

Advanced Membrane Separation for Sustainability 2013

**Topical Conference at the 2013 AIChE Annual Meeting: Global
Challenges for Engineering a Sustainable Future**

**San Francisco, California, USA
3-8 November 2013**

ISBN: 978-1-63439-030-9

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© (2013) 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

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

(226e) A Sustainable Chemical Industry May Imply Dispersed Manufacturing	1
<i>Edward L. Cussler, Douglas Tiffany</i>	
(142d) Advanced Polymeric Membranes With Tailored Surface Properties	2
<i>Mathias Ulbricht, Marc Birkner, Sven Frost, Mahendra Kumar, Miao Li, Mathias Quilitzsch, Thorsten Pieper, Nico Stahra, Robert Sulc</i>	
(142b) New Material Development for Membrane Separations	4
<i>Richard D. Noble</i>	
(142c) Hybrid Membranes for Improved Molecular Separation in Gas, Liquid-Phase	5
<i>Toshinori Tsuru</i>	
(142a) Nature-Inspired Geomimetic Separation Membranes	6
<i>Kuo-Lun Tung</i>	
(155a) Charged Polymer Membranes for Water Purification, Power Generation	7
<i>Donald R. Paul</i>	
(155b) Opportunities for Scalable Desalination	8
<i>Georges Belfort</i>	
(155c) Desalination Studies Using Membrane Distillation	9
<i>Kamalesh K. Sirkar, Dhananjay Singh</i>	
(142e) Novel Polymeric Hollow Fibers for Pervaporation, Multi-Bore Membranes for Membrane Distillation	10
<i>Tai Shung Chung, Yee Kang Ong, Peng Wang</i>	
(155d) Treatment of Produced Water, Frac Fluids By Ceramic Membranes for a Sustainable Water Reuse	11
<i>Peter Czermak</i>	
(226a) New Developments on Membranes for CO2 Separation, Capture	12
<i>Yuanxin Chen, Kartik Ramasubramanian, Michael A. Severance, Zi Tong, Varun Vakharia, Lin Zhao, Yanan Zhao, Prabir K. Dutta, W.S. Winston Ho</i>	
(226b) Organic Solvent Nanofiltration Molecular Separations In Organic Liquids	13
<i>Andrew G. Livingston</i>	
(226c) Sustainability Issues in Membrane Systems for Bioprocessing	14
<i>Andrew L. Zydney</i>	
(226d) Membrane Separations As "Lever" Points in Biomass-Based Processes	15
<i>John Pellegrino</i>	
(155e) Progresses in Membrane Integrated Systems for Water, Energy, Raw Materials Production	16
<i>Enrico Drioli, Tai-Shung Chung, Francesca Macedonio</i>	
(299a) Solar- Powered Reverse Osmosis Technology for Brackish Water : The State of The Art	17
<i>Leili Abkar, Kwonit Mallick, Rafal Alshukri, Abbas Ghassemi, James Loya</i>	
(299b) Nanofiltration: High Potential, Poorly Defined, Understood	18
<i>David Paulson</i>	
(299c) RO/NF Applications in Brackish Groundwater Desalination: Membrane Characterization	19
<i>Ghazaleh Vaseghi, Abbas Ghassemi, James Loya</i>	
(299d) Investigating the Effective Parameters in Optimizing Reverse Osmosis Technology for Water Treatment	20
<i>Leili Abkar, Abbas Ghassemi, James Loya</i>	
(299e) Carbon Electrode Driven Electrodialysis	21
<i>John Barber, Hai Yang</i>	
(299f) Impact of Silica in Water Treatment Technology	22
<i>Fattaneh Naderi Behdani, Abbas Ghassemi, James Loya</i>	
(299g) Selectivity Comparison for Two Cation Exchange Membranes in the Electrodialysis Process	23
<i>Leila Karimi, Azadeh Ghorbani, Abbas Ghassemi, Jim Loya</i>	
(299h) Developing a Mechanistic Transport Model for Electrodialysis/Electrodialysis Reversal Process	24
<i>Azadeh Ghorbani, Leila Karimi, Abbas Ghassemi, James Loya</i>	
(299i) Flexible Desalination Systems for Variable Salinity Sources	25
<i>Michelle Chapman, Frank Leitz, Andrew Tiffenbach</i>	
(299j) An Innovative, Environmentally Friendly, Low-Cost Desalination System	26
<i>Goli Nossoni, Kiley Markes, Helmer Matinez, Alessandra Piazza, Mohammad Qasim, James P. Abulencia</i>	

(702a) Low-Pressure Sweep Membrane Modules for Carbon Dioxide Capture	27
<i>Jay Kniep, Pingjiao Hao, Ken Chan, Don Fulton, Brice Freeman, Tim Merkel, Richard Baker</i>	
(702b) Major Interest of Hollow Fiber Membrane Contactors for An Ammonia-Based CO2 Capture Process: Detailed Analysis of An Innovative Process	28
<i>Camel Makhloufi, Denis Roizard, Eric Favre</i>	
(702c) Membrane Assisted Liquid Absorbent Regeneration (MALAR):Innovative Use of Membranes in Liquid Absorbent Based CO2 Capture	30
<i>Paul Feron, Shuaifei Zhao</i>	
(702d) Pressure Swing Membrane Absorption for Pre-Combustion CO2 Capture From Shifted Syngas	32
<i>Kamalesh K. Sirkar, John Chau, Xingming Jie, Gordana Obuskovic</i>	
(702e) Application of Composite Polymeric Membranes for Efficient Regeneration of Physical Solvents	33
<i>Alireza Pesaran, Brian Tande</i>	
(702f) Efficient Capture of CO2 From Pulverized Coal Fired Plants	35
<i>Emmanuel A. Dada, Kazeem Olanrewaju, Roy A Drayton</i>	
(780a) Continuous Enzymatic Hydrolysis of Biomass in a Membrane-Assisted Reactor	36
<i>Mohammadmahdi Malmali, Jonathan Stickel, S. Ranil Wickramasinghe</i>	
(780b) Small-Scale Production of Ammonia From a Combined Reactor-Membrane-Adsorber	37
<i>Heath Himstedt, Alon V. McCormick, Lanny D. Schmidt, Edward L. Cussler</i>	
(780d) Membrane Processes for Conversion of Solar Energy to Electricity	38
<i>Glenn Lipscomb, Rahul Patil</i>	
(780e) Industrial Membrane Hybrid Driers	39
<i>Daniel Campos, Stuart Nemser, Kenneth J. Pennisi, Sudipto Majumdar</i>	
(780f) A Generic Approach of Hybrid Membrane / Condensation Process : Potentialities, Limitations	40
<i>Bouchra Belaïssaoui, Eric Favre</i>	
(784a) Characterizing the Gas Transport, Mechanical Properties of Thermally Rearranged (TR) Polymers	42
<i>Qiang Liu, Donald R. Paul, Benny D. Freeman</i>	
(784b) Vapor Permeation of Ethanol, Water in Thermally Rearranged (TR) Polymers	43
<i>Kristofer L. Gleason, Donald R. Paul, Benny D. Freeman</i>	
(784c) Synthesis, Gas Transport of Thermally Rearranged Polyimides for Applications in Gas Separations	44
<i>Zachary P. Smith, David F. Sanders, Ruilan Guo, James E. McGrath, Donald R. Paul, Benny D. Freeman</i>	
(784d) Composite Hollow Fiber Membranes for Post Combustion CO2 Capture	45
<i>Ali A. Rownaghi, William J. Koros, Dhaval Bhandari</i>	
(784e) Exploring Light Gas Transport in Carbon Molecular Sieve Membranes Using Diffusion NMR	47
<i>Robert Mueller, Rohit Kanungo, Mayumi Kiyono-Shimobe, William J. Koros, Sergey Vasenkov</i>	
(784f) ZIF/Polyimide Asymmetric Mixed-Matrix Hollow Fiber Membranes With Significantly Enhanced Hydrocarbon Separation Performance	48
<i>Chen Zhang, William J. Koros</i>	
(814a) Polyimide Membranes With High Fractional Free Volume for Gas Separations	50
<i>Jennifer Wiegand, Ruilan Guo</i>	
(814b) Membrane Gas Separation Processes: Improved Performances Through Unsteady Cyclic Operation	52
<i>Lei Wang, Jean Pierre Corriou, Christophe Castel, Bouchra Belaïssaoui, Eric Favre</i>	
(814c) Multiwalled Carbon Nanotube Mixed-Matrix Membranes Containing Amines for Acid Gas Removal From Natural Gas	54
<i>Luca Ansaloni, Yanan Zhao, Kartik Ramasubramanian, Marco Giacinti Baschetti, W. S. Winston Ho</i>	
(814d) CO2 Removal From High Pressure Natural Gas With Hybrid Fixed-Site-Carrier Membranes: Membrane Material Development	57
<i>Xuezhong He, Taek-Joong Kim, Mohammad Washim Uddin, May-Britt Hägg</i>	
(814e) Performance, Stability of RTIL-Membranes for Dehumidification of Methane	59
<i>Frances Sullivan-Gonzalez, Ryan Amos, Si-Kyun Bae, Paul Scovazzo</i>	
(814f) Polymerized Pyrrolidinium-Based Ionic Liquid Membranes for CO2 Capture	60
<i>Jing Wang, Sheila N. Baker, Gary A. Baker</i>	
Author Index	