

# **14th Topical Conference on Gas Utilization 2014**

**Topical Conference at the 2014 AIChE Spring Meeting and 10th  
Global Congress on Process Safety**

**New Orleans, Louisiana, USA  
30 March – 3 April 2014**

**ISBN: 978-1-63439-063-7**

**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© (2014) by AIChE  
All rights reserved.

Printed by Curran Associates, Inc. (2014)

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](http://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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

## TABLE OF CONTENTS

<b>(1a) Possible vs. Practical: Engineers Must Lead the Development of Practical Technologies .....</b>	1
<i>William Banholzer</i>	
<b>(30a) Key Decisions and the Factors Influencing Them for a Successful LNG Liquefaction Plant – Perspective from an OEM.....</b>	2
<i>Patrice Bardon</i>	
<b>(30b) Star LNG: a Family of Small-to-Mid-Scale LNG Processes.....</b>	16
<i>Heinz C. Bauer</i>	
<b>(30c) Recent Development in Natural Gas Liquefaction Technology.....</b>	23
<i>Fei Chen, Yu-Nan Liu</i>	
<b>(30e) Consistent Methodology for Addressing Greenhouse Gas Emissions from the LNG Value Chain.....</b>	24
<i>Miriam Lev-On, Karin Ritter</i>	
<b>(34a) Kinetic and Thermodynamic Aspects for CO<sub>2</sub> Conversion to Methanol via Trireforming .....</b>	32
<i>Tracy J. Benson, Yishan Zhang, Helen Lou, John Gossage</i>	
<b>(34b) Study of Cobalt Copper Nanoparticles as Catalysts for Ethanol Synthesis from Syngas .....</b>	34
<i>Zi Wang, James J. Spivey</i>	
<b>(34c) Syngas Utilization through High Pressure Solvent Assisted Fischer-Tropsch Synthesis .....</b>	50
<i>Jan H. Blank, Rehan Hussain, Nimir Elbashir</i>	
<b>(34d) Improve Energy Efficiency &amp; Capacity by Integrating Synloop &amp; Process Compressors in Ammonia Plants.....</b>	72
<i>Vk Arora</i>	
<b>(48a) Change Your Board Operator to a Process Manager with State-Based Control .....</b>	73
<i>Tom Nolan, Dustin Beebe</i>	
<b>(48aa) Huaa – When Learning Is Not Enough .....</b>	88
<i>Mike Bearrow</i>	
<b>(48ac) Autocad - Smart Grid – Agriculture - Architecture and the United States Government.....</b>	92
<i>Ethenia Scott</i>	
<b>(48ad) Production, Characterization and Catalytic Studies of Biobased Carbon Materials.....</b>	93
<i>Qiangu Yan, Jilei Zhang, Zhiyong Cai</i>	
<b>(48ag) Uncertainty in Sour Gas Viscosities Estimation, What Is the Effect on Your Reservoir Inflow and Tubing Performance .....</b>	94
<i>Adel Elsharkawy</i>	
<b>(48ah) Chromonic Nanocarriers for Chemotherapeutics: Size Distribution and Control Release Studies.....</b>	95
<i>Rahul Misra, Sanat Mohanty</i>	
<b>(48ai) Double Containment Piping Solutions for Safety and Environmental Concerns .....</b>	96
<i>Patrick Fedor, Darin Johnson</i>	
<b>(48b) DTP Process: On-purpose Propylene Production Technology.....</b>	103
<i>Kazunori Honda, Atsushi Okita, Jumpei Takahashi, Koji Oyama, Nobuyasu Chikamatsu, Mitsuo Morita, Shuji Obayashi</i>	
<b>(48d) Self-Cleaning "Bernoulli" Type Filters Used in Onshore and Offshore Applications .....</b>	108
<i>Artur W. Krueger</i>	
<b>(48f) Effects of Support on Sulfur Tolerance and Regeneration of Pt Catalysts Measured By Ethylene Hydrogenation and EXAFS .....</b>	109
<i>Jorge Pazmino, Chuansheng Bai, Jeffrey T. Miller, Fabio H. Ribeiro, W.N. Delgass</i>	
<b>(48h) Improved Operational Efficiency and Reliability through Insulation Materials Selection .....</b>	110
<i>Steven Coppella</i>	
<b>(48ij) Compliance with EPA Boiler MACT standards: Mercury-In-Fuel Gas.....</b>	111
<i>Patrick Laine</i>	
<b>(48k) Young Professional Simulation Tutorial .....</b>	112
<i>Naomi Hua, Mike Donahue</i>	
<b>(48m) Development Of Polymeric Sulfonic Acid Composite Membranes For Fuel Cell Applications.....</b>	116
<i>Jimoh Adewole, Abdullah S. Sultan, Amir Al-Ahmed, S. M. Jayid Zaidi</i>	
<b>(48o) Facility Siting for Major Projects – Implementation of Consequence Analysis/Quantitative Risk Analysis, a Project Development Lifecycle Framework .....</b>	124
<i>Mohammad Faruq Haider</i>	
<b>(48p) Global Energy and Transportation and Mobil Oil.....</b>	137
<i>Ethenia Scott</i>	

<b>(48r) Characterization of Iron Phthalocyanine As the Active Material for Lithium Batteries</b>	138
<i>Sarwan S. Sandhu, Joseph P. Fellner, David Anneken</i>	
<b>(48s) Design of a Free-Fall Reactor for Fast Pyrolysis of Waste Plastics</b>	139
<i>Pravin Kannan, Ahmed AlShoabi</i>	
<b>(48t) Biosorptive Dehydration of Ethanol/Water Azeotropes Using Compound Starch-Based Adsorbent</b>	140
<i>Wenping Wang, Jinsheng Sun, Xijia Cao, Guangxin Liu</i>	
<b>(48u) Purification of 2-Amino-1-Phenylethanol Enantiomers By a New Technique Combining Distillation and Crystallization</b>	142
<i>Lie-Ding Shiao, Hou-Guo Teng</i>	
<b>(48w) Fabrication of Low Cost Insulating Material from Kaolin Clay for Construction Purposes</b>	143
<i>Naim Faqir, MA Al-Harthi, Hamad AbdulWahhab, Mazen Alshaaeer, Reyad Shawabkeh</i>	
<b>(48x) Thermodynamic Study of Binary PAH (Anthracene + Phenanthrene) Solid Mixtures</b>	144
<i>James W. Rice, Jinxia Fu, Emma Sandström, Eric M. Suuberg</i>	
<b>(48y) How Confident Are You That Your Major Accident Risks Are Under Control?</b>	145
<i>Ellis Graeme, Robert Smith</i>	
<b>(48z) Sil Determination: Shortcomings with the Use of LOPA</b>	146
<i>Alan King</i>	
<b>(52a) Shale Oil and Gas -Wellhead to Fuel</b>	148
<i>Lawrence Kremer</i>	
<b>(64c) Technology Validation Process for Offshore Gas Fields: A Winding Road</b>	160
<i>Ankur Jariwala</i>	
<b>(64d) Technology Qualification - Two Subsea Applications</b>	171
<i>Martha Viteri, Austen Tyler</i>	
<b>(87a) Improving Design of Hot Oil Unit in LNG Plants Using Dynamic Simulation</b>	186
<i>Amudha valli Narasimhan, Jaleel Valapil, Sanjay Ganjam</i>	
<b>(87b) Mol. Sieve Dehydration Unit Potential Problems for LNG Plant</b>	193
<i>J. C. Kuo, Keh-Han Wang</i>	
<b>(87c) Use Exergy Analysis to Increase Efficiencies of Mid-Scale LNG Processes</b>	202
<i>Jian Zhang, Ha Dinh, Yogesh Kurle, Qiang Xu</i>	
<b>(87d) Advanced Thermodynamic Property Models for Natural Gas, LNG and Related Mixtures</b>	204
<i>Roland Span</i>	
<b>(87e) Current Operational LNG Expanders</b>	221
<i>Samuel Afolabi, Arindom Goswami, Hans E. Kimmel</i>	
<b>(93a) Use Off-Gases to Save Energy-Environment &amp; Produce Chemicals</b>	222
<i>Vk Arora</i>	
<b>(93b) A FT-GTL Technology for Small-Scale Applications</b>	223
<i>Mark Peters, Diane Hildebrandt, David Glasser, Wayne Stocks, Andrew Ross-Innes</i>	
<b>(93c) Determination of the Active Sites over Rh Substituted Pyrochlores for Dry Reforming of Methane</b>	241
<i>Devendra Pakhare, Viviane Schwartz, Daniel J. Haynes, Victor Abdelsayed, Dushyant Shekhawat, James J. Spivey</i>	
<b>(93d) Design of Synthetic Fuels and Value-Added Chemicals Derived from Natural Gas via Combined Experimental and Statistical Methodology</b>	269
<i>Rehan Hussain, Elfatih E. Elmalik, Haider Ramadhan, Nimir Elbashir</i>	
<b>(108a) Monetising Gas Hydrates: New Mode for Natural Gas Storage and Transportation Against LNG Storage and Transportation</b>	286
<i>Aman Dhanani, Ishan Shah</i>	
<b>(108b) Towards the Development of a Control-Relevant Model of the Hydraulic Fracturing Process to Investigate Various Control Strategies</b>	287
<i>Karlene A. Hoo, Qiuying Gu</i>	
<b>(108c) Shale Gas as a Potential Source of Unconventional Reserve for Crude Oil</b>	289
<i>Sagar Gaikwad, Utkarsh Maheshwari</i>	
<b>(122a) Dual Layer Spinning with Lumen Layer Containing PAI/Silica/PEI Hollow Fiber Sorbent for CO<sub>2</sub> Separation by Rapid Temperature Swing Adsorption</b>	290
<i>Ying Labreche, Yanfang Fan, Ryan P. Lively, Christopher W. Jones, William J. Koros</i>	
<b>(122b) Application of Controlled Freeze Zone™ Technology for Commercialization of Sour Natural Gas Resources</b>	291
<i>Ananda Krishna Nagavarapu, Jaime A. Valencia, Scott Kelman</i>	
<b>(122c) Modeling and Simulation of Removal of CO<sub>2</sub> and N<sub>2</sub> from Natural Gas Using Aspen Plus Platform</b>	300
<i>Bharadwaz Vedula, Atanu Mukherjee, Utkarsh Maheshwari</i>	

<b>(122d) Model Based Analysis of Plasticization Behaviour of Polymeric Membranes Used for High Pressure CO<sub>2</sub> Separation in Natural Gas Processing.....</b>	301
<i>J. K. Adewole, A. L. Ahmad, S. Ismail, C. P. Leo, A. S. Sultan</i>	
<b>(122e) Surface Area Measurements for Spray Absorption of CO<sub>2</sub> in Amine Solvents.....</b>	302
<i>Yash Tamhankar, James R. Whiteley, Mike Resetarits, Tony Cai, Clint P. Aichele</i>	
<b>(123b) Considerations in the Sizing of Power Generation Facilities for LNG Liquefaction Plants .....</b>	314
<i>Dragan Ristanovic, Cyrus B Mehar-Homji, Neeraj Bhatia, Sunita Singh</i>	
<b>(123d) A Highly Accurate Densimeter for Cryogenic Liquid Mixtures – First Results for LNG .....</b>	323
<i>Markus Richter, Roland Span</i>	
<b>(123e) Flashing Two-Phase LNG Expanders.....</b>	326
<i>Eginhard Berger, Hans Kimmel</i>	
<b>(134a) The Past, Present and Future of LNG .....</b>	327
<i>Harri K. Kytomaa</i>	
<b>(142a) Reliable Technology Selection Links Value Chains: LNG Transfer in FLNG.....</b>	328
<i>Joseph Cho, Henry Ha, Wan-Jae Lee</i>	
<b>(142b) Gas Trial for FLNG Nearshore Commissioning .....</b>	337
<i>Herbert Moon, Paul Kim, Taehee KIM</i>	
<b>(142c) Challenges and New Technologies for World Largest FLNG Facility.....</b>	351
<i>Deogjin Ha</i>	
<b>(142d) Numerical Simulation of Rollover Phenomena for FLNG Application.....</b>	352
<i>Eun Sang Jung, Sangmin Park Sr., Kiil Nam</i>	
<b>(142e) LNG Expanders for Small Scale LNG Liquefaction Plants.....</b>	361
<i>Tyler Brower</i>	
<b>(151a) Increasing Reliability and Functionality of Molecular Sieve Dehydrators.....</b>	362
<i>Benjamin A. Schmitt, Mikael Ekholm, Gene Eberhardt</i>	
<b>(151b) Zeolite Adsorption Studies for Conditioning of High-Pressure Natural Gas Fluids .....</b>	376
<i>Behnaz Hojjati, Rob Marriott</i>	
<b>(151c) Design of Units for Mercury Removal from Hydrocarbon Gas Streams.....</b>	387
<i>Robert W. Soffel, John Markovs</i>	
<b>(151d) Estimation of Calorific Value and Grindability of Colombian Caribbean Coals by Multiple Regression and Artificial Neural Networks.....</b>	389
<i>Yamid Alí Gómez Rueda, Ricardo Andrés Angulo Mercado</i>	
<b>(153a) Safety Study for Optimum Safe Design of FLNG.....</b>	395
<i>Kiil Nam, Jin Sang Park, T.J. Kim, Jaeshin Kim, Sungeun Kim</i>	
<b>(153b) Advanced Modeling for Cryogenic Spill Risk Assessments of Floating LNG .....</b>	404
<i>Filippo Gavelli</i>	
<b>(153c) LNG Plant Inlet Facility - Design, Safety &amp; Operability .....</b>	410
<i>Haribabu Chittibabu, Dipanjan Bhattacharya</i>	
<b>(153d) Design Considerations for Small-Scale LNG Facilities .....</b>	421
<i>Jenna Wilson, Arthur Ransome, Filippo Gavelli</i>	
<b>(153e) Effects of Expansion Foam on Controlling LNG Vaporization Rate .....</b>	430
<i>Bin Zhang, Yi Liu, Tomasz Olewski, Luc Vechot, M. Sam Mannan</i>	
<b>Author Index</b>	