom in Distance Lifelong Learning or in Traditional Teaching	637
<i>Marie Debacq</i>	
(454f) Progress on the SMART-CN Education Modules for Engineering Curriculum	638
<i>Alessandra R. Carreon, Yulin Huang, Thomas F. Edgar, Mario Richard Eden, Cliff Davidson, Mahmoud M. El-Halwagi</i>	
(510a) Computer-Aided Tools for Teaching Sustainable Product-Process Design	639
<i>Deenesh K. Babi</i>	
(510b) Sage Math - an Open Source Computer Algebra System	641
<i>Brandon S. Curtis</i>	
(510c) Developing Graphical Interfaces for Solving Distillation Problems Trough Graphical and Short-Cut Methods	642
<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	643
<i>Russell F. Dunn, Scott A. Guelcher</i>	
(510e) Population Balances in Undergraduate Education in Chemical Engineering	644
<i>Priscilla Hill</i>	
(510f) Using Templates for Demonstrating Good Programming Practices	645
<i>Mordechai Shacham, Michael B. Culpin</i>	
(510g) Teaching Aspen Plus and Other Engineering Software through Video at the University of Delaware	654
<i>Mark Shiflett, Prasad S. Dhurjati</i>	
(525a) The Higher Ed Maker Initiative and the Opportunity for Cheme	655
<i>Margot Vigeant</i>	
(525b) Chemical Engineering Innovation Incubator Laboratory	656
<i>Shannon Ciston, Jeffrey A. Reimer, Colin Cerretani, Esayas Kelkile</i>	
(525c) An Undergraduate Research Project Using 3D Printing	663
<i>Tamara Floyd-Smith, Alisha White, Juliaunica Tigner</i>	
(525d) Laser Cut Microfluidics Projects for Undergraduate Teaching Laboratories	664
<i>Anthony Edward Butterfield, Kyle Branch</i>	
(525e) Open Source Hardware for Data Acquisition and Control	665
<i>Brandon S. Curtis</i>	
(593a) Tendencies of Chemical Engineering in the Last 10 Years	666
<i>Benito Serrano Rosales, Agraham Carrillo Campos, Jose Ramses Garcia Elias, Jared Andre Delgado Perez, Xiuhnel Villagrana Pacheco, Jesus Fabricio Guayaquil Sosa</i>	
(593b) The Use of an on-Line Peer-Review Process in the Framework of a Student Chemical Engineering Project	673
<i>Henri Berthiaux, Nathalie Veillez</i>	
(593c) Learning By Problem Design and Problem Solving: International Collaborations	679
<i>Marcel A. Liauw</i>	

(593e) Design of Techno-Industrial Platform As Pro-Active Recruitment Approach for Biotechnology/Bioprocess Engineering Post-Graduate Students.....	680
<i>Hesham A. El Enshasy, Nor Zalina Othman, Ramlan Aziz</i>	
Chemical Engineering Salary Survey.....	681
<i>Geoffrey Price</i>	
CACHE Overview and Update.....	682
<i>Marianthi Ierapetritou</i>	
The State of Funding, an NSF Perspective	683
<i>JoAnn Lighty</i>	
ABET Update.....	684
<i>Randy S. Lewis</i>	
The Gift of Time: How to Give It and Receive It.....	685
<i>Steven R. Little, Mark A. Burns</i>	
Author Index	