

## Oral Sessions Schedule

**Thu, May 25, 2000 - AM**

### Membrane Formation and Modification 1

Benny Freeman, NC State University and Ingo Pinnau, MTR, Inc.

- 9:30 Gas Permeation Properties of Side-Chain Crystalline Polymers  
*Z. Mogri - University of Texas at Austin; D. R. Paul - University of Texas at Austin*
- 9:55 Gas Permeation Properties of Modified Poly(alkyl acetylenes)  
*A. Morisato - MTR, Inc.; Z. He - MTR, Inc.; I. Pinnau - MTR, Inc.*
- 10:20 Plasma Treatment of Rubbery Membrane Materials for Gas Separations  
*Kelly Houston - New Mexico Tech; Don Weinkauf - New Mexico Tech; Fred Stewart - Idaho National Engineering Lab*
- 10:45 Impact of H<sup>+</sup> Ion Irradiation of Polysulfone Membranes  
*J. Ilconich - University of Toledo; E. Pollauf - University of Toledo; X. Xu - University of Toledo; M.R. Coleman - University of Toledo*
- 11:10 Comparative Investigation of Ionically, Covalently, and Ionically-Covalently Cross-linked Ionomer Membranes  
*J. Kerres - Universit?t Stuttgart; W. Zhang - Universit?t Stuttgart; C Tang - Universit?t Stuttgart*
- 11:35 Composite Facilitated Transport Membranes: Preparation, Characterization, and Separation Properties  
*Leonard Kaljevic - U. of Colorado; Carl Koval - U. of Colorado; Richard Noble - U. of Colorado*
- 12:00 Xe Sorption Properties Of Poly(2,6-Dimethyl-1,4-Phenylene Oxide) Films At Low Temperatures  
*Satoshi Ota - Nagoya Institute of Technology; Yoshiharu Tsujita - Nagoya Institute of Technology; Hiroaki Yoshimizu - Nagoya Institute of Technology; Takatoshi Kinoshita - Nagoya Institute of Technology*

**Thu, May 25, 2000**

### Inorganic Membranes for Reaction and Separation 1

Arvind Varma, University of Notre Dame and Michael P. Harold, DuPont Central Research

- 9:30 Molecular Dynamics Simulation of Transport and Separation of Gas Mixtures in Carbon Molecular Sieve Membranes  
*Lifang Xu - University of Southern California; Muhammad Sahimi - University of Southern California; Theodore T. Tsotsis - University of Southern California*
- 9:55 Carbon Membranes for Difficult Gas Separations  
*Keisha Steel - University of Texas at Austin; W. J. Koros - University of Texas at Austin*
- 10:20 Oriented Zeolite Membranes via Pulsed Laser Ablation  
*Kenneth Balkus - UTD; Lisa Washmon - UTD; Sharon Hogue - UTD; Godefroy Gbery - UTD*
- 10:45 Modified ZSM-5 Zeolite Membranes: Preparation and Separation Performance  
*Vu Tuan - CU-Boulder; Joseph Tamburini - CU-Boulder; Richard Noble - CU-Boulder; John Falconer - CU-Boulder*
- 11:10 Growth Behavior and Permeation Properties of Silicalite-1 Membranes on Seeded Porous Support  
*Louisa Tak Yin Au - Hong Kong University of Science and Technology; Wan Cheong Wong - Hong Kong University of Science and Technology; Carlos Tellez - Hong Kong University of Science and Technology; King Lun Yeung - Hong Kong University of Science and Technology*
- 11:35 Characterization of SAPO-34 Membranes by the Effects of Humidity on Gas Permeation  
*Joseph Poshusta - University of Massachusetts; Richard Noble - University of Colorado; John Falconer - University of Colorado*
- 12:00 Silicon Carbide Substrates for Membrane Gas Separations at High-Temperature.  
*Varaporn Suwanmethanon - University of Southern California; George Johnston - Thermal Technology, Inc.; Paul Liu - Media & Process Technology, Inc.; Muhammad Sahimi - University of Southern California; Edward Goo - University of Southern California; Theodore Tsotsis - University of Southern California*

## **Thu, May 25, 2000 - AM**

### **Environmental Separations and Water Treatment 1**

Myriam Fabien, US Bureau of Reclamation-Yuma and Michelle Chapman Wilbert, US Bureau of Reclamation-Denver

- 9:30 Engineered Membrane Separation Systems for Acid Hydrometallurgical Process Improvements  
*Dennis Green - HW Process Technologies; Ron Bernard - HW Process Technologies*
- 9:55 Remediation of Dilute Metal Ion/Oxanyanion Solutions by Polymeric Ligand Functionalized Microfiltration Membranes  
*Stephen Ritchie - University of Kentucky; Jamie Hestekin - University of Kentucky; Kyle Kissick - University of Kentucky; Leonidas Bachas - University of Kentucky; Dibakar Bhattacharyya - University of Kentucky; Chetan Parikh - Daramic, Inc.*
- 10:20 Denitrification in a novel ion exchange membrane bioreactor: minimization of secondary pollution  
*Anabela D. Fonseca - CH2M HILL; Maria A. M. Reis - Univ. Nova Lisboa; Jonas S. Almeida - Univ. Nova Lisboa; Joao P. G. S. Crespo - Univ. Nova Lisboa*
- 10:45 New Fouling Resistant RO Membrane  
*Robert Brown - TriSep; Mike Snodgrass - TriSep; Matt Tanner - TriSep; Mike Jenkins - TriSep*
- 11:10 Strontium Removal with Supported Liquid Membranes  
*W.S. Winston Ho - University of Kentucky; Bing Wang - Commodore Separation Technologies, Inc.*
- 11:35 Ceramic Microfiltration Treatment Systems for the Removal of Heavy Metals from Industrial Wastewater  
*Paul Thoen - BASX Systems; Dave Stewart - BASX Systems; Tom Grove - BASX Systems*
- 12:00 Recovery of VOCs from High-Volume, Low-VOC-Concentration Air Streams by an Absorption-Membrane Process  
*Xiang Wang - MTR, Inc.; Ramin Daniels - MTR, Inc.; Richard W. Baker - MTR, Inc.*

## **Thu, May 25, 2000 - PM**

### **Membrane Formation and Modification 2**

Benny Freeman, NC State University and Ingo Pinnau, MTR, Inc.

- 14:00 A New Preparation Method for Cellulose Composite Membranes  
*Jens Timmermann - GKSS; Suzana Pereira Nunes - GKSS; Klaus-V. Peinemann - GKSS*
- 14:25 Skin Layer Characterization of Defect-Free Polyimide Hollow Fiber Membranes for Gas Separations  
*S.B. Carruthers - University of Texas at Austin; D.T. Clausi - University of Texas at Austin; W.J. Koros - University of Texas at Austin*
- 14:50 Model Development for the Thermally Assisted Evaporative Phase Separation (TAEPS) Process  
*Diana J. Hellman - NSF I/U CRC for Membrane Applied Science and Technology, University of Colorado; Alan R. Greenberg - NSF I/U CRC for Membrane Applied Science and Technology, University of Colorado; William B. Krantz - NSF I/U CRC for Membrane Applied Science and Technology, University of Colorado*
- 15:15 Poly(acrylic acid) Pore Filled Membranes  
*Christopher T.C. McCrory - McMaster University; Alicja Mika - McMaster University; Ronald F. Childs - McMaster University*
- 15:40 Development of Pore Filling Type Organic-Inorganic Composite Membranes by Plasma-Graft Filling Polymerization  
*Takeo Yamaguchi - University of Tokyo; Takahiro Kato - University of Tokyo; Takashi Chiba - University of Tokyo; Balagopal Nair - University of Tokyo; Teruhiko Kai, Shin-ichi Nakao*
- 16:05 Polysulfone Membranes from New Copolymers Formed During Membrane Formation  
*John Charkoudian - Millipore Corp.; Anthony Allegrezza - Millipore Corp.*

## **Thu, May 25, 2000 - PM**

### **Inorganic Membranes for Reaction and Separation 2**

Arvind Varma, University of Notre Dame and Michael P. Harold, DuPont Central Research

- 14:00 Palladium Composite Membranes: Synthesis, Characterization and Hydrogen Permeation Studies  
*Razima Souleimanova - University of Notre Dame; Alexander Mukasyan - University of Notre Dame;*

- Arvind Varma* - University of Notre Dame
- 14:25 Preparation and Characterization of Composite PD/RU Membranes Supported On Porous Stainless Steel  
*Ying She* - WPI; *Peter P. Mardilovich* - WPI; *Yi Hua Ma* - WPI
- 14:50 Synthesis and Fabrication of Ceramic Oxide Tubes for the Separation of Oxygen from Air to Produce Synthesis Gas  
*James Ritchie* - University of Houston; *Dan Luss* - University of Houston; *James Richardson* - University of Houston; *Mikael Nersessian* - University of Houston
- 15:15 Inorganic Membranes for Selective Metal Ion Separation  
*Jennifer Young* - Los Alamos National Lab; *Gordon Jarvinen* - Los Alamos National Lab; *Rob Dye* - Los Alamos National Lab; *Elizabeth Bluhm* - Los Alamos National Lab
- 15:40 Methanol Oxidative Dehydrogenation in a Catalytic Packed-Bed Membrane Reactor  
*Victor Diakov* - Univ. of Notre Dame; *David Lafarga* - Univ. of Notre Dame; *Arvind Varma* - Univ. of Notre Dame
- 16:05 Role of Backpulsing in Fouling Minimization in Crossflow Filtration with Ceramic Membranes  
*Ramesh Bhave* - US Filter; *Rishi Sondhi* - US Filter

## **Thu, May 25, 2000 - PM**

### **Environmental Separations and Water Treatment 2**

Myriam Fabien, US Bureau of Reclamation-Yuma and Michelle Chapman Wilbert, US Bureau of Reclamation-Denver

- 14:00 Novel Fouling-Resistant Polymer-Modified Ceramic Ultrafiltration Membrane for the Treatment of Microemulsified Oil-in-Water Aqueous Wastes  
*Ron Faibish* - UCLA ; *Yorem Cohen* - UCLA
- 14:25 Evaluation of Various Pretreatment Processes in Hybrid NF/RO Treatment of Colorado River Water  
*James Lozier* - CH2MHill; *Sunil Kommineni* - Malcolm Pirnie; *Zaid Chowdhury* - Malcolm Pirnie; *William Suchdolowski* - City of Tucson Water Department; *Marie Pearthree* - City of Tucson Water Department; *Mike Ring* - City of Tucson Water Department; *Willie Farmer* - CH2MHill
- 14:50 Evaluation of Integrity Testing Methods for Reverse Osmosis Systems.  
*Michelle Chapman Wilbert* - USBR; *Kim Linton* - USBR
- 15:15 Behavior of Biofilms growing on Gas Permeable Membranes. Opportunities for Membrane Aerated Bioreactors.  
*Michael Semmens* - U of Minnesota; *H. Hanus* - U of Minnesota; *Karl Dahm* - U of Minnesota
- 15:40 Reactors with Submerged Membranes for Wastewater Treatment  
*Roger Ben Aim* - INSA TOULOUSE; *El Hani Bouhabila* - INSA TOULOUSE
- 16:05 Development of Design Parameters for Rotating Filtration  
*Deepanjan Mitra* - Northwestern University; *John A. Schwille* - Northwestern University; *Richard M. Lueptow* - Northwestern University

## **Thu, May 25, 2000, 4:45PM to 5:45PM**

### **Student Oral Contest 1**

Rich Noble, University of Colorado

- Characterization of the Hydrophobicity of Polymeric RO and NF Membranes: Implications to Membrane Fouling  
*Jonathan A. Brant* - University of Nevada, Reno; *Amy E. Childress* - University of Nevada, Reno
- Skin Layer Characterization of Defect-Free Polyimide Hollow Fiber Membranes for Gas Separations  
*S.B. Carruthers* - University of Texas at Austin; *D.T. Clausi* - University of Texas at Austin; *W.J. Koros* - University of Texas at Austin
- A New Characterization Method For Membrane Pore-Size Distribution Using Fractional Rejection Of Polyethylene Glycol (FR-PEG)  
*Sangyoun Lee* - K-JIST; *Gunyoung Park* - K-JIST; *Jaeweon Cho* - K-JIST; *Seungkwon Hong* - Univ. of Central Florida

- Characterization Of Zeolite Membranes By Transient Gas Permeation  
*Tracy Gardner - University of Colorado; Ana Flores - University of Colorado; John Falconer - University of Colorado; Rich Noble - University of Colorado*
- An Analysis Of The Pore Structure Of Membranes Utilizing Multiple Complementary Pore Structure Characterization Techniques  
*David Greenbaum - Cornell University; Akshaya Jena - Porous Materials, Inc.*
- Impact of H<sup>+</sup> Ion Irradiation of Polysulfone Membranes  
*J. Ilconich - University of Toledo; E. Pollauf - University of Toledo; X. Xu - University of Toledo; M.R. Coleman - University of Toledo*
- Poly(acrylic acid) Pore Filled Membranes  
*Christopher T.C. McCrory - McMaster University; Alicja Mika - McMaster University; Ronald F. Childs - McMaster University*
- Gas Permeation Properties of Side-Chain Crystalline Polymers  
*Z. Mogri - Department of Chemical Engineering, The University of Texas at Austin; D. R. Paul - Department of Chemical Engineering, The University of Texas at Austin*
- Characterization Of Microporous Silica Membranes Using <sup>29</sup>Si and <sup>129</sup>Xe NMR  
*Larry Wagg - Colorado School of Mines; J. Douglas Way - Colorado School of Mines; Steve Dec - Colorado School of Mines*
- Plasma Treatment of Rubbery Membrane Materials for Gas Separations  
*Kelly Houston - New Mexico Tech; Don Weinkauff - New Mexico Tech; Fred Stewart - Idaho National Engineering Lab*

**Thu, May 25, 2000, 4:45PM to 5:45PM**

### **Student Oral Contest 2**

Carl Koval, University of Colorado

- An Integrated Membrane-Based Bioseparation Process  
*Xiao-Ping Dai - NJIT; Robert G. Luo - NJIT; Kamalesh K. Sirkar - NJIT*
- Design of an Affinity Adsorption Membrane Module for Heparin Removal  
*Goetz Friederichs - University of Louisville; Thomas R. Hanley - University of Louisville; Elias Klein - University of Louisville; Ulrich Baurmeister - Membrana GmbH*
- Photofacilitated Transport In Liquid Membranes  
*Michelle Goyette - Department of Chemistry, University of Colorado; Teresa Longin - Department of Chemistry, University of Redlands; Carl Koval - Department of Chemistry, University of Colorado; Richard Noble - Department of Chemical Engineering, University of Colorado*
- Shear-Induced Hydrodynamic Diffusion Model Of Cross-Flow Microfiltration, With The Consideration Of The Axial Variation Of The Transmembrane Pressure  
*Martin Mondor - Universite de Sherbrooke; C. Moresoli - University of Waterloo*
- Chiral Separations Using Ultrafiltration Membranes  
*Jonathan Romero - Dept. Chemical Engineering, Univ. of Delaware; Andrew Zydny - Dept. Chemical Engineering, Univ. of Delaware*
- Direct Visual Observation of Fouling and Cleaning via Rapid Backpulsing of Microfiltration Membranes  
*Wendy Mores - University of Colorado; Robert Davis - University of Colorado*

- Characterization of Polymer-Modified Ceramic Membranes  
*Wayne Yoshida - UCLA; Yoram Cohen - UCLA*
- Membrane Fouling Reduction by Backpulsing and Surface Modification  
*Huimin Ma - CU-Boulder; Christopher Bowman - CU-Boulder; Robert Davis - CU-Boulder*
- Enhancement of Yeast Microfiltration Using Gas Sparging: II. Effect of Feed Properties  
*Hwal Sur - Oxford; Raja Ghosh - Oxford; Zhanfeng Cui - Oxford*
- Interplay between Physical and Chemical Interactions in Colloidal Fouling of Reverse Osmosis and Nanofiltration Membranes  
*Eric Vrijenhoek - Yale University; Menachem Elimelech - Yale University*

**Thu, May 25, 2000, 4:45PM to 5:45PM**

### **Student Oral Contest 3**

Doug Way, Colorado School of Mines

- Zeolite Pervaporation Membranes for Novel Applications  
*Dhaval Shah - University of Kentucky; D. Bhattacharyya - University of Kentucky; A. Ghorpade - SmithKline Beecham*
- Polyphosphazenes as Proton-Exchange Membranes  
*M.A. Hofmann - The Pennsylvania State University, Department of Chemistry; H.R. Allcock - The Pennsylvania State University, Department of Chemistry; S.N. Lvov - The Pennsylvania State University, Department of Energy and Geo-Environmental Engineering; X.Y. Zhou - The Pennsylvania State University, The Energy Institute; M.V. Fedkin, The Pennsylvania State University, The Energy Institute*
- Mixed Matrix Gas Separation Materials  
*Rajiv Mahajan - Department of Chemical Engineering, University of Texas at Austin; William Koros - Department of Chemical Engineering, University of Texas at Austin*
- Enhanced Selectivity in Thin Film Composite Membranes of Poly(3-(2-acetoxyethyl)thiophene  
*Brian Reid - University of Texas at Dallas; Von Ebron - University of Texas at Dallas; Inga Musselman - University of Texas at Dallas; John Ferraris - University of Texas at Dallas; Kenneth Balkus, Jr., - University of Texas at Dallas*
- Gas Permeability Properties of Polysulfone Membranes Containing the Mesoporous Molecular Sieve, MCM-41  
*Brian Reid - University of Texas at Dallas; Alberto Ruiz-Trevino - University of Texas at Dallas; Inga Musselman - University of Texas at Dallas; Kenneth Balkus, Jr. - University of Texas at Dallas; John Ferraris, University of Texas at Dallas*
- Separation Of Aroma Compounds From Fruit Juice By Pervaporation Using Polyocthylmethyl Siloxane (POMS) And Polydimethyl Siloxane (PDMS) Composite Membranes.  
*Panida Sampranpiboon - Univesity of Waterloo; Ratana Jiratananon - King Mongkut's University of Technology Thonburi; Dudsadee Uttapap - King Mongkut's University of Technology Thonburi; Xianshe Feng - Univesity of Waterloo; Robert Huang, Univesity of Waterloo*
- Preparation And Characterization Of Composite Pd/Ru Membranes Supported On Porous Stainless Steel  
*Ying She - WPI; Peter P. Mardilovich - WPI; Yi Hua Ma - WPI*
- Vapor Permeation with NaY- and ZSM-5-Zeolite Membranes for the Separation of Organic Mixtures  
*S. Sommer - Institut fuer Verfahrenstechnik ; T. Melin - Institut fuer Verfahrenstechnik*

- Pervaporation of Aqueous Nitric Acid with an Ionomer Membrane  
*Scott Sportsman - Colorado School of Mines; J.Douglas Way - Colorado School of Mines; Guido Pez - Air Products and Chemicals, Inc.; Daniel Laciak - Air Products and Chemicals, Inc.; Chen Wen-Janq*
- Silicon Carbide Substrates for Membrane Gas Separations at High-Temperature.  
*Varaporn Suwanmethanonnd - University of Southern California; George Johnston - Thermal Technology, Inc.; Paul Liu - Media & Process Technology, Inc.; Muhammad Sahimi - University of Southern California; Edward Goo, University of Southern California and Theodore Tsotsis, University of Southern California*

**Thu, May 25, 2000, 4:45PM to 5:45PM**

**Student Oral Contest 4**

Ranil Wickramasinghe, Colorado State University

- Novel Fouling-Resistant Polymer-Modified Ceramic Ultrafiltration Membrane for the Treatment of Microemulsified Oil-in-Water Aqueous Wastes  
*Ron Faibish - UCLA Chemical Engineering Department; Yorem Cohen - UCLA Chemical Engineering Department*
- Development of Novel Electrocatalysts for Proton Exchange Membrane Fuel Cells  
*Sumana Sharmin - North Carolina A&T State University; Keith Schimmel - North Carolina A&T State University; Shamsuddin Ilias - North Carolina A&T State University*
- Modeling of the Thermally Induced Phase Separation (TIPS) Membrane Formation Process  
*Dongmei Li - ChE, University of Colorado at Boulder; W.B. Krantz - ChE, University of Colorado at Boulder; R.L. Sani - ChE, University of Colorado at Boulder; A.R. Greenberg - ME, University of Colorado at Boulder*
- A Study of Mass Transfer in the Membrane Air-Stripping Process Using Microporous Polypropylene Hollow Fibers  
*Hassan Mahmud - ChE, University of Ottawa, Ottawa, ON, Canada; Takeshi Matsuura - ChE, University of Ottawa, Ottawa, ON, Canada; Roberto M. Narbaitz - CE, University of Ottawa, Ottawa, ON, Canada; Ashwani Kumar - Institute of Chemical Process and Environmental Technology, National Research Council Canada, Montreal Road, Ottawa, ON, Canada*
- Flocculation for the Improvement of Microfiltration  
*Scott Powers - Colorado State University; S. Ranil Wickramasinghe - Colorado State University*
- Characterization of TIPS-Cast ECTFE Membranes  
*Senthilkumar Ramaswamy - ChE, University of Colorado; Alan R. Greenberg - ME, University of Colorado; William B. Krantz - ChE, University of Colorado*
- Remediation of Dilute Metal Ion/Oxanyon Solutions by Polymeric Ligand Functionalized Microfiltration Membranes  
*Stephen Ritchie - University of Kentucky; Jamie Hestekin - University of Kentucky; Kyle Kissick - University of Kentucky; Leonidas Bachas - University of Kentucky; Dibakar Bhattacharyya, University of Kentucky; Chetan Parikh, Daramic, Inc.*
- Investigation of Oxidative Degradation of Polyamide Reverse Osmosis Membranes: Insights from Molecular Model Compounds and Membrane Studies  
*N.P. Soice - Chem & BioChem, University of Colorado; A.D. Norman - Chem & BioChem, University of Colorado; W.B. Krantz - ChE, University of Colorado; A.R. Greenberg -ME, University of Colorado*
- Development of a Nanofiltration Model for Laminar, Cross-Flow Conditions  
*Michael Weber - University of Colorado; Victor Barocas - University of Colorado; Alan Greenberg - University of Colorado; William Krantz - University of Cincinnati*

- Model Development for the Thermally Assisted Evaporative Phase Separation (TAEPS) Process  
*Diana J. Hellman* - ME, MAST, University of Colorado; *Alan R. Greenberg* - ME, MAST, University of Colorado; *William B. Krantz* - ChE, MAST, University of Colorado
- Membrane Separations for Biomass-to-Ethanol Conversion  
*Jeffrey Knutsen* - University of Colorado-Boulder; *Wendy Mores* - University of Colorado-Boulder; *Robert Davis* - University of Colorado-Boulder

## **Fri, May 26, 2000 - AM**

### **Membrane Transport 1**

Ruth Baltus, Clarkson University and Ian Roman, Air Liquide

- 9:30 MD Simulation of Gas Transport through Polymer/Zeolite Composite Interfaces  
*Martin Boehning* - G.K.S.S. Research Centre; *Dieter Hofmann* - G.K.S.S. Research Centre
- 9:55 Supported Nanoporous Carbon Membranes: Experiments and Analysis of Transport.  
*Henry Foley* - Univ. of Delaware-ChE; *Michael Strano* - Univ. of Delaware-ChE; *Mark Shiflett* - Univ. of Delaware-ChE/DuPont; *Madhav Acharya* - Exxon-Mobil
- 10:20
- 10:45 Determination of the Effect of Shear Stress within a Spinneret on Surface Porosity and Skin Structure of Gas Separation Hollow Fiber Membranes  
*Rong Wang* - Environmental Technology Institute, Singapore; *Tai-Shung Chung* - Institute of Materials Research and Engineering, Singapore
- 11:10 Characteristics of Membrane Transport for High Pressure Gas Permeation  
*Bernd Keil* - GKSS; *Morten Schonert* - GKSS; *Klaus Ohlrogge* - GKSS; *Henk Rijkens* - Shell Global Solutions International
- 11:35 Transport of Organic Chemicals in Rubbery Membranes under Mechanical Deformation  
*Juan Hinestroza* - Tulane University; *Daniel De Kee* - Tulane University; *Peter Pintauro* - Tulane University
- 12:00 Organic Vapor Sorption Mechanisms in Plasma Polymerized Thin Films  
*Sam Russell* - New Mexico Tech; *Don Weinkauf* - New Mexico Tech; *Rich Cernosek* - Sandia National Labs; *W. Graham Yelton* - Sandia National Labs

## **Fri, May 26, 2000 - AM**

### **Membrane Fouling, Cleaning, and Characterization 1**

Victor Rodgers, University of Iowa and Jagannadh Satyorohi, Cargill, Inc.- Central Research

- 9:30 Characterization and Fouling of SPEES/PES-PS UF Membranes  
*Yonghun Lee* - University of Illinois; *Corine Combe* - SCT, France; *Bob Riley* - Separation Systems Technology; *Mark M. Clark* - University of Illinois; *Manish Kumar and Yingge Wang* - University of Illinois
- 9:55 Interplay between Physical and Chemical Interactions in Colloidal Fouling of Reverse Osmosis and Nanofiltration Membranes  
*Eric Vrijenhoek* - Yale University; *Menachem Elimelech* - Yale University
- 10:20 Membrane Fouling Reduction by Backpulsing and Surface Modification  
*Huimin Ma* - CU-Boulder; *Christopher Bowman* - CU-Boulder; *Robert Davis* - CU-Boulder
- 10:45 Direct Visual Observation of Fouling and Cleaning via Rapid Backpulsing of Microfiltration Membranes  
*Wendy Mores* - University of Colorado; *Robert Davis* - University of Colorado
- 11:10 Characterization of Zeolite Membranes By Transient Gas Permeation  
*Tracy Gardner* - University of Colorado; *Ana Flores* - University of Colorado; *John Falconer* - University of Colorado; *Rich Noble* - University of Colorado
- 11:35 Property-Sensitive Imaging of Ultrafiltration Membranes using Dynamic (Tapping Mode) Force Microscopy  
*Greg Haugstad* - University of Minnesota; *Srinivas Somayajula* - University of Minnesota;

- 12:00 *Michael Semmens - University of Minnesota; Hiroshi Nomura - Neomecs*  
Characterization of UF and NF Membrane Fouling by Atomic Force Microscopy and Multifractal Analysis  
*Erin Mackey - Carollo Engineers; Mark Wiesner - Rice University; Ana Tarquis - Universitaria Polit?cnica Madrid*

## **Fri, May 26, 2000 - AM**

### **Biomolecular/Membrane Interactions and Drug Delivery**

Kristi Anseth, University of Colorado and Gilles Tapolsky, FeRx, Inc.

- 9:30 Predicting the Release Behavior of High Molecular Weight Solutes From Degradable Poly(Ethylene Glycol)-Based Networks  
*Andrew Metters - University of Colorado at Boulder; Sanxiu Lu - University of Colorado at Boulder; Christopher Bowman - University of Colorado at Boulder; Kristi Anseth - University of Colorado at Boulder*
- 9:55 Effect of Preparation Temperature on the Characteristics and Release Profiles of PLGA Microspheres Containing Protein Fabricated by Double-Emulsion Solvent Extraction/Evaporation Method  
*Hui-Hui Chia - National U of Singapore; Yiyang Yang - Institute of Materials Research and Engineering; Tai-Shung Chung - National U of Singapore*
- 10:20 Novel Application of Reversed Micelles for Bioseparation  
*Shintaro Furusaki - Kyushu University; Masahiro Goto - Kyushu University; Sosaku Ichikawa - Kyushu University*
- 10:45 Proteins at Membrane Interfaces: What do we know?  
*Brian P. Frank - RPI; Ganesh Vedantham - Carnegie Mellon University; H. Gerald Sparks - RPI; Samir U. Sane - RPI; Todd P. Przybycien - Carnegie Mellon University; Georges Belfort - RPI*
- 11:10 pH-sensitive charged membranes having a memory effect of ionic permeation states  
*Mitsuru Higa - Yamaguchi University; Masahide Motonaga - Yamaguchi University; Junichi Sonoda - Yamaguchi University*
- 11:35 Catalytic Biofunctional Membranes: Site-Specific Membrane-Immobilized Enzyme Arrays  
*Allan Butterfield - University of Kentucky; Dibakar Bhattacharyya - University of Kentucky; Sylvia Daunert - University of Kentucky; Leonidas Bachas - University of Kentucky*
- 12:00 The Effect of Wet-out and Entrapped Air Pockets on Hemodialyzer Performance  
*A. Frank - University of Toledo; G. Lipscomb - University of Toledo; M. Dennis - Medical College of Ohio*

## **Fri, May 26, 2000 - PM**

### **Membrane Transport 2**

Ruth Baltus, Clarkson University and Ian Roman, Air Liquide

- 14:00 Photofacilitated Transport in Liquid Membranes  
*Michelle Goyette - University of Colorado; Teresa Longin - University of Redlands; Carl Koval - University of Colorado; Richard Noble - University of Colorado*
- 14:25 Twist and Turn or Dancing with Vortices: An MRI and Numerical Analysis of Curved Tube Flows in Tubular Membranes  
*Hanuman Mallubhotla - RPI and Millipore; William Edelstein - GE Corporate Research & Development; Thomas Earley - GE Corporate Research & Development; Georges Belfort - RPI*
- 14:50 Solvent Controlled Permeability of Gel-filled Porous Membranes  
*Kristen Buehler - Institute for Defense Analysis; John Anderson - Carnegie Mellon University*
- 15:15 Theory and Experiments on the Operation of a Microdialysis Probe in In Vitro and in Dermal In Vivo Systems  
*Johannes Nitsche - State University of New York at Buffalo; Eva Benfeldt - University of Copenhagen*
- 15:40 Understanding Complex Molecular Transport Mechanisms in Pervaporation Using FTIR-ATR Spectroscopy  
*Denise Farmer - Johns Hopkins University; Timothy Barbari - University of Maryland*
- 16:05 Measurement of Diffusion of Lubricants in Polymers from ATR-FTIR Spectroscopy  
*Xiaohua Yi - NIST; Karen Nerbonne - University of Colorado; John Pellegrino - NIST*

16:30 Chemical Expansivity in Ceramics - A New Physical Property of Materials  
Stuart Adler - Case Western Reserve University

### **Fri, May 26, 2000 - PM**

#### **Membrane Fouling, Cleaning, and Characterization 2**

Victor Rodgers, University of Iowa and Jagannadh Satyorohi, Cargill, Inc.- Central Research

- 14:00 A Simple Approach to Estimate Gas Permeability and Selectivity of Extremely Thin and Brittle Materials  
Tai-Shung Chung - National University of Singapore; Eddy S. P. Loh - National University of Singapore; Jyh-Jeng Shieh - National University of Singapore
- 14:25 Hydrodynamic Optimization of Capillary Membrane Modules  
M. P. M. (Mark) Jetten - Eindhoven University of Technology; J. M. K. (Martin) Timmer - Environmental Technology Development and Consultancy; J.G. (Johan) Wijers - Eindhoven University of Technology; J. T. F. (Jos) Keurentjes - Eindhoven University of Technology
- 14:50 Thickness Dependent Physical Aging in Glassy Polymers Used for Gas Separation Membranes  
David Punsalan - Univ. of Texas at Austin; William J. Koros - Univ. of Texas at Austin
- 15:15 An Analysis of the Pore Structure of Membranes Utilizing Multiple Complementary Pore Structure Characterization Techniques  
David Greenbaum - Cornell University; Akshaya Jena - Porous Materials, Inc.
- 15:40 Characterization Of Microporous Silica Membranes Using <sup>29</sup>Si and <sup>129</sup>Xe NMR  
Larry Wagg - Colorado School of Mines; J. Douglas Way - Colorado School of Mines; Steve Dec - Colorado School of Mines
- 16:05 A New Characterization Method For Membrane Pore-Size Distribution Using Fractional Rejection Of Polyethylene Glycol (FR-PEG)  
Sangyounp Lee - K-JIST; Gunyoung Park - K-JIST; Jaeweon Cho - K-JIST; Seungkwan Hong - Univ. of Central Florida
- 16:30 Characterization of the Hydrophobicity of Polymeric RO and NF Membranes: Implications to Membrane Fouling  
Jonathan A. Brant - University of Nevada, Reno; Amy E. Childress - University of Nevada, Reno

### **Fri, May 26, 2000 - PM**

#### **Biological Separations**

Andrew Zydney, University of Delaware and Russell Boyd, Merck & Co., Inc.

- 14:00 Design of an Affinity Adsorption Membrane Module for Heparin Removal  
Goetz Friederichs - University of Louisville; Thomas R. Hanley - University of Louisville; Elias Klein - University of Louisville; Ulrich Baurmeister - Membrana GmbH
- 14:25 Isolation and Purification of m-IgG1 from Tissue Culture Supernatants using Pr A and Strong Cation Exchange Modified Hollow Fibers  
Elias Klein - Univ of Louisville; Merten Klingauf - Fachhochschule Giessen-Friedberg; Sabine Waigel - Peptides Int'l
- 14:50 Development of a Charged Composite Membrane for High Performance Tangential Flow Filtration  
Gizette Sperinde - Genentech; Robert van Reis - Genentech
- 15:15 Chiral Separations Using Ultrafiltration Membranes  
Jonathan Romero - Univ. of Delaware; Andrew Zydney - Univ. of Delaware
- 15:40 Virus Clearance By Flocculation And Microfiltration  
Ranil Wickramasinghe - Colorado State University; Scott Powers - Colorado State University
- 16:05 Enhancement of Yeast Microfiltration Using Gas Sparging: II. Effect of Feed Properties  
Hwal Sur - Oxford; Raja Ghosh - Oxford; Zhanfeng Cui - Oxford
- 16:30 An Integrated Membrane-Based Bioseparation Process  
Xiao-Ping Dai - NJIT; Robert G. Luo - NJIT; Kamalesh K. Sirkar - NJIT

### **Fri, May 26, 2000 - PM**

#### **Gas/Vapor Separations and Pervaporation 1**

Tim Barbari, University of Maryland and Andre DaCosta, MTR, Inc.

- 14:00 Stable Immobilized Liquid Membranes for Gas Separation  
*Hua Chen - New Jersey Institute of Technology; Sarma Kovvali - New Jersey Institute of Technology; Gordana Obuskovic - New Jersey Institute of Technology; Sudipto Majumdar - New Jersey Institute of Technology; Kamalesh Sirkar - New Jersey Institute of Technology*
- 14:25 Mixed Matrix Gas Separation Materials  
*Rajiv Mahajan - University of Texas at Austin; William Koros - University of Texas at Austin*
- 14:50 Glass Membranes used for Aggressive Separations  
*May-Britt Hegg - Norway; K Kuraoka - Norway; T. Yazawa - Norway*
- 15:15 Xylene Isomer Permeation through Crystalline Molecular Sieve Membranes  
*Christopher Gump - University of Colorado; Vu Tuan - University of Colorado; Richard Noble - University of Colorado; John Falconer - University of Colorado*
- 15:40 Experimental and Theoretical Studies of the Effect of Shell Flow Distribution on Shell-Fed Gas Separation Module Performance  
*J. Lemanski - University of Toledo; G. Lipscomb - University of Toledo*
- 16:05 Gas Permeability Properties of Polysulfone Membranes Containing the Mesoporous Molecular Sieve, MCM-41  
*Brian Reid - University of Texas at Dallas; Alberto Ruiz-Trevino - University of Texas at Dallas; Inga Musselman - University of Texas at Dallas; Kenneth Balkus, Jr. - University of Texas at Dallas; John Ferraris - University of Texas at Dallas*
- 16:30 Formation and Characterization of Asymmetric Carbon Molecular Sieve Membranes For Natural Gas Separation  
*De Vu - Univ. of Texas at Austin; William Koros - Univ. of Texas at Austin*

**Sat, May 27, 2000 - AM**

**Gas/Vapor Separations and Pervaporation 2**

Tim Barbari, University of Maryland and Andre DaCosta, MTR, Inc.

- 9:30 Membrane Dehydrator for High Pressure Gases  
*Dilip Kalthod - Air Products and Chemicals Inc.; Donald Stookey - Air Products and Chemicals Inc.; Kenneth Jones - Air Products and Chemicals Inc.*
- 9:55 Membrane Process for Nitrogen Removal from Natural Gas  
*Karl Amo - MTR; Richard Baker - MTR; Andre da Costa - MTR; Ramin Daniels - MTR; Kaaeid Lokhandwala, Matt Ringer, Tim Su, Hans Wijmans*
- 10:20 Production of Ultra-Pure Solvents Using Hollow-Fiber Membrane Technology  
*Scott McCray - Bend Reserach, Inc.; Lori Ray - Bend Research, Inc.; David Newbold - Bend Research, Inc.; Rod Ray - Bend Research, Inc.*
- 10:45 Pervaporation of Water-Alcohol Mixtures using Chemically Modified Phosphazene Polymers.  
*F.F. Stewart - INEEL; M.K. Harrup - INEEL; C.J. Orme - INEEL; D.H. Weinkauff - New Mexico Institute of Mining and Technology*
- 11:10 Pervaporation of Aqueous Nitric Acid with an Ionomer Membrane  
*Scott Sportsman - Colorado School of Mines; J.Douglas Way - Colorado School of Mines; Guido Pez - Air Products and Chemicals, Inc.; Daniel Laciak - Air Products and Chemicals, Inc.; Chen Wen-Jang*
- 11:35 Study And Correlation Of Quasi-Phase Equilibrium For Pervaporation Of Methanol-MTBE-C4~5 Ternary Mixture  
*Huan Lin Chen - Zhejiang University; Lin Zhang - Zhejiang University; Zhejun Zhou - Zhejiang University; Mo Liu - Zhejiang University*
- 12:00 Pervaporation Membrane Reactors and Pervaporation Membrane Enhanced Reactions - Industrial Cases  
*Nick Wynn - Sulzer Chemtech*

**Sat, May 27, 2000 - AM**

**Liquid Separations (RO/NF/UF/MF)**

Menachem Elimelech, Yale University and Steven D. Kloos, Osmonics Inc.

- 9:30 Shear-Induced Hydrodynamic Diffusion Model Of Cross-Flow Microfiltration, With The Consideration Of The Axial Variation Of The Transmembrane Pressure  
*Martin Mondor* - *Universite de Sherbrooke*; *C. Moresoli* - *University of Waterloo*
- 9:55 Nanofiltration-based Diafiltration Process for Solvent Exchange in Pharmaceutical Manufacturing\*  
*Jignesh P. Sheth* - *New Jersey Institute of Technology*; *Yingjie Qin* - *New Jersey Institute of Technology*; *Basil C. Baltzis* - *New Jersey Institute of Technology*; *Kamalesh K. Sirkar* - *New Jersey Institute of Technology*
- 10:20 Characterization of Silica Scaling and its Inhibition in Reverse Osmosis  
*David Hasson* - *Technion-Israel Institute of Technology*; *Iris Sutzkover* - *Technion-Israel Institute of Technology*; *Raphael Semiat* - *Technion-Israel Institute of Technology*
- 10:45 Optimal Membrane Design For Specific MF Applications  
*Dieter Melzner* - *Sartorius AG*
- 11:10 Characterization of Polymer-Modified Ceramic Membranes  
*Wayne Yoshida* - *UCLA*; *Yoram Cohen* - *UCLA*
- 11:35 Solvent and Solute Transport in Nanofiltration Membranes Involving Selected Alkanes and Alcohols  
*Dibakar Bhattacharyya* - *University of Kentucky*; *Dharmesh Bhanushali* - *University of Kentucky*; *Steven D. Kloos* - *Osmonics, Inc.*; *Christopher J. Kurth* - *Osmonics, Inc*
- 12:00 Surface Water Treatment using a Hybrid Reverse Osmosis and Nanofiltration Process  
*Craig Bartels* - *Metropolitan Water District*; *Sun Liang* - *Metropolitan Water District*; *James Green* - *Metropolitan Water District*

## Sat, May 27, 2000 - AM

### Fuel Cell Membranes 1

Peter Pintauro, Tulane University and Robert Kovar, Foster-Miller, Inc.

- 9:30 Membranes For Low Temperature Fuel Cells: Current Situation And Perspectives Of Development  
*Michel Pineri* - *Atomic Energy Commission, DTA/DEM/SPCM, CEA Grenoble*
- 9:55 On the Development of Proton Conducting Polymer Membranes for Methanol Fuel Cell Applications  
*Klaus-Dieter Kreuer* - *MPI-FKF*; *Martin Ise* - *MPI-FKF*; *Joachim Maier* - *MPI-FKF*; *Martin Schuster* - *MPI-P*; *Wolfgang Meyer*
- 10:20 Molecular Design Considerations in the Synthesis of High Proton Conductivity PEMs.  
*Morton Litt* - *CWRU*; *Yue Zhang* - *CWRU*; *Hongyan Jiang* - *CWRU*; *Jesse Wainwright* - *CWRU*; *Robert Savinell*, *H-J Kim*
- 10:45 Proton Friction and Diffusion Coefficients in Hydrated Proton Exchange Membranes  
*Stephen J. Paddison* - *Los Alamos National Laboratory*; *Reginald Paul* - *The University of Calgary*; *Thomas A. Zawodzinski Jr.* - *Los Alamos National Laboratory*
- 11:10 Perfluorinated Ionomers Containing the Sulfonimide Function: Promising Membrane and Electrocatalyst Materials for Higher Temperature PEM Fuel Cells  
*Darryl DesMarteau* - *Clemson University*; *Stephen Creager* - *Clemson University*; *Brian Thomas* - *Clemson University*; *Scott Savett* - *Clemson University*; *Jennie Atkins*, *Shuang Zhou*, *Larry Ford*, *Michael Bollinger* and *Greg Shafer*
- 11:35 New Membranes for PEM Fuel Cell  
*Israel Cabasso* - *Polymer Research Institute, State University of New York - ESF*; *Han Liu* - *Polymer Research Institute, State University of New York - ESF*; *Frederick Johnson* - *Polymer Research Institute, State University of New York - ESF*; *Youxin Yuan* - *P*
- 12:00 Novel Membranes for High Temperature Proton-Exchange Membrane Fuel Cells  
*Kevorc Adjemian* - *Princeton University*; *Chris Yang* - *Princeton University*; *Paola Costamagna* - *Princeton University*; *Seung Jae Lee* - *Princeton University*; *Supramanian Srinivasan* - *Princeton University*; *Andrew Bocarsly* - *Princeton University*

## Sat, May 27, 2000 - PM

### Gas/Vapor Separations and Pervaporation 3

Tim Barbari, University of Maryland and Andre DaCosta, MTR, Inc.

- 14:00 Pervaporation of purely organic mixtures with new highly permeable polyamideimides

- Anne Jonquieres - ENSIC LCPM; Christopher Dole - ENSIC LCPM; Robert Clement - ENSIC LCPM; Laurent Perrin - ENSIC LCPM; Pierre Lochon - ENSIC LCPM*
- 14:25 Vapor Permeation with NaY- and ZSM-5-Zeolite Membranes for the Separation of Organic Mixtures  
*S. Sommer - Institut fuer Verfahrenstechnik ; T. Melin - Institut fuer Verfahrenstechnik*
- 14:50 High temperature separation performance of amorphous silica pervaporation membranes  
*Arjan Verkerk - Eindhoven University of Technology; Marius Vorstman - Eindhoven University of Technology; Jos Keurentjes - Eindhoven University of Technology*
- 15:15 Extraction of Butanol from Aqueous Solutions by Pervaporation Through Poly[1-(TriMethylSilyl)-1-Propyne]  
*Andrei Fadeev - University of Nebraska-Lincoln ; Yana Selinskaya - Topchiev Institute of Petrochemical Synthesis; Michael Meagher - University of Nebraska-Lincoln ; Stephen Kelley - National Renewable Energy Lab; Valery Khotimsky & Victor Volkov - Topchiev Institute*
- 15:40 Separation of aroma compounds from fruit juice by pervaporation using polyocthylmethyl siloxane (POMS) and polydimethyl siloxane (PDMS) composite membranes.  
*Panida Sampranpiboon - Univesity of Waterloo; Ratana Jiratananon - King Mongkut's University of Technology Thonburi; Dudsadee Uttapap - King Mongkut's University of Technology Thonburi; Xianshe Feng - Univesity of Waterloo; Robert Huang - Univesity of W*
- 16:05 Removal and Recovery of Apolar and Polar VOCs from Water by Supported Liquid Membrane-Based Pervaporation  
*Yingjie Qin - New Jersey Institute of Technology; Jignesh P. Sheth - New Jersey Institute of Technology; Kamallesh K. Sirkar - New Jersey Institute of Technology*
- 16:30 Pervaporation of Aromatic/Aliphatic Hydrocarbons through Crosslinked Acrylate Copolymer Membranes  
*Shigetoshi Matsui - University of Texas at Austin; Donald Paul - University of Texas at Austin*

## Sat, May 27, 2000 - PM

### Small-Scale Sample Preparation

Robert Spillman, Millipore Corporation and Jim Davis, Whatman/Polyfiltronics

- 14:00 Challenges in Membrane-Based Sample Preparation for Life Science Applications  
*Robert Spillman - Millipore*
- 14:25 Molecular Weight Cut-off Membrane Applications in the Multiwell Format  
*Martin Smith - Whatman; Dean Tsou - Whatman*
- 14:50 Utilization of Membranes in Continuous Format High Throughput Screening  
*Usha Warrior - Abbott Laboratories; Jennifer Donnelly - Abbott Laboratories; Martin Voorbach - Abbott Laboratories; Kenneth Corness - Abbott Laboratories; Xiaoling Xuei, Caroline David, Yihong Fan, Holly Hahn, Duncan Groebe, Sujatha Gopalakrishnan, Jim Ko*
- 15:15 Adsorptive Structures for MicroScale Sample Preparation  
*Dave Brewster - Millipore; Robert Spillman - Millipore; Bill Kopaciewicz - Millipore; Libby Kellard - Millipore; Cheryl Brucato - Millipore*
- 15:40 Hyphenation of Membrane Extraction with Chromatography for Automated On-Line Analysis of Organic Pollutants in Aqueous Samples.  
*Somenath Mitra - New Jersey Inst. of Technology; Xuemei Guo - New Jersey Inst. of Technology; Anthony San Juan - New Jersey Inst. of Technology; Dawen Kou - New Jersey Inst. of Technology*

## Sat, May 27, 2000 - PM

### Fuel Cell Membranes 2

Peter Pintauro, Tulane University and Robert Kovar, Foster-Miller, Inc

- 14:00 Modeling of Conductive Transport in Proton-Exchange Membranes for Fuel Cells  
*Tony Thampan - Worcester Polytechnic Institute; Sanjiv Malhotra - HPower Corp; Hao Tang - Worcester Polytechnic Institute; Ravindra Datta - Worcester Polytechnic Institute*
- 14:25 Modeling of Polybasic Acid Sorption Equilibria with PBI Films  
*Morton Litt - Case Western Reserve University*
- 14:50 Sulfonated Polyimide Membranes :  
Effect of Polymer Chain Flexibility On Structure And Related Properties.

- N. Cornet - Groupe Polymères Conducteurs Ioniques, Département de Recherche Fondamentale sur la Matière Condensée; C. Genies - CNRS, LMOPS; G. Gebel - Groupe Polymères Conducteurs; F. Jousse - CEA-Le Ripault, DAM/DMAT/CF/LMOD; R. Mercier, CNRS, LMOPS,*
- 15:15 Polyphosphazenes as Proton-Exchange Membranes  
*M.A. Hofmann - Pennsylvania State University; H.R. Allcock - Pennsylvania State University; S.N. Lvov - Pennsylvania State University; X.Y. Zhou - Pennsylvania State University; M.V. Fedkin - Pennsylvania State University*
- 15:40 Measurement of Methanol Diffusivity and Methanol/Water Partitioning in Sulfonated Polyphosphazenes Membranes  
*Roy Carter - Tulane University; Peter Pintauro - Tulane University; Ron Evilia - University of New Orleans*
- 16:05 NMR Study of Non-Aqueous Proton Gel Electrolytes Based on Poly(Vinylidene Fluoride) and H<sub>3</sub>PO<sub>4</sub>  
*S.H. Chung - Physics, Hunter College; Y. Wang - Physics, Hunter College; S.G. Greenbaum - Physics, Hunter College; G. Zukowska - Chemistry, Warsaw University of Technology, Poland; W. Wiczorek, Chemistry, Warsaw University of Technology, Poland*
- 16:30 Application of Acid-Base Blend Membranes in Direct Methanol Fuel Cells  
*L. Joerissen - Universität Stuttgart; J. Kerres - Universität Stuttgart; V. Gogel - Universität Stuttgart; Th. Hering - Universität Stuttgart; A. Ullrich - Universität Stuttgart; J. Kerres*

## Thursday, May 25, 2000 - PM

### Poster Session

1. **Characterization of the Hydrophobicity of Polymeric RO and NF Membranes: Implications to Membrane Fouling**  
*Jonathan A. Brant - University of Nevada, Reno; Amy E. Childress - University of Nevada, Reno*
2. **Skin Layer Characterization of Defect-Free Polyimide Hollow Fiber Membranes for Gas Separations**  
*S.B. Carruthers - University of Texas at Austin; D.T. Clausi - University of Texas at Austin; W.J. Koros - University of Texas at Austin*
3. **A new characterization method for membrane pore-size distribution using fractional rejection of polyethylene glycol (FR-PEG)**  
*Sangyoun Lee - K-JIST; Gunyoung Park - K-JIST; Jaeweon Cho - K-JIST; Seungkwon Hong - Univ. of Central Florida*
4. **Characterization of Zeolite Membranes By Transient Gas Permeation**  
*Tracy Gardner - University of Colorado; Ana Flores - University of Colorado; John Falconer - University of Colorado; Rich Noble - University of Colorado*
5. **An Analysis of the Pore Structure of Membranes Utilizing Multiple Complementary Pore Structure Characterization Techniques**  
*David Greenbaum - Cornell University; Akshaya Jena - Porous Materials, Inc.*
6. **Impact of H<sup>+</sup> Ion Irradiation of Polysulfone Membranes**  
*J. Ilconich - University of Toledo; E. Pollauf - University of Toledo; X. Xu - University of Toledo; M.R. Coleman - University of Toledo*
7. **Poly(acrylic acid) Pore Filled Membranes**  
*Christopher T.C. McCrory - McMaster University; Alicja Mika - McMaster University; Ronald F. Childs - McMaster University*
8. **Gas Permeation Properties of Side-Chain Crystalline Polymers**  
*Z. Mogri - University of Texas at Austin; D. R. Paul - University of Texas at Austin*
9. **Characterization Of Microporous Silica Membranes Using <sup>29</sup>Si and <sup>129</sup>Xe NMR**  
*Larry Wagg - Colorado School of Mines; J. Douglas Way - Colorado School of Mines; Steve Dec - Colorado School of Mines*
10. **Plasma Treatment of Rubbery Membrane Materials for Gas Separations**  
*Kelly Houston - New Mexico Tech; Don Weinkauff - New Mexico Tech; Fred Stewart - Idaho National Engineering Lab*
11. **An Integrated Membrane-Based Bioseparation Process**  
*Xiao-Ping Dai - NJIT; Robert G. Luo - NJIT; Kamallesh K. Sirkar - NJIT*
12. **Design of an Affinity Adsorption Membrane Module for Heparin Removal**

*Goetz Friederichs - University of Louisville; Thomas R. Hanley - University of Louisville; Elias Klein - University of Louisville; Ulrich Baurmeister - Membrana GmbH*

- 13. Photofacilitated Transport in Liquid Membranes**  
*Michelle Goyette - University of Colorado; Teresa Longin - University of Redlands; Carl Koval - University of Colorado; Richard Noble - University of Colorado*
- 14. Shear-Induced Hydrodynamic Diffusion Model Of Cross-Flow Microfiltration, With The Consideration Of The Axial Variation Of The Transmembrane Pressure**  
*Martin Mondor - Universite de Sherbrooke; C. Moresoli - University of Waterloo*
- 15. Chiral Separations Using Ultrafiltration Membranes**  
*Jonathan Romero - Univ. of Delaware; Andrew Zydny - Univ. of Delaware*
- 16. Direct Visual Observation of Fouling and Cleaning via Rapid Backpulsing of Microfiltration Membranes**  
*Wendy Mores - University of Colorado; Robert Davis - University of Colorado*
- 17. Characterization of Polymer-Modified Ceramic Membranes**  
*Wayne Yoshida - UCLA; Yoram Cohen - UCLA*
- 18. Membrane Fouling Reduction by Backpulsing and Surface Modification**  
*Huimin Ma - CU-Boulder; Christopher Bowman - CU-Boulder; Robert Davis - CU-Boulder*
- 19. Enhancement of Yeast Microfiltration Using Gas Sparging; II. Effect of Feed Properties**  
*Hwal Sur - Ind.; Raja Ghosh - Ind.; Zhanfeng Cui - Ind.*
- 20. Interplay between Physical and Chemical Interactions in Colloidal Fouling of Reverse Osmosis and Nanofiltration Membranes**  
*Eric Vrijenhoek - Yale University; Menachem Elimelech - Yale University*
- 21. Zeolite Pervaporation Membranes for Novel Applications**  
*D. Shah - University of Kentucky; D. Bhattacharyya - University of Kentucky; A. Ghorpade - SmithKline Beecham; R. E. Hannah - University of Kentucky*
- 22. Polyphosphazenes as Proton-Exchange Membranes**  
*M.A. Hofmann - Pennsylvania State University; H.R. Allcock - Pennsylvania State University; S.N. Lvov - Pennsylvania State University; X.Y. Zhou - Pennsylvania State University; M.V. Fedkin - Pennsylvania State University*
- 23. Mixed Matrix Gas Separation Materials**  
*Rajiv Mahajan - University of Texas at Austin; William Koros - University of Texas at Austin*
- 24. Enhanced Selectivity in Thin Film Composite Membranes of Poly(3-(2-acetoxyethyl)thiophene**  
*Brian Reid - University of Texas at Dallas; Von Ebron - University of Texas at Dallas; Inga Musselman - University of Texas at Dallas; John Ferraris - University of Texas at Dallas; Kenneth Balkus, Jr., - University of Texas at Dallas*
- 25. Gas Permeability Properties of Polysulfone Membranes Containing the Mesoporous Molecular Sieve, MCM-41**  
*Brian Reid - University of Texas at Dallas; Alberto Ruiz-Trevino - University of Texas at Dallas; Inga Musselman - University of Texas at Dallas; Kenneth Balkus, Jr. - University of Texas at Dallas; John Ferraris - University of Texas at Dallas*
- 26. Separation of aroma compounds from fruit juice by pervaporation using polyocthylmethyl siloxane (POMS) and polydimethyl siloxane (PDMS) composite membranes.**  
*Panida Sampranpiboon - Univesity of Waterloo; Ratana Jiratananon - King Mongkut's University of Technology Thonburi; Dudsadee Uttapap - King Mongkut's University of Technology Thonburi; Xianshe Feng - Univesity of Waterloo; Robert Huang - Univesity of Waterloo*
- 27. Preparation and Characterization of Composite PD/RU Membranes Supported On Porous Stainless Steel**  
*Ying She - WPI; Peter P. Mardilovich - WPI; Yi Hua Ma - WPI*
- 28. Vapor Permeation with NaY- and ZSM-5-Zeolite Membranes for the Separation of Organic Mixtures**  
*S. Sommer - Institut fuer Verfahrenstechnik ; T. Melin - Institut fuer Verfahrenstechnik*
- 29. Pervaporation of Aqueous Nitric Acid with an Ionomer Membrane**  
*Scott Sportsman - Colorado School of Mines; J.Douglas Way - Colorado School of Mines; Guido Pez - Air Products and Chemicals, Inc.; Daniel Laciak - Air Products and Chemicals, Inc.; Chen Wen-Janq*
- 30. Silicon Carbide Substrates for Membrane Gas Separations at High-Temperature.**  
*Varaporn Suwanmethanond - University of Southern California; George Johnston - Thermal Technology, Inc.; Paul Liu - Media & Process Technology, Inc.; Muhammad Sahimi - University of Southern California; Edward Goo - University of Southern California; Theodore Tsotsis - University of Southern California*

31. **Novel Fouling-Resistant Polymer-Modified Ceramic Ultrafiltration Membrane for the Treatment of Microemulsified Oil-in-Water Aqueous Wastes**  
*Ron Faibish - UCLA ; Yorem Cohen - UCLA*
32. **Development of Novel Electrocatalysts for Proton Exchange Membrane Fuel Cells**  
*Sumana Sharmin - North Carolina A&T State University; Keith Schimmel - North Carolina A&T State University; Shamsuddin Ilias - North Carolina A&T State University*
33. **Modeling of the Thermally Induced Phase Separation (TIPS) Membrane Formation Process**  
*Dongmei Li - University of Colorado; W.B. Krantz - University of Colorado; R.L. Sani - University of Colorado; A.R. Greenberg - University of Colorado*
34. **A Study of Mass Transfer in the Membrane Air-Stripping Process Using Microporous Polypropylene Hollow Fibers**  
*Hassan Mahmud - University of Ottawa; Takeshi Matsuura - University of Ottawa; Roberto M. Narbaitz - University of Ottawa; Ashwani Kumar - Institute of Chemical Process and Environmental Technology, National Research Council Canada*
35. **Flocculation For the Improvement of Microfiltration**  
*Scott Powers - Colorado State University; S. Ranil Wickramasinghe - Colorado State University*
36. **Characterization of TIPS-Cast ECTFE Membranes**  
*Senthilkumar Ramaswamy - University of Colorado; Alan R. Greenberg - University of Colorado; William B. Krantz - University of Colorado*
37. **Remediation of Dilute Metal Ion/Oxyanion Solutions by Polymeric Ligand Functionalized Microfiltration Membranes**  
*Stephen Ritchie - University of Kentucky; Jamie Hestekin - University of Kentucky; Kyle Kissick - University of Kentucky; Leonidas Bachas - University of Kentucky; Dibakar Bhattacharyya - University of Kentucky; Chetan Parikh - Daramic, Inc.*
38. **Investigation of Oxidative Degradation of Polyamide Reverse Osmosis Membranes: Insights from Molecular Model Compounds and Membrane Studies**  
*N.P. Soice - University of Colorado; A.D. Norman - University of Colorado; W.B. Krantz - University of Colorado; A.R. Greenberg - University of Colorado*
39. **Development of a Nanofiltration Model for Laminar, Cross-Flow Conditions**  
*Michael Weber - University of Colorado; Victor Barocas - University of Colorado; Alan Greenberg - University of Colorado; William Krantz - University of Cincinnati*
40. **Model Development for the Thermally Assisted Evaporative Phase Separation (TAEPS) Process**  
*Diana J. Hellman - NSF I/U CRC for Membrane Applied Science and Technology , University of Colorado; Alan R. Greenberg - NSF I/U CRC for Membrane Applied Science and Technology , University of Colorado; William B. Krantz - NSF I/U CRC for Membrane Applied Science and Technology , University of Colorado*
41. **Membrane Separations for Biomass-to-Ethanol Conversion**  
*Jeffrey Knutsen - University of Colorado; Wendy Mores - University of Colorado; Robert Davis - University of Colorado*
42. **The Removal Trend of Heavy Metals in Batch Recycle System Using Mixed Biomembrane**  
*Ikjoong Kang - Kyungwon University; Kapkeun Kim - Kyungwon University*
43. **The removal effects of organic components in the bioreactor using anaerobics**  
*Ikjoong Kang - Kyungwon University*
44. **Membrane bioreactor with ceramic membrane for removal of wastewater-effluent organic matter**  
*Yongki Shim - K-JIST; Dohee Kim - K-JIST; Jaeweon Cho - K-JIST; I.S. Kim - K-JIST*
45. **Drying of Used Blend Cellulose Acetate Membrane Elements Using DOE (Design of Experiments)**  
*Myriam J Fabien - US Bureau of Reclamation; Brent Corbett - Burns & Roe Services*
46. **Multilayer Electrochemical Cell Technology Using Sol-Gel Processing**  
*Sandra Mege - Rutgers University; Lisa Klein - Rutgers University; Ravi Chandran - CHEMIONIC Ent. Inc*
47. **Synthesis And Characterization Of YSZ Electrolyte Thin Films For Solid Oxide Fuel Cells By Sol-Gel Spin Coating**  
*Sukhwan Lim - Korea University, Dept. Of Chemical Engineering; Taeyoon Kim - Korea University, Dept. Of Chemical Engineering; Sangjin Moon Moon - Korea University, Dept. Of Chemical Engineering; Suk-In Hong - Korea University, Dept. Of Chemical Engineering; Hoonjun Kim - Kyonggi University*
48. **Dielectric Properties of Nafion Pores**  
*Stephen J. Paddison - Los Alamos National Laboratory; Reginald Paul - The University of Calgary*
49. **High-Efficiency Electrochemical Generation Of Ozone In A Proton-Exchange Membrane Reactor**

*Dmitri Bessarabov - University of Stellenbosch*

**50. Flowsheet Optimization of Membrane Separation Systems**

*Michael Henson - Louisiana State University*

**51. Thin-film Silicalite-Silicone Composite Membrane for Recovery of Butanol by Pervaporation. I. Ultrafine Silicalite-1 Particle Synthesis and Membrane Fabrication**

*Jicai Huang - University of Nebraska; Michael M. Meagher - University of Nebraska*

**52. Gas Transport Properties of Poly(vinylpyridine) Films**

*Jyh-Jeng Shieh - Industrial Technology Research Institute*

**53. Relationship Between Chain Mobility And Gas Permeation By CP/MAS NMR Relaxation Study Of Substituted Polysulfones**

*Kwi Jong Lee - Seoul National University; Hyun Chae Park - Korea Institute of Science and Technology; Jae Young Jho - Seoul National University; Yong Soo Kang - Korea Institute of Science and Technology; Michael D. Guiver - National Research Council of Canada*

**54. Pure Components And Mixture Diffusion Of Liquids And Vapors In Polymers Using ATR-FTIR-Spectroscopy**

*O. Stange - GKSS Research Center Geesthacht GmbH; X. Yi - NIST; K. Ebert - GKSS Research Center Geesthacht GmbH; J. Pellegrino - NIST; K. Ohlrogge, GKSS Research Center Geesthacht GmbH*

**55. Dissolved-Oxygen Permeability Effect of heavy Ion Irradiation of Methacrylate Copolymer Membranes Containing Hydrophilic Group**

*Shuuichi Takahashi - Meiji University; Tsutomu Nakagawa - Meiji University*

**56. Preparation and Performance of Blended Polymer/Ceramic Membranes for Dehydration of Isopropyl Alcohol by Pervaporation**

*Ravi Prasad Ponangi - ORISE/U.S.EPA; Ballard Mullins - U.S. EPA; Johnny Springer Jr. - U.S. EPA; Leland Vane - U.S. EPA; Latonya Dawson*

**57. Poly(3-octylthiophene) / NaY Zeolite Composite Membranes for Gas Separations**

*Inga H. Musselman - University of Texas at Dallas; Sudha Madhugiri - University of Texas at Dallas; Kenneth J. Balkus, Jr. - University of Texas at Dallas; John P. Ferraris - University of Texas at Dallas*

**58. Optimization of Inorganic Membrane Module Design**

*B. Klinkhammer - Institut fur Verfahrenstechnik; S. Sommer - Institut fur Verfahrenstechnik; T. Melin - Institut fur Verfahrenstechnik; H. van Veen - Netherlands Energy Research Foundation*

**59. Analysis Of The Permeation Behaviors Of VOCs/N<sub>2</sub> Mixtures Through PDMS Membrane: The Permeation Of Alcohol/N<sub>2</sub> Mixture**

*C.K. Yeom - Korea Research Institute of Chemical Technology; S. Lee - Korea Research Institute of Chemical Technology; H.Y. H.Y.Song - Korea Research Institute of Chemical Technology; J.M. Lee - Korea Research Institute of Chemical Technology*

**60. A Characterization Of The Permeation Of VOCs/N<sub>2</sub> Mixtures Through PDMS Membrane: The Permeation Of Chlorinated Hydrocarbon/N<sub>2</sub> Mixtures**

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**61. Gas Permeation Of Polyaniline As An Organic Molecular Sieve**

*Ho Bum Park - Hanyang University; Seong Yong Ha - Hanyang University; Young Moo Lee - Hanyang University*

**62. Hydrodynamics in a ceramic pervaporation membrane reactor for polycondensation reactions**

*Gert-Jan S. van der Gulik - Eindhoven; Johan G. Wijers - Eindhoven; Jos T.F. Keurentjes - Eindhoven*

**63. Study of the Structure of Asymmetric Cellulose Membranes for Reverse Osmosis Using Electron Spin Resonance (ESR) Method**

*K. C. Khulbe - Univ. of Ottawa; T. Matsuura - Univ. of Ottawa; G. Lamarche - Univ. of Ottawa; A.-M. Lamarche - Univ. of Ottawa; C. Choi and S. H. Noh. Yongsei University*

**64. Silica Fouling of RO Membranes**

*S. Zhou - UNSW; R. Sheikholeslami - UNSW*

**65. Thiol-Modified Gold-Coated Alumina Membranes and Applications for Phenolic Compound Transport Study**

*Quyen T. Le - LANL CST Division; Deborah S. Ehler - LANL CST Division; T. Mark McCleskey - LANL CST Division; Nancy N. Sauer - LANL CST Division; Gordon D. Jarvinen, LANL NMT Division*

- 66. Preparation and Characterization of Highly Hydrophilic Ultrafiltration Membranes with and without Negative Surface Charges.**  
*Shui Wai Lin-Ho - Instituto Tecnológico de Tijuana; Jose Heriberto Espinoza-Gomez - Instituto Tecnológico de Tijuana*
- 67. A Technique for Assessing the Chlorine Degradation Resistance of Interfacially Polymerized Polyamide Films**  
*N.P. Soice - University of Colorado; A.R. Greenberg - University of Colorado; W.B. Krantz - University of Colorado; A.D. Norman - University of Colorado*
- 68. Strategy for the Selection of Polymers for Composite Membranes**  
*Sarah Roberts - University of Colorado; Carl Koval - University of Colorado; Richard Noble - University of Colorado*
- 69. A Novel Technique for Characterization of the Pore Structure of Membranes**  
*Akshaya Jena - Porous Materials, Inc.; Krishna Gupta - Porous Materials, Inc.*
- 70. Membrane Electrokinetic Characteristics and Performance**  
*Michelle Chapman Wilbert - USBR; Qian Zhang - USBR; John Pellegrino - NIST*
- 71. Relating Complex Solute Mixture Characteristics to Membrane Fouling Using Field Flow Fractionation**  
*S. Wright - NIST/UCB; J. Pellegrino - NIST; G. Amy - UCB; J. Ranville - CSM*
- 72. Diffusion with Solvation in Homogeneous and Heterogeneous Polymeric Membranes**  
*Yossef Elabd - Johns Hopkins University; Timothy Barbari - University of Maryland*
- 73. Dicytylferrocene based redox active liquid supported membrane.**  
*Nikolai Kocherginsky - NUS; Andrew Grishchenko - NUS; Danny Tan - NUS*
- 74. Fine Metal Fiber Membranes for Oxygen-Water Separation**  
*Alex Sobolevsky - USF Filtration and Separations Group, Inc.; R. Range - USF Filtration and Separations Group, Inc.; N. Quick - USF Fluid Dynamics Division*
- 75. Structural And Molecular Dynamics Studies On The Gas Permeation Of Polypyrrolone**  
*Jong Seok Kang - Hanyang University; Seong Yong Ha - Hanyang University; Young Moo Lee - Hanyang University*
- 76. OSMOFILM/OSMOBAG : Innovative membrane technology for process drying**  
*Eberhardt Wittich - ALYZEE S.A.; Henri-Jean Caupin - ATOFINA*
- 77. Membrane Applied Science and Technology (MAST) Center**  
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