

Energy and Transport Processes 2013

**Core Programming Topic at the 2013 AIChE Spring Meeting &
9th Global Congress on Process Safety**

**San Antonio, Texas, USA
28 April – 2 May 2013**

ISBN: 978-1-62748-459-6

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© (2013) by AIChE
All rights reserved.

Printed by Curran Associates, Inc. (2013)

For permission requests, please contact AIChE
at the address below.

AIChE
3 Park Avenue
New York, NY 10016-5991

Phone: (203) 702-7660
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

| | |
|--|-----|
| Progress and Challenges in Emerging Clean Energy Technology: A Case Study in Hydrogen and Fuel Cells from the U.S. Department of Energy | 1 |
| <i>Sunita Satyapal</i> | |
| Pilot Plant Controlling Regimes and Scale-up Similitude | 2 |
| <i>Jonathan H. Worstell</i> | |
| Degumming Process Design for Biodiesel Plants | 3 |
| <i>Maoqi Feng</i> | |
| The Role of a Maxi Lab On the Scale-up of New Processes | 4 |
| <i>César González Serrano, Matthew Kuhlman, Gregory Hemmer</i> | |
| Challenges in Commercial Scale up of Novel Poly(phenylene ether)-Polysiloxane Block Copolymer Process | 5 |
| <i>Alvaro Carrillo, Scott Fisher</i> | |
| Pilot and Full-Scale Application of Technologies for Mercury Control | 6 |
| <i>Noah Meeks</i> | |
| Acid Tunneling Vs Acidizing : A Case Study of Rudatain Oilfield-Kuwait | 7 |
| <i>Adel Elsharkawy, Mohamed Al-Hadher</i> | |
| Sustained Casing Pressure Modeling and Well Integrity | 8 |
| <i>Tony Rocha-Valadez, A. Rashid Hasan, C. Shah Kabir, Sam M. Manman</i> | |
| Evaluation of Particle Growth in an Electrochemical Fluidised Bed Reactor | 10 |
| <i>Emmanuel Ehirim</i> | |
| Debottlenecking Gas Dryers and Desiccant Adsorbers | 11 |
| <i>Benjamin A. Schmitt, Michael Ekholm</i> | |
| Design Considerations for Effective Liquid Removal in Suction Drums | 13 |
| <i>Kanti Patel</i> | |
| Renewable Feedstock for Steam Crackers: Catalytic Upgrading of Crude Tall Oil (CTO) Into Bio-Naphtha | 28 |
| <i>Jinto Anthonykutty, Juha Linnekoski, Antero Laitinen, Ali Harlin</i> | |
| High Efficiency Ethylene Cracking Furnaces | 30 |
| <i>Rajaram Ramesh, Marco W.M. Van Goethem</i> | |
| Modernize Control Functionality, Easy Steps to Start Process Optimization | 44 |
| <i>Laurie Ben, James Beall</i> | |
| Paralleled Double-Effect Distillation: Simulative Case Studies | 62 |
| <i>Jinsheng Sun, Pei Wang, Hong Gao, Fan Wang, Leilei Dai, Ming Shi</i> | |
| In Situ Transesterification of Jatropha Curcas Seed Particles with Alkaline Phase Transfer Catalyst | 76 |
| <i>Subbarao Duvvuri, Shuhaimi Mahadzir, Sintayehu Hailegiorgis</i> | |
| Catalyzed-Assisted Manufacture of Olefins (CAMOL): Updated for Use in Naphtha Service | 77 |
| <i>Maximilian Walter, Suzanne Rech</i> | |
| Extending Furnace Run Length and Coil Life by Optimizing Decoking | 78 |
| <i>Vinod Mishra, James Brigman</i> | |
| Solving Operational Problems in Naphtha Splitter | 79 |
| <i>Giorgio Franceschetti, Flavio Weissheimer, Rafael Henrique Camparin, Patrick Lucas</i> | |
| Smartprocess® Application Strategy Achieves Faster and More Efficient Control of an Ethylene Complex | 86 |
| <i>Patrick Truesdale</i> | |
| Ethylene Furnace High Temperature Imaging Cameras to Monitor Burner Flames, Tube Temperature and Tube Failure Detection | 95 |
| <i>Thomas Canty</i> | |
| Straighten up! Non-Linear Compensation Using Feed Forward Control | 103 |
| <i>Barbara Hamilton</i> | |
| Adsorption of CO₂ by Alkaline Activated Ca-Al₂O₃-SiO₂ Material | 104 |
| <i>Naim Faqir, Reyad Shawabkeh</i> | |
| Pressure Gauges: Hidden Danger or Visible Safety | 105 |
| <i>Jeff Placek</i> | |
| Sources Of Energy (from Wood to Hydrogen), How Did We Get Here and Where Do We Go Now | 114 |
| <i>Terry Payne</i> | |
| Component Degradation and Its Mitigation In Polymer Electrolyte Fuel Cells | 115 |
| <i>Vijay Ramani</i> | |

| | |
|---|-----|
| Investigating the Role of Ion in Methanol Oxidation by MDH for Bio-Fuel Cell Applications | 116 |
| <i>Purnima Kharidehal</i> | |
| Redox-Flow Battery Based on a Nonionic Molecular Sieve Zeolite Membrane | 117 |
| <i>Ruidong Yang, Zhi Xu, Junhang Dong</i> | |
| Effects of Nanocarbon Buffer Layers On the Anodic Performance of Copper Oxide and Ball-Milled Graphite Composites | 118 |
| <i>Eun-Suok Oh, Dong-Won Jung</i> | |
| Contributions of Current Density and Voltage Efficiency to Estimated Capital Costs of an All Vanadium Redox-Flow Battery | 119 |
| <i>Mark Moore, Che-nan Sun, Thomas Zawodzinski, Robert Counce, Jack Watson</i> | |
| Overview of PE Licensing Process in United States | 120 |
| <i>William R. Parrish, Cory D. Jensen</i> | |
| Licensure--An Academic Perspective | 123 |
| <i>S. Ranil Wickramasinghe</i> | |
| Testing for Competency - The Professional Engineering Examination | 124 |
| <i>Anne Bertelsmann, Denise Chastain-Knight</i> | |
| The Current Hot Button Issues in Domestic Professional Licensing | 139 |
| <i>Amos Holt</i> | |
| The California Divide – And Why You Need To Engage Your Legislators | 140 |
| <i>Diane Spencer, Emmett Miller</i> | |
| Panel of Speakers | 148 |
| <i>Joseph Cramer, Jeffery Perl</i> | |
| Simulation and Experimental Investigation for Biodiesel Production Using Reactive Distillation | 149 |
| <i>Nada B. Nakkash, Sarah R. Al-Karkhi</i> | |
| Molecular Origin of Cellulose Dissolution in Novel Solvent Mixtures | 163 |
| <i>Ritankar Das, Jih-Wei Chu</i> | |
| Biochemical Engineering Characterisation of a Shaken Micro-Photobioreactor Platform for High-Throughput Development of Microalgae Cultivation Processes | 165 |
| <i>Ebenezer Ojo, Hadiza Auta, Kane Miller, Frank Baganz, Gary J. Lye</i> | |
| Highly Active, Stable, and Recyclable Magnetic Nano-Size Solid Acid Catalysts for Efficient Esterification of Free Fatty Acid in Grease to Produce Biodiesel | 166 |
| <i>Zillillah Zillillah, Guowei Tan, Zhi Li</i> | |
| Development of A Hybrid Neural System for Monitoring the Bioethanol Production with Yeast Recycling | 167 |
| <i>William Herrera, Rubens Maciel</i> | |
| Pellets From Lignocellulosic Materials: Briquetting Process Evaluation | 168 |
| <i>Yuri Gonzalez, Sahra Rincon, Gabriel Camargo</i> | |
| A DFT Study of NaMgH₃ (001) Surfaces : Lattice Dynamics | 169 |
| <i>Fernando A. Soto, Daniela S. Mainardi</i> | |
| Production of Hydrogen From Carbon Compounds by Molten Salt Gasification | 171 |
| <i>Lyman Frost, Bruce Wilding, Neil Camarta, Terry Turner</i> | |
| Low Carbon Hybrid Energy System: A Possible Solution to China's Future Low Carbon Economy | 172 |
| <i>Zhiyong Tang, Yuhan Sun, Tiejun Zhao</i> | |
| Efficient Hydrogen-Rich Syngas Production Via Microwave-Induced Gasification of Bio-Char Derived From Agricultural Residues | 173 |
| <i>Xiaoquan Wang, Hu Luo, Bo Liao Sr., Yuhan Sun</i> | |
| Multi-Stage-Counter Current Rotating Packed Bed For Distillation | 174 |
| <i>Andrzej Gorak, Philip Lutze, Daniel Sudhoff</i> | |
| Effects of Gas Jet in the Downcomer On Liquid Circulation in Internal Loop Airlift Reactors | 175 |
| <i>Luhaibo Zhao, Bo Liao Sr., Xiaohao Liu, Xiaoquan Wang, Yuhan Sun</i> | |
| Comparison of the Thermal Performance of Aluminum and Stainless Steel Compact Heat Exchange Reactors | 176 |
| <i>Steven J. Vallee, Hani Gadalla, Zhijun Jia</i> | |
| Electrodeposition of Aluminum From AlCl₃-BMIC Ionic Liquids in High Gravity Fields | 177 |
| <i>Lianbin Xu, Nannan Shan, Zhiyun Pan, Jian-Feng Chen</i> | |
| MASS Transfer Enhancement Due to the Presence of Rotating Single Twisted Tape Promoter in an Electrolytic Cell | 178 |
| <i>Nalluri chitti Babu, Paladugu Venkateswarlu</i> | |
| Enhancement of Mass Transfer with Square-Grooved Serrated Disc As Turbulence Promoter in Circular Tube | 179 |
| <i>D. S. Seetha Rama Raju, M. Gangadhar, V. Nageswara Rao, Nalluri Chitti Babu</i> | |

| | |
|--|-----|
| Use of Mechanical Agglomeration Technology for Rubber Particle Size Control in Emulsion ABS Production | 190 |
| <i>Jianhua Xu, Vern Lowry, Satish Gaggar, Dane Ferraris</i> | |
| Simulation of Interfacial Rayleigh Convection in Desorption Process by Lattice Boltzmann Method | 202 |
| <i>Bo Fu, Xigang Yuan, Yang Wang, Shaohui Chen, Aiwu Yang</i> | |
| Highly b-Oriented MFI Monolayer Film Synthesized Optical Fiber Chemical Sensor for Analysis of Gas Diffusion | 205 |
| <i>Ruidong Yang, Junhang Dong</i> | |
| LEHCO Desulfurizer - Remove Sulfur and Nitrogen from Petroleum Coke | 206 |
| <i>Louis E. Herrington</i> | |
| Refinery Feedstock From Partially Hydrogenated Biomass Pyrolysis Oil | 214 |
| <i>Richard J. French</i> | |
| Catalytic Pyrolysis of Model Compounds Using Different Acidic Zeolites | 215 |
| <i>Vaishnavi Srinivasan, Sushil Adhikari</i> | |
| Synthesis Gas Production by Autothermal Reforming of Crude Glycerol using a Dual Layer Monolith Catalyst | 216 |
| <i>Yujia Liu, Adeniyi Lawal</i> | |
| Thermophysical Properties Measurements for Bio-Oil Upgrading Process | 217 |
| <i>Erlin Sapei, Juho Autio, Piia Haimi, Thomas Kohl, Timo Laukkanen, Ville Alopaeus, Mika Jarvinen</i> | |
| Fractionation and Characterization of Bio-Oils Produced From Microwave-Assisted Pyrolysis of Rice Straw | 218 |
| <i>Hu Luo, Bo Liao Sr., Yuhan Sun, Xiaoquan Wang</i> | |
| Ceramic and Coal: ITM Oxygen for Power Generation with Reduced CO₂-Emissions, Detailed Engineering Study Results | 219 |
| <i>John M. Repasky, VanEric E. Stein, Phillip A. Armstrong, Merrill S. Quintrell, Andrew Maxson, L. Michael Bartone</i> | |
| Carbon Storage and Methane Production Via Permafrost Gas Hydrate Deposits | 241 |
| <i>Garrett C. Fitzgerald, Marco J. Castaldi</i> | |
| Synthesis of High Performance SAPO-34 Zeolite Membrane for CO₂/CH₄ Separation | 242 |
| <i>Yanfeng Zhang, Meng Li, Yuhan Sun</i> | |
| Author Index | |