

Distillation Symposium 2016

Topical Conference at the 2016 AIChE Spring Meeting and 12th
Global Congress on Process Safety

Houston, Texas, USA
10-14 April 2016

ISBN: 978-1-5108-2482-9

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© (2016) 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: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

(4a) The Colwell Equation - More Than Just a Clear Liquid Height Model	1
<i>Izak Nieuwoudt, Neil A. Sandford</i>	
(4b) cMIST™: Novel, Compact Gas Dehydration System.....	2
<i>Shwetha Ramkumar, Ed Grave, P. Scott Northrop, Norman K. Yeh</i>	
(4c) What Process Troubleshooters Should Know about Downcomer Gamma Scans.....	3
<i>Henry Z. Kister, Charles Winfield</i>	
(4d) Charlie Colwell's Achievements and Correlation	29
<i>Todd Marut, Berne K. Stober, Simon Chambers, Nathan Lee</i>	
(27a) Vacuum Distillation - Process Configurations.....	30
<i>Andrew W. Soley</i>	
(27b) Atmospheric Crude Distillation - Equipment State-of-the-Art.....	59
<i>Andrew W. Soley</i>	
(27c) Balanced Distillation Equipment Design for Crude Distillation Units.....	86
<i>Soun Ho Lee</i>	
(50a) Rigorous Simulation of a Crude Distillation Unit with Heat Exchanger Network	97
<i>Mohammad Shamsuzzoha, Rakib Mohammad, Mohamed Al Musharfy</i>	
(50b) Retrofit and Off-Line Operational Optimisation of Heat-Integrated Crude Oil Distillation Systems	98
<i>Lluvia M. Ochoa-Estopier</i>	
(50c) Pilot Experiments of a Novel Catalytic Distillation Process for Sulfur Removal of FCC Gasoline	118
<i>Yonghong Li</i>	
(63bb) Using a Large Data Bank to Develop a Robust and Simple Model to Estimate the Saturation Pressure of Oil Reservoirs.....	119
<i>Adel Elsharkawy, Hassan Alkandari, Adel Malallah, Osamah Alomair</i>	
(63af) Purification of Ibuprofen Enantiomers By a New Technique Combining Distillation and Crystallization.....	147
<i>Lie-Ding Shiau</i>	
(63ah) Hydrogen Disposal Flare System Hazard Identification and Mitigation Analysis	148
<i>Alan Sutton, Christopher McGrath, Lawrence Goudie, John Standen</i>	
(63aj) Enhanced Furfural Production By an Innovative Bottom Dividing Wall Column with a Decanter Configuration.....	149
<i>Nguyen Van Duc Long, Le Cao Nhien, Moonyong Lee</i>	
(63ag) Flow Field Simulation and Distribution Performance Analysis of a Gas Pipe Distributor in Fccu.....	150
<i>Yaodong Wei, Lian Yang, Chaoyu Yan, Jianfei Song</i>	
(63d) Identifying Gas Liquid Contactor Performances for Optimized Natural Gas Desacidification Amines Units - from Process Calculations to Experimental Strategy	151
<i>Pascal Alix, Sébastien Gonnard, John Roesler, Gauthier Perdu, Xavier Courtial</i>	
(63ap) Technical Reconstruction of Double Effect Distillation for Methanol Process	152
<i>Jinsheng Sun, Chengtian Cui</i>	
(63h) Experimental and Numerical Study of Transport Phenomenon of Falling Film Flow with Different Heating Methods	153
<i>Xiaoyu Quan, Chunjiang Liu</i>	
(63al) Thermodynamic Modeling of HNO₃-H₂SO₄-H₂O Ternary System with Symmetric Electrolyte NRTL Model	154
<i>Meng Wang, Harnoor Kaur, Chau-Chyun Chen</i>	
(63ar) A Computational Analysis of Fire Scene for Safety in a Compartment	155
<i>Jaedeuk Park, Soo Il Shin, Ki-Jeong Kong</i>	
(63b) Preparation and Characterization of (FURCRAEA spp) as Green Support of Iron Nanostructured Catalyst	156
<i>Karen Giovanna Bastidas Gómez, Anamaria Barrera Bogoya, Hugo Ricardo Zea Ramírez, Cesar Augusto Sierra Avila</i>	
(63at) Optimization of Heat Exchanger Network in Steam Assisted Gravity Drainage Oil Sands Surface Facilities.....	157
<i>Eun B. Cho, Choon H. Kang</i>	

(63j) Thermodynamic Anaysis of Dehydration of n-Propanol Using Heterogeneous Azeotropic Distillation	158
<i>Janakey Devi V. K. P., Sai P. S. T., Balakrishnan A. R.</i>	
(63l) Study of Ionic Liquids As Entrainers for the Extractive Distillation of N-Propanol and N-Propyl Acetate Binary Azeotropic Mixture and the Isobaric VLE Studies of the System	159
<i>George Ankitha Theres, A. R. Balakrishnan</i>	
(63e) Measurement and Correlation of the Mutual Solubility of Diisopropylamine + Water and Triethylamine + Water Systems at High Pressure	160
<i>Pingfang Yuan</i>	
(63n) Improving High Shear Rate Friction Reduction Behavior of Polyacrylamide-Based Fracturing Fluids Using Xanthan Gum	161
<i>Mehdi Habibpour Rezaabadi, Peter Clark</i>	
(63be) Oxidative Dehydrogenation of n-Butane on Carbon Catalysts	162
<i>Sungwon Hwang, Geon Joong Kim, Sungwon Park</i>	
(63av) Modeling the Thermal Behaviors of an Ultracapacitor Module	163
<i>Sung June Park, Boram Koo, Jaeshin Yi, Chee Burn Shin, Jongrak Choi, Ha-Young Lee</i>	
(63aw) Modeling the Electrolyte Flow Behaviors of a Zinc/Bromine Flow Battery Module	164
<i>Boram Koo, Jaeshin Yi, Sung June Park, Chee Burn Shin, Dae-Sik Kim, Hyun-Jin Jung, Tae Hyuk Kang</i>	
(63bf) Blowdown Dynamic Modeling and Analysis of Pressure and Temperature	165
<i>Kyungwoon Kim, Jiwon Seo, Sungwon Hwang</i>	
(63ax) Observer-Based Model Predictive Control for Time-Delay Systems	166
<i>Xinghua Pan, M. Nazmul Karim</i>	
(63ai) Thermodynamic Modeling of Aqueous Lithium Sulfate and Its Solubility in the Presence of Na⁺, K⁺ and Mg²⁺ Sulfates	167
<i>Samira Abedi, Chau-Chyun Chen</i>	
(63ay) Organic Solar Cells	168
<i>Satinder Pal Singh, Avanindra Jaiswal, Naresh Samnerkar</i>	
(63az) A Refined Non-Random Two-Liquid Segment Activity Coefficient Model for Solubility Modeling	169
<i>Yifan Hao, Chau-Chyun Chen</i>	
(63ba) Explaining the Paradox of Asphaltene Precipitation with n-Alkanes	170
<i>M. R. Islam, Chau-Chyun Chen</i>	
(63ab) Optimization of Layered Graphene Oxide Nanostructures through Controlling the Membrane Deposition Rate Towards Size-Sieving Separation	171
<i>Weiwei Xu, Zhuonan Song, Miao Yu</i>	
(63ad) Robust Design of a Radiant Wall Burner for a High Temperature Environment Utilizing Computational Fluid Dynamics Simulations	172
<i>Addison Cruz</i>	
(63g) Novel Microwave Synthesis Carbon Dots from PINE Bark and Its Application for Heavy Metal Sensing	173
<i>Saheed Sanni, Puthalappattu Reddyprasad, Augustine E. Ofomaja</i>	
(63k) Functionalization of OH-Terminated Nanoparticles By Cyclic Azasilanes	184
<i>Oleg A. Mazyar, Radhika Suresh, Valery N. Khabashesku</i>	
(63p) New Development on Hoist Scheduling with the Relaxation of Cyclic Precondition	185
<i>Honglin Qu, Chuanyu Zhao, Qiang Xu</i>	
(63as) Development of Novel Emulsified Acid Using Waste Oil	186
<i>Abdullah S. Sultan, Ziad Sidaoui, Saleh Al-Mutairi, Hicham El Hajj</i>	
(63bg) Molecular Simulation of Controlling Ions and Their Role in Low Salinity IOR for Carbonate Reservoirs	187
<i>Abdullah S. Sultan</i>	
(63ak) Insight into the Mechanism of Toxic Chromium (VI) from Wastewater Using Magnetite Coated PINE Powder	188
<i>Agnes Pholosi, Augustine E. Ofomaja, Bobby Naidoo</i>	
(63m) Copper-Phyllosilicate Core-Shell Nanocatalysts with Balanced Active Sites for Carbon-Oxygen Hydrogenolysis Reactions	191
<i>Jiankang Ying, Weimao Fang, Hairong Yue, Changmin Liu</i>	
(63o) Stimuli-Responsive Rubber in Oil and Gas Application	192
<i>Rostyslav Dolog, Sankaran Murugesan, Valery N. Khabashesku</i>	
(63q) Formal Modeling of Accidents and Automatic Generation of Tutoring Scenarios for Intelligent Safety Training of Process Operators	206
<i>Dongil Shin, En Sup Yoon</i>	

(63ac) Ozone Source Apportionments of Local Anthropogenic Emissions.....	207
<i>Jian Zhang, Ziyuan Wang, Sijie Ge, Qiang Xu, Thomas C. Ho</i>	
(63ae) Flare Minimization and Emission Characterization during Start-Ups of Chilling Train in Ethylene Plants	208
<i>Cuixia Xu, Wayne Chiu, Jian Zhang, Qiang Xu</i>	
(63r) Experimental Study on Najas Minor of Producing Bio-Oil	209
<i>Hong Yin, Jinsheng Sun, Hao Lv</i>	
(63aq) A Combined Rheology and Stability Study on Emulsified Acid for High Temperature Applications.....	214
<i>Ziad Sidaoui, Abdullah S. Sultan</i>	
(63s) Comparative Analysis of Molecular Structure Identifiability Based on Signatures and Descriptors	215
<i>Zelimir Kurtanjek</i>	
(63ao) Dissolution and Precipitation of Minerals Under Different Alkali Concentrations in a Reactive CO₂ Batch System.....	223
<i>Hyukmin Kweon, Yoonsung Goo, Milind Deo</i>	
(128b) Significance of Energy Intensity and GHG Emission Reduction Towards Sustainability of a Petrochemical Plant.....	224
<i>Muhammad Imran, Abdullah Al-Sayari</i>	
(63x) Syngas to Ethylene Glycol: A Technology Overview	225
<i>Muhammad Imran, Abdullah Al-Sayari</i>	
(63bc) Stability and Rheology of Emulsified Acid in Waste Oil: Effect of Emulsifier Concentration, Mixing Speed, Temperature and Droplet Size	226
<i>Ziad Sidaoui, Abdullah S. Sultan</i>	
(63w) Multiscale Simulation of Proteins Motion in the Microchannel	227
<i>Tao Wei, Mohammadreza Samieegohar, Symon Sajib</i>	
(63z) Grand Challenges in Future Energy and Chemicals: Climate Change and Sustainability As Drivers for New Technology and Innovation	228
<i>Joseph B. Powell</i>	
(63y) Electrospun Nanocomposite Fibers for the Removal of Heavy Metals in Water.....	229
<i>Yang Lu, Zhanhu Guo, Suying Wei, Evan K. Wujcik</i>	
(63aa) Heavy Metal Detection in Treated Water Via a Fabric Nanocomposite Sensor	230
<i>Guoqiang Yu, Yang Lu, Zhanhu Guo, Suying Wei, Evan K. Wujcik</i>	
(63bh) Development R&D of Manoir Industries and Emphasis on Coating	231
<i>Hugues Chasselin</i>	
(63v) Biogas Reforming with Addition of Carbon Dioxide to Syngas over Ni-Based Bimodal Pore Catalyst.....	232
<i>Zhenghong Bao, Yongwu Lu, Yebo Li, Fei Yu</i>	
(63am) Continuously Adjustable, Molecular-Sieving "Gate" on 5A Zeolite for Distinguishing Small Organic Molecules By Size	233
<i>Zhuoran Song, Yi Huang, Weiwei Xu, Lei Wang, Miao Yu</i>	
(63a) The Principle of Intrinsic Reality: Solving the World's Woes through Chemical Engineering and Economics.....	234
<i>Jed Moyano Bellen</i>	
(87a) Maximize Tray Deck Performances	248
<i>Giuseppe Mosca, Mark W. Pilling</i>	
(87b) Cyclic Operation of Distillation Columns	249
<i>Carsten Knoesche, Juergen Paschold, Steffen Buetehorn, Claudio Ribeiro</i>	
(87c) Prediction of Valve Tray Pressure Drop	250
<i>Chao Wang, Ken C. McCarley, Tony J. Cai, Anand N. Vennavelli</i>	
(87d) Sulzer UFM Tray - the Next Generation Valve Tray.....	251
<i>Daniel R. Summers</i>	
(87e) A New Realization of Periodic Cycled Separation.....	252
<i>Jens Abildskov, Sten Bay Jorgensen, Bjarne Toftegaard, Charlotte Clausen</i>	
(87f) Distillation Column Troubleshooting with Imaged Improved Gamma Scan Technique.....	253
<i>Marcio Issamu Haraguchi, Hae Yong Kim, Wilson A. P. Calvo</i>	
(120a) Integration of Divided Wall Columns in a Shale Oil Processing Unit	264
<i>Kirtan K. Trivedi, Phillip Melancon, Sundar Narayanan</i>	
(120b) Dividing-Wall Column Screening Guidelines and Applications	265
<i>Robert Tsai, Paul Steacy, Frank Zhu</i>	
(120c) New Superstructure-Based Optimization for Process Intensification.....	266
<i>Salih E. Demirel, Jianping Li, M. M. Faruque Hasan</i>	

(139a) Novel Dividing Wall Columns for Ternary and Quaternary Distillation	267
<i>Gautham Madenoor Ramapriya, Mohit Tawarmalani, Rakesh Agrawal</i>	
(139b) Bridging the Know-How Gap - Hydraulic Design of Packed Dividing Wall Columns	268
<i>Helmut Jansen, Thomas Rietfort, Thorsten Hugen, Igor Dejanovic, Zarko Olujic</i>	
(139c) Dividing Wall Column - Design for a Retrofit	269
<i>Steven Schon</i>	
(188a) Operating Characteristics of Sulzer's High Performance NExring Random Packing	280
<i>Mark W. Pilling, Ilja Ausner</i>	
(188b) Distillation Performance Characteristics of RMP-Type Standard and High Capacity Structured Packings	281
<i>Christian Geipel, Jose Luis Sola Cervera, Frank Seibert</i>	
(188c) Olefins Column Troubleshooting and Process Improvement Project	282
<i>Lowell Pless, Nicholas Graham, Mason Bicker, Rodney Thompson</i>	
(188d) Effect of Liquid Distribution on Structured Packing Performances	283
<i>Anand N. Vennavelli, Chao Wang, Ken C. McCarley, Tony J. Cai</i>	
(188e) A Potential Application of Ceramic Foam Material to Distillation: Structured Corrugation Foam Packing	284
<i>Xin Gao, Hong Li, Xingang Li</i>	
(191a) Distillation Tray Operation	285
<i>Anand N. Vennavelli, Tony J. Cai, Ken C. McCarley, Chao Wang</i>	
(191b) Distillation Packing Operation	286
<i>Tony J. Cai, Anand N. Vennavelli, Chao Wang, Ken C. McCarley</i>	
(191c) Acid Gas Absorption Fundamentals	287
<i>Clint P. Aichele</i>	
(191d) Introduction to Rate Based Mass Transfer Models	288
<i>Anand Govindarajan</i>	
(191e) Process Investigations Using Radioisotope Techniques	289
<i>Lowell Pless, Andy Burleigh, Brian Davis</i>	
(200a) Evaluation of the Axial Mixing and of the Mass Transfer Coefficients in the Distillation Column	290
<i>Frantisek J. Rejl, Jan Haidl, Lukas Valenz</i>	
(200b) Predicting Pressure Drop of Structured Packings at Lowest Operating Pressures	298
<i>Zarko Olujic, Thomas Rietfort, Helmut Jansen</i>	
(200c) Model for Methanol Partitioning in Fractionation Column	299
<i>Rameshwar Hiwale, Kathy Bigger</i>	
(200d) Hydrodynamic Behavior and Residence Time Distribution of Winpak in a Concurrent Downflow Packed Column	300
<i>Pingfang Yuan, Chunjiang Liu</i>	
(200e) Analogy of Mass Transfer in Absorption and Distillation Columns: Wetted Wall Column Study Distillation	301
<i>Jan Haidl, Frantisek J. Rejl, Lukas Valenz, Michael Schultes, Tomas Moucha</i>	
(200f) Comparative Analysis of Phase Doppler Interferometry (PDI) Data Obtained in Forward-Scatter and Back-Scatter for Entrainment Applications	312
<i>Mason Dupre, Raj Manivannan, Tony J. Cai, Ken C. McCarley, James R. Whiteley, Clint P. Aichele</i>	
Author Index	