

# SYMPOSIUM AA

Membranes—Preparation, Properties, and Applications

December 2 – 5, 2002

## Chairs

Vasilis N. Burganos ICE/HT-FORTH  
Richard D. Noble Univ of Colorado-Boulder  
Masashi Asaeda Hiroshima Univ  
André Ayrat Univ of Montpellier II  
Johann D. LeRoux Innovative Membrane Systems, Inc.  
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\* Invited paper

## SESSION AA1: SYNTHESIS AND FABRICATION OF ORGANIC MEMBRANES

Chairs: Benjamin Bikson and Matthias Wessling  
Monday Morning, December 2, 2002  
Back Bay D (Sheraton)

### 8:30 AM \*AA1.1

MICROFABRICATION OF MEMBRANES. M. Wessling, L. Vogelaar, J. Barsema, University of Twente, Chemical Technology, Enschede, THE NETHERLANDS; C. van Rijn, W. Nijdam, Aquamarijn Research, Hengelo (Gl.), THE NETHERLANDS.

### 9:00 AM AA1.2

ASYMMETRIC DENSE/POROUS MEMBRANES WITH CONTROLLED MORPHOLOGY FROM MODIFIED POLYETHERETHERKETONE. PREPARATION AND CHARACTERIZATION. M.G. Buonomenna, A. Figoli, J.C. Jansen, E. Drioli, Research Institute on Membrane Technology (ITM-CNR), Cosenza, ITALY.

### 9:15 AM AA1.3

NOVEL NANO POROUS MATERIALS PREPARED FROM MISCIBLE POLYSULFONE/POLYIMIDE BLENDS. Yong Ding, Benjamin Bikson, Innovative Membrane Systems, Inc., Norwood, MA.

### 9:30 AM AA1.4

HIGH PERFORMANCE GAS SEPARATION HOLLOW FIBER MEMBRANES MADE FROM POLYETHERSULFONE/POLYIMIDE BLENDS; PREPARATION AND CHARACTERIZATION. Geert Henk Koops, George Kapantaidakis, Matthias Wessling, University of Twente, Dept of Chemical Technology, Membrane Technology Group, EMI, Enschede, THE NETHERLANDS.

### 9:45 AM AA1.5

MULTISPINNERET METHODOLOGIES FOR HIGH THROUGHPUT ELECTROSPUN NANOFIBER PRODUCTION. Jeremy Bowman, Malcolm Taylor, Vikram Sharma, Suneet Chadha, Foster-Miller, Inc. Waltham, MA.

### 10:00 AM AA1.6

WATER VAPOR PENETRANT IN HYDROPHILIC POLYURETHANE MEMBRANE AT CRYSTAL MELTING POINT. Xuemei Ding<sup>a</sup>, Jinlian Hu<sup>a</sup>, Chunpu Hu<sup>b</sup>, Xiaoming Tao<sup>a</sup>, B. Wang<sup>c</sup>;  
<sup>a</sup>Institute of Textiles and Clothing, The Hong Kong Polytechnic University, Hong Kong, CHINA; <sup>b</sup>Institute of Material Science and Engineering, East China University of Science and Technology, Shanghai, P.R. CHINA; <sup>c</sup>Department of Physics, Wuhan University, Wuhan, P.R. CHINA.

### 10:15 AM BREAK

## SESSION AA2: SYNTHESIS OF ZEOLITE MEMBRANES

Chairs: Anne Julbe and Richard D. Noble  
Monday Morning, December 2, 2002  
Back Bay D (Sheraton)

### 10:30 AM \*AA2.1

POLYCRYSTALLINE ZEOLITE MEMBRANES FOR GAS AND LIQUID SEPARATION. Jerry Y.S. Lin, Department of Chemical Engineering, University of Cincinnati, Cincinnati, OH.

### 11:00 AM AA2.2

ORIENTED ZEOLITE AND COMPOSITE MULTILAYER MEMBRANES. Zhonsheng Deng, Decio Countinho, Kenneth J. Balkus Jr., University of Texas at Dallas, Department of Chemistry and the UTD NanoTech Institute, Richardson, TX.

### 11:15 AM AA2.3

HOW CAN MICROWAVE HEATING CONTRIBUTE TO THE DEVELOPMENT OF ZEOLITE MEMBRANES. Anne Julbe, CNRS, Montpellier, FRANCE; Julius Motuzas, Univ of Kaunas, LITHUANIA; Christian Guizard, CNRS, Montpellier, FRANCE.

### 11:30 AM AA2.4

THE ZEOLITE ZSM-5 MEMBRANE STUDY: SYNTHESIS, PERMEATION AND MODELING. Bovornlak Oonkhanond, Michael E. Mullins, Michigan Technological University, Dept of Chemical Engineering, Houghton, MI.

### 11:45 AM AA2.5

USE OF ORGANIC STRUCTURE DIRECTING AGENTS TO CONTROL THE MORPHOLOGY OF ZEOLITE CRYSTALS AND ITS IMPLICATIONS ON MEMBRANE MICROSTRUCTURE. Griselda Bonilla, Zhiping Lai, Jose G. Nery, Michael Tsapatsis, University of Massachusetts, Dept. of Chemical Engineering, Amherst, MA; Dionisios G. Vlachos, University of Delaware, Dept. of Chemical Engineering, Newark, DE.

## SESSION AA3: SURFACE MODIFICATION AND ADDITIVES

Chairs: Donald R. Paul and Matthias Wessling  
Monday Afternoon, December 2, 2002  
Back Bay D (Sheraton)

### 1:30 PM AA3.1

HYDROPHILIC SURFACE MODIFICATION OF MICROPOROUS POLYMER MEMBRANES USING LOW-TEMPERATURE PLASMAS. D.S. Wavhal, K.R. Kull, M.L. Steen, Ellen R. Fisher, Colorado State University, Department of Chemistry, Fort Collins, CO.

### 1:45 PM AA3.2

HYBRID AMINE-FUNCTIONAL MEMBRANE FOR CO<sub>2</sub> SEPARATION. Chung-Yi A. Tsai, Xia Tang, United Technologies Research Center, CT; C. Jeffrey Brinker, Sandia National Laboratories and The University of New Mexico, NM; George Xomerita, The University of New Mexico, NM; Tim Nalette, Catherine Thibaud-Erkey, Hamilton Sundstrand Space System International, CT; Ipek Guray, Worcester Polytechnic Institute, MA.

### 2:00 PM AA3.3

HYDROPHILIC, HEAT STABLE, LOW PROTEIN BINDING SURFACE MODIFICATION OF PVDF MEMBRANES. John Charkoudian, Alex Xenopoulos, and John Lynch, Millipore Corporation, Bedford, MA.

### 2:15 PM AA3.4

COMPARISON OF IMPACT OF VIRGIN POLYMER STRUCTURE ON PROPERTIES OF IRRADIATED MEMBRANES – HYDROGEN ION IRRADIATION ON POLYIMIDE ISOMERS. Xinglong Xu, J. Ikonich, Ling Hu, Maria Coleman, Univ. of Toledo, Dept. of Chemical & Environmental Engineering, Toledo, OH.

### 2:30 PM AA3.5

FROM PARTICLE ASSISTED WETTING TO STRUCTURED SURFACES AND POROUS MEMBRANES. Hui Xu, Pietro Tierno, Werner A. Goedel, University of Ulm, Organic and Macromolecular Chemistry, Ulm, GERMANY.

### 2:45 PM AA3.6

PREPARATION OF HYDROPHILIC PVDF MEMBRANES FOR OIL/WATER SEPARATION VIA SURFACE SEGREGATION OF MICROPHASE-SEPARATED PVDF-g-POEM DURING IMMERSION PRECIPITATION. Ariya Akthakul, Jonathan F. Hester, Jane Y. Park, William F. McDonald, Anne M. Mayes, MIT,

**3:00 PM BREAK**

SESSION AA4: HYBRID AND COMPOSITE  
MEMBRANES

Chairs: Christian Guizard and Hidetoshi Kita  
Monday Afternoon, December 2, 2002  
Back Bay D (Sheraton)

**3:15 PM \*AA4.1**

MATERIALS SCIENCE AND PROCESSING ISSUES IN  
ORGANIC-INORGANIC HYBRID GAS SEPARATION  
MEMBRANES. William Koros, Theodore Moore, The Georgia  
Institute of Technology, School of Chemical Engineering, Atlanta, GA.

**3:45 PM \*AA4.2**

NANOCOMPOSITE GAS SEPARATION MEMBRANE  
MATERIALS. Benny Freeman, University of Texas at Austin, Dept.  
of Chemical Engineering, Austin, TX; Tim Merkel, Research Triangle  
Institute, RTP, NC; Ingo Pinnau, Membrane Technology and  
Research, Inc., Menlo Park, CA; Richard Spontak, NC State  
University, Raleigh, NC; Anita Hill, Pavla Meakin, CSIRO, Clayton,  
Victoria, AUSTRALIA.

**4:15 PM AA4.3**

SELECTIVE MATRIMID<sup>®</sup> MEMBRANES CONTAINING THE  
MESOPOROUS MOLECULAR SIEVE, AMINE DAM-1. Kyle  
Cattanach, Inga Musselman, Kenneth Balkus Jr., John Ferraris,  
University of Texas at Dallas, Department of Chemistry, Richardson,  
TX.

**4:30 PM AA4.4**

STRUCTURALLY COMPOSITE MEMBRANES OF TITANIUM  
OXIDE AND TITANIUM PHOSPHORUS OXIDE FOR PROTON  
CONDUCTION AT INTERMEDIATE TEMPERATURES.  
Toshinori Tsuru, Yasuhito Yagi, Yosuke Kinoshita, Masashi Asada,  
Hiroshima University, Department of Chemical Engineering,  
Higashi-Hiroshima, JAPAN.

**4:45 PM AA4.5**

STUDY OF NAFION<sup>™</sup> PROTON-EXCHANGE MEMBRANE  
INFILTRATED WITH PROTON CONDUCTING GELS.  
Francoise Damay and Lisa C. Klein, Rutgers University, Dept of  
Ceramic and Materials Engineering, NJ.

SESSION AA5: SYNTHESIS OF MEMBRANES WITH  
TEMPLATES

Chairs: Andrew L. Zydney and André Ayrál  
Tuesday Morning, December 3, 2002  
Back Bay D (Sheraton)

**8:30 AM \*AA5.1**

A HIGHLY CRYSTALLINE LAYERED SILICATE WITH  
THREE-Dimensionally MICROPOROUS LAYERS AND  
POTENTIAL APPLICATIONS IN MIXED MATRIX MEMBRANES.  
Michael Tsapatsis, Hae-Kwon Jeong, Sankar Nair, Department of  
Chemical Engineering, University of Massachusetts, Amherst, MA;  
Thomas Vogt, Physics Department, Brookhaven National Laboratory,  
Upton, NY; L. Charles Dickinson, Department of Polymer Science and  
Engineering, Silvio Conte National Center for Polymer Research,  
Amherst, MA.

**9:00 AM AA5.2**

MOLECULAR IMPRINTING MEMBRANES AS RECOGNITION  
AND SEPARATION MATERIALS. Takaomi Kobayashi, Masanori  
Abe, Puchalapalli Sreenivasulu Reddy, Nobuyuki Fujii, Nagaoka Univ  
Technology, Dept of Chemistry, Nagaoka, JAPAN.

**9:15 AM AA5.3**

SYNTHESIS AND PROPERTIES OF A SILICA MEMBRANE  
MADE WITH MSU-X TYPE MESOPOROUS SILICA. Eric Prouzet,  
Marco Martines, Cedric Boissiere, Andre Larbot, Institut Europeen  
des Membranes (CNRS UMR 5635), CNRS, Montpellier, FRANCE.

**9:30 AM AA5.4**

POROUS MEMBRANES DERIVED FROM NANOPARTICLE  
TEMPLATES. Maria M. Cortalezzi, Energy and Environmental  
Systems Institute, Rice University, Houston, TX; Vicki Colvin,  
Department of Chemistry, Rice University, Houston, TX; Mark R.  
Wiesner, Energy and Environmental Systems Institute, Rice  
University, Houston, TX.

**9:45 AM AA5.5**

A SIMPLE APPROACH TO HIERARCHICAL CERAMIC  
ULTRAFILTRATION MEMBRANES. Kimberly A. DeFriend,  
Andrew R. Barron, Department of Chemistry and Center for  
Biological and Environmental Nanotechnology, Rice University,  
Houston, TX.

**10:00 AM BREAK**

SESSION AA6: MEMBRANE CHARACTERIZATION

Chairs: Alan R. Greenberg and Vasilis N. Burganos  
Tuesday Morning, December 3, 2002  
Back Bay D (Sheraton)

**10:15 AM \*AA6.1**

CHARACTERIZATION OF MEMBRANE MORPHOLOGY USING  
ULTRASONIC TIME-DOMAIN REFLECTOMETRY. Senthilkumar  
Ramaswamy, Univ of Colorado, Dept of Chemical Engineering,  
Boulder, CO; Alan R. Greenberg, Univ of Colorado, Dept of  
Mechanical Engineering, Boulder, CO; Michael L. Peterson, Univ of  
Maine, Dept of Mechanical Engineering, Orano, ME.

**10:45 AM AA6.2**

MECHANICAL AND STRUCTURAL STABILITY OF  
PEROVSKITES MEMBRANES IN REDUCING ENVIRONMENTS.  
N. Nagendra, S. Bandopadhyay, School of Mineral Engineering,  
University of Alaska, Fairbanks, AK.

**11:00 AM AA6.3**

NEARLY SPACE-FILLING FRACTAL NETWORKS OF CARBON  
NANOPORES. Peter Pfeifer, Dept. of Physics, University of Missouri,  
Columbia, MO; F. Ehrburger-Dolle, Laboratoire de Spectrometrie  
Physique, CNRS, Universite Joseph Fourier, St. Martin d'Heres,  
FRANCE; T.P. Rieker, Corporate Research, Corning Inc., Corning,  
NY; W.P. Hoffman, Air Force Research Laboratory, Edwards Air  
Force Base, CA; M.T. Gonzalez, M. Molina-Sabio, F. Rodriguez-  
Reinoso, Depto. de Quimica Inorganica, Universidad de Alicante,  
Alicante, SPAIN.

**11:15 AM AA6.4**

ANALYSIS OF NANOPORES WITH A HIGH-ASPECT RATIO.  
Jing Wu, Chaiya Chandavasu, Qiang Zhang, Marino Xanthos,  
Kamalesh Sirkar, New Jersey Institute of Technology, Department of  
Chemical Engineering.

**11:30 AM AA6.5**

STOCHASTIC RECONSTRUCTION AND PERMEATION OF  
CERAMIC MEMBRANES PREPARED BY THE SOL-GEL  
METHOD. E.S. Kikkinides, V.T. Zaspalis, Chemical Process  
Engineering Research Institute, Centre for Research and Technology  
Hellas, Thessaloniki, GREECE; V.N. Burganos, Institute of  
Chemical Engineering and High Temperature Chemical Processes,  
Foundation for Research and Technology, Patras, GREECE.

**11:45 AM AA6.6**

MODELING OF THE DEFORMATION OF A CELL MEMBRANE  
PROBED BY ATOMIC FORCE MICROSCOPY. Robert E. Rudd,  
M. McElfresh, R. Balhorn, J. Belak, Lawrence Livermore National  
Laboratory, Livermore, CA; E. Baesu, U. Nebraska, Lincoln, NE; M.J.  
Allen, Biometrolgy, Inc., Alameda, CA.

SESSION AA7: TRANSPORT PHENOMENA IN  
MEMBRANES

Chairs: Dionisios G. Vlachos and Vasilis N. Burganos  
Tuesday Afternoon, December 3, 2002  
Back Bay D (Sheraton)

**1:30 PM \*AA7.1**

PREFERENTIAL OXYGEN TRANSPORT IN NANOPHASE  
MICRO AND MESOPOROUS CERAMIC ION CONDUCTING  
MEMBRANES. Christian Guizard, Caroline Levy, Anne Julbe,  
CNRS, Institut Europeen des Membranes, Montpellier, FRANCE.

**2:00 PM AA7.2**

ISOTOPE TRANSIENT STUDIES OF OXYGEN PERMEATION  
THROUGH A DENSE  $\text{La}_{0.6}\text{Sr}_{0.4}\text{Co}_{0.2}\text{Fe}_{0.8}\text{O}_{3-\delta}$  MEMBRANE.  
Linjie Hu, Charles A. Mims, Department of Chemical Engineering  
and Applied Chemistry, University of Toronto, Toronto, CANADA.

**2:15 PM AA7.3**

INFLUENCE OF AVERAGE FREE VOLUME ELEMENT SIZE ON

THE TRANSPORT OF GASES THROUGH POLYMERS WITH EQUIVALENT TOTAL FREE VOLUMES. Broderick Wilks, Georgia Institute of Technology, School of Chemical Engineering, Atlanta, GA; Mary Rezac, Kansas State University, Department of Chemical Engineering, Manhattan, KS.

**2:30 PM AA7.4**

MOLECULAR MODELLING OF FREE VOLUME DISTRIBUTIONS OF AMORPHOUS MEMBRANE POLYMERS.

Dieter Hofmann, Matthias Heuchel, GKSS Research Center, Institute of Chemistry, Teltow, GERMANY; Yuri Yampolskii, A.V. Topchiev Institute of Petrochemical Synthesis, Russian Academy of Sciences, Moscow, RUSSIA

**2:45 PM AA7.5**

GAS TRANSPORT PROPERTIES OF HYBRID ORGANIC-INORGANIC COMPOSITES. Chris J. Cornelius, Catalysis and Chemical Technologies, Sandia National Laboratories, Albuquerque, NM.

**3:00 PM BREAK**

**3:15 PM \*AA7.6**

FRACTIONATION OF PARTICLES BY MICROFILTRATION MEMBRANES. Shin-ichi Nakao, The University of Tokyo, School of Engineering, Tokyo, JAPAN.

**3:45 PM AA7.7**

TRANSPORT PROPERTIES OF RECONSTRUCTED ALUMINA AND VYCOR MEMBRANES. M.E. Kainourgiakis, National Research Center DEMOKRITOS, Athens, GREECE; E.S. Kikkinides, Chemical Process Engineering Research Institute, Center for Research and Technology Hellas, Thessaloniki, GREECE; Th. A. Steriotis and A.K. Stubos, National Research Center DEMOKRITOS, Athens, GREECE.

**4:00 PM AA7.8**

MESOSCOPIC MODELING OF TRANSPORT THROUGH ANISOTROPIC MICROPOROUS MEMBRANES. Mark A. Snyder, Dionisios G. Vlachos, Univ of Delaware, Dept of Chemical Engineering, Newark, DE; Markos A. Katsoulakis, Univ of Massachusetts-Amherst, Dept of Mathematics and Statistics, Amherst, MA.

**4:15 PM AA7.9**

FLUID DYNAMICS IN NANOPORES. A. ten Bosch, CNRS, Laboratoire de Physique de la Matière Condensée, Nice, FRANCE.

**4:30 PM AA7.10**

AN EXPERIMENTAL STUDY AND MOLECULAR SIMULATIONS OF TRANSPORT OF CARBON DIOXIDE-ALKANE MIXTURES THROUGH NANOPOROUS MEMBRANES UNDER SUPERCRITICAL CONDITIONS. Khadijeh Molaai Nezhad, Mahnaz Firouzi, Theodore T. Tsotsis, Muhammad Sahimi, University of Southern California, Los Angeles, CA.

SESSION AA8: POSTER SESSION  
Chairs: Jean-Alain Dalmon and André Ayrál  
Tuesday Evening, December 3, 2002  
8:00 PM  
Exhibition Hall D (Hynes)

**AA8.1**

FABRICATION OF A METAL-CERAMIC COMPOSITE MEMBRANE ASSISTED BY THE ELECTROLESS-PLATING TECHNIQUE. Yuanyuan Liu, Liang Hong, Zhongcai Shao, Huixing Jiang, Institute of Materials Research & Engineering, SINGAPORE.

**AA8.2**

FABRICATION OF POROUS ANODIC ALUMINA FILM USING NAIL POLISH AS A PROTECTIVE LAYER. Terry Xu and Rod Ruoff, Northwestern Univ., Evanston, IL.

**AA8.3**

ORIENTED ZEOLITE MFI MEMBRANES ON STAINLESS STEEL GRIDS. Maria P. Bernal, Joaquin Coronas, Miguel Menendez, Jesus Santamaria, Dept of Chemical and Environmental Engineering, University of Zaragoza, SPAIN.

**AA8.4**

AMPHIPHILIC POLYSULFONE COMBS ADDITIVES AS MODIFICATION AGENTS FOR POLYSULFONE MEMBRANES. Jane Y. Park, Metin Acar, Ariya Akthakul, Anne Mayes, Massachusetts Institute of Technology, Dept of Materials Science and Engineering, Cambridge, MA.

**AA8.5**

CHIRAL SUPRAMOLECULAR MATERIALS: POLYMERIZATION OF CHIRAL COLUMNAR LIQUID CRYSTALS WITH RETENTION OF MESOPHASE ORDER. Karen R. Villazor, Timothy M. Swager, Massachusetts Institute of Technology, Department of Chemistry, Cambridge, MA.

**AA8.6**

ORDERED 3D HEXAGONAL MESOPOROUS SILICA MEMBRANES: SYNTHESIS AND CHARACTERIZATION. Michaela Klotz, Sophie Besson, Laboratoire CNRS/ Saint-Gobain 'Interfaces and Glass Surface' UMR 125, Aubervilliers, FRANCE; Christian Ricolleau, Laboratoire de Mineralogie, Cristallographie, UMR 7590, Universites Paris VI et Paris VII, Paris, FRANCE; Florence Bosc, Andre Ayrál, Institut Europeen des Membranes, UMR CNRS 5635, Universite Montpellier II, Montpellier, FRANCE.

**AA8.7**

SURFACE GRAFTING AND HEAVY METAL SEPARATION OF Al<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub>-TiO<sub>2</sub> MEMBRANES. Zhiqiang Zeng, Jia-Qian Jiang, University of Surrey, Dept of Civil Engineering, Guildford, UNITED KINGDOM; Zhilun Gui, Longtu Li, Tsinghua University, Dept of Material Science & Engineering, Beijing, CHINA.

**AA8.8**

ORGANIC/INORGANIC NANOHYBRID MEMBRANES FOR NANOFILTRATION OF NONAQUEOUS SOLUTIONS. Toshinori Tsuru, Hiroyasu Kondo, Tomohisa Yoshioka, Masashi Asaeda, Hiroshima University, Department of Chemical Engineering, Higashi-Hiroshima, JAPAN.

**AA8.9**

FIBRIN FREE AND AQUEOUS HUMOR PENETRATION MODIFIED MEMBRANE WITH ARF EXCIMER LASER FOR GLAUCOMA IMPLANT. Yuji Sato, Yoshikazu Igarashi, Masataka Murahara, Tokai Univ, Dept of Electrical Engineering, Kanagawa, JAPAN; Jean Marie Parel, Univ of Miami School of Medicine, The Bascom Palmer Eye Institute, Miami, FL.

**AA8.10**

UNDERSTANDING AND PREDICTING THE PERFORMANCE OF ASYMMETRIC SILICA MEMBRANE FOR GAS SEPARATION. Siu-Yue Tam, Imation Corp., MN; Chung-Yi Tsai, United Technologies Research Center, CT.

**AA8.11**

INTERPRETATION OF LIQUID-JUNCTION AND (ION-SELECTIVE) MEMBRANE POTENTIALS IN REAL-TIME AND SPACE DOMAINS THROUGH SOLUTION OF THE NERNST-PLANCK AND POISSON EQUATIONS. Tomasz Sokalski<sup>a,b</sup>, Peter Lingenfelter<sup>a</sup>, and Andrzej Lewenstam<sup>a,c</sup>; <sup>a</sup>Process Chemistry Group, c/o Center for Process Analytical Chemistry and Sensor Technology (ProSens), Åbo Akademi University, Åbo, FINLAND; <sup>b</sup>Department of Chemistry, University of Warsaw, Warsaw, POLAND; <sup>c</sup>Faculty of Material Science and Ceramics, University of Mining and Metallurgy, Cracow, POLAND.

**AA8.12**

CRITICAL EVALUATION OF MACROSCOPIC THEORIES FOR MULTI-COMPONENT DIFFUSION IN IDEAL LANGMUIR SORBENTS. Nieck E. Benes, University of Twente, Dept of Chemical Engineering, Enschede, THE NETHERLANDS; Henk Verweij, Ohio State University, Department of Materials Science and Engineering, Columbus, OH.

**AA8.13**

ION BEAM MODIFICATION OF MATRIMID™ GAS SEPARATION MEMBRANE-EVOLUTION IN CHEMICAL STRUCTURE, MICROSTRUCTURE AND GAS PERMEATION PROPERTIES. Xinglong Xu, Ling Hu, and Maria Coleman, Univ. of Toledo, Dept. of Chemical & Environmental Engineering, Toledo, OH.

**AA8.14**

PALLADIUM ALLOY COMPOSITE MEMBRANES FOR HYDROGEN SEPARATION AND DEHYDROGENATION MEMBRANE REACTIONS. Seung-Eun Nam, Kew-Ho Lee, Membranes and Separation Center, Korea Research Institute of Chemical Technology, Taejon, SOUTH KOREA.

**AA8.15**

A NEW HYBRID MEMBRANE PROCESS TO RECYCLE HOMOGENEOUS CATALYSTS VIA DIALYSIS. Koen De Smet, Annick Pleysier, Bert Janssen, Ivo F.J. Vankelecom and Pierre A. Jacobs, Centre for Surface Chemistry and Catalysis Faculty of Agricultural and Applied Biological Sciences, Katholieke Universiteit Leuven, Leuven, BELGIUM.

SESSION AA10: GAS PERMEATION AND SEPARATION

Chairs: Benny D. Freeman and Masahiko Matsukata  
Wednesday Morning, December 4, 2002  
Back Bay D (Sheraton)

**AA8.16**

OPTIMIZATION OF GROWTH OR SINGLE BONE MARROW STROMAL CELL PRECURSORS OF OSTEOBLASTS BY EXTRACELLULAR MATRIX COATED SURFACES.

Joel S. Greenberger, Julie Goff, Donna Shields, Department of Radiation Oncology, University of Pittsburgh Cancer Institute, Pittsburgh, PA; and Julie Glowacki, Department of Orthopedics, Brigham and Women's Hospital, Boston, MA.

**AA8.17**

INVESTIGATION OF THE FILTRATION PROPERTIES OF COLLAGEN MEMBRANES ON SILICON. Lori Lepak, Cornell University, Dept of Chemistry and Chemical Biology, Ithaca, NY; Troy Richards, Cornell University, Dept of Electrical and Computer Engineering, Ithaca, NY; Peter Russo, Don Szarowski, James Turner, Wadsworth Center, Albany, NY; Michael Spencer, Cornell University, Dept of Electrical and Computer Engineering, Ithaca, NY.

**AA8.18**

USE OF ELECTRODIALYSIS PROCESS TO BENTONITICS CLAYS DISPERSIONS. Luciana V. Amorim, Helio L. Lira, Cynthia M. Gomes and Heber C. Ferreira, Federal University of Paraiba, Dept of Materials Engineering, Campina Grande, BRAZIL; Flavio L.H. Silva, Kepler B. Franca, Federal University of Paraiba, Dept of Chemical Engineering, Campina Grande, BRAZIL.

**AA8.19**

HIGHLY EFFICIENT SENSORS BASED ON SELF-ASSEMBLED CONJUGATED POLYMER LAYERS ON ELECTROSPUN NANOFIBROUS MEMBRANES. Xianyan Wang, Young-Gi Kim, Christopher Drew, Bon-Cheol Ku, Jayant Kumar, Center for Advanced Materials, Departments of Chemistry and Physics, University of Massachusetts Lowell, Lowell, MA; Lynne A. Samuelson, Natick Soldier Center, U.S. Army Soldier & Biological Chemical Command, Natick, MA.

SESSION AA9: CHARGED MEMBRANES FOR ION TRANSFER

Chairs: Matthias Wessling and Toshinori Tsuru  
Wednesday Morning, December 4, 2002  
Back Bay D (Sheraton)

**8:30 AM AA9.1**

COMPARATIVE AVAILABILITY OF WATER-IMMISCIBLE AND WATER-SOLUBLE LIQUID MEMBRANE SYSTEMS FOR SEPARATION OF METALS AND ACIDS. V. Kislik and A. Eyal, Casali Institute of Applied Chemistry, The Hebrew University of Jerusalem, Jerusalem, ISRAEL.

**8:45 AM AA9.2**

INTERFACIAL ION FLUXES AT NANOSTRUCTURED THIN FILMS. Nancy N. Kariuki, Jin Luo, Li Han, Mathew M. Maye, Melissa J. Peterson, and Chuan-Jian Zhong, Dept of Chemistry, State University of New York at Binghamton, Binghamton, NY; Maria Hepel, Dept of Chemistry, SUNY, Potsdam, NY.

**9:00 AM AA9.3**

ELECTRIC FIELD MEDIATED ION TRANSPORT THROUGH CHARGED NANOPOROUS MEMBRANES. R. Schmuhl, W.B.S. de Lint, K. Keizer, J.E. ten Elshof, A. van den Berg, MESA Research Institute, University of Twente, Enschede, THE NETHERLANDS.

**9:15 AM AA9.4**

ION-EXCHANGE FUNNELING EFFECT IN THIN FILM SURFACE MODIFICATION OF HETEROGENEOUS ELECTRODIALYSIS MEMBRANES. Isaak Rubinstein, Boris Zaltzman, Blaustein Institute for Desert Research, Ben-Gurion University of the Negev, Sede Boqer Campus, ISRAEL.

**9:30 AM AA9.5**

ELECTRO-OSMOTICALLY INDUCED CONVECTION AT A PERMSELECTIVE ELECTRODIALYSIS MEMBRANE. Isaak Rubinstein, Boris Zaltzman, Blaustein Institute for Desert Research, Ben-Gurion University of the Negev, Sede Boqer Campus, ISRAEL.

**9:45 AM AA9.6**

HIGHLY CONDUCTIVE HETEROGENEOUS ION EXCHANGE MEMBRANES. Yoram Oren, Viatcheslav Freger, Ora Kedem, Laboratory for Desalination and Water Treatment Research, The Institutes for Applied Research, Ben-Gurion University of the Negev, Beer-Sheva, ISRAEL.

**10:00 AM BREAK**

**10:30 AM \*AA10.1**

COMPOSITE MF-ALUMINA MEMBRANES FOR GAS SEPARATION PROCESSES. MATERIAL SYNTHESIS AND GAS TRANSPORT DESCRIPTION. APPLICATION TO AMMONIA RECOVERY. Sylvain Miachon, Jean-Alain Dalmon, Institut de Recherches sur la Catalyse, CNRS, Villeurbanne, FRANCE.

**11:00 AM AA10.2**

FUNCTIONALIZED CARBON MOLECULAR SIEVE MEMBRANES FOR GAS SEPARATION. J.N. Barsema, J. Balster, N.F.A. van der Vegt, and M. Wessling, Membrane Technology Group, Faculty of Chemical Technology, University of Twente, Enschede, THE NETHERLANDS.

**11:15 AM AA10.3**

GAS PERMEATION CHARACTERISTICS AND STABILITY OF COMPOSITE SILICA-METAL OXIDE MEMBRANES. Masashi Asaeda, Masakoto Kanezashi, Tomohisa Yoshioka, Toshinori Tsuru, Hiroshima Univ, Chemical Engineering Dept, Higashi-Hiroshima, JAPAN.

**11:30 AM AA10.4**

POROUS MEMBRANES FOR MAGNETIC SEPARATION OF PARAMAGNETIC AND DIAMAGNETIC SPECIES. Jihye Gwak, André Ayrat, Vincent Rouesac and Louis Cot, Institut Européen des Membranes, UMR CNRS, Université Montpellier II, Place Eugène Bataillon, Montpellier, FRANCE; Eue-Soon Jang and Jin-Ho Choy, National Nanohybrid Materials Laboratory, School of Chemistry and Molecular Engineering, Seoul National University, Seoul, KOREA; Jean-Claude Grenier, Institut de Chimie de la Matière Condensée de Bordeaux, UPR CNRS, Pessac, FRANCE.

**11:45 AM AA10.5**

STUDY OF THE EFFECT OF MORPHOLOGY OF NANOPOROUS CARBON MEMBRANES ON PERMSELECTIVITY. Ramakrishnan Rajagopalan, Henry C. Foley, Pennsylvania State University, Dept of Chemical Engineering, University Park, PA.

SESSION AA11: PERVAPORATION AND VAPOR PERMEATION

Chairs: Shin-ichi Nakao and Mary E. Rezak  
Wednesday Afternoon, December 4, 2002  
Back Bay D (Sheraton)

**1:30 PM \*AA11.1**

FABRICATION AND APPLICATION OF ZEOLITE MEMBRANES. Hidetoshi Kita, Yamaguchi Univ, Dept of Advanced Materials Science and Engineering, Ube, JAPAN.

**2:00 PM \*AA11.2**

POLYMERIC MATERIALS FOR HYDROCARBON SEPARATIONS BY PERVAPORATION. S. Matsui, W. Xu, W.J. Koros, D.R. Paul, University of Texas at Austin, Department of Chemical Engineering, Austin, TX.

**2:30 PM AA11.3**

PERVAPORATION OF AQUEOUS ORGANIC MIXTURES THROUGH Ge-ZSM-5 ZEOLITE MEMBRANES. Travis C. Bowen, Shiguang Li, Vu.A. Tuan, John L. Falconer, and Richard D. Noble, Department of Chemical Engineering University of Colorado, Boulder, CO.

**2:45 PM AA11.4**

GAS SEPARATION USING ALUMINA ULTRAFILTRATION MEMBRANES DERIVED FROM CARBOXYLATE-ALUMOXANE NANOPARTICLES. Kimberly A. DeFriend, Andrew R. Barron, Department of Chemistry and Center for Biological and Environmental Nanotechnology, Rice University, Houston, TX.

**3:00 PM BREAK**

**3:30 PM AA11.5**

PERVAPORATION AND VAPOR PERMEATION CHARACTERISTICS OF POROUS SILICA-ZIRCONIA MEMBRANES FOR SEPARATION OF ORGANIC SOLVENTS/WATER MIXTURES. Masashi Asaeda, Yasuhumi Tasaka, Hiroshima University, Chemical Engineering Department, Higashi-Hiroshima, JAPAN.

**3:45 PM AA11.6**

PERVAPORATIVE DEHYDRATION OF AN INDUSTRIAL KETONE SOLVENT USING CERAMIC SILICA MEMBRANES. Ane Urtiaga, Clara Casado, Inmaculada Ortiz, Dept of Chemical Engineering, University of Cantabria, SPAIN.

SESSION AA12: DENSE MEMBRANES FOR HYDROGEN SEPARATION

Chairs: Jerry Y.S. Lin and Masashi Asaeda  
Wednesday Afternoon, December 4, 2002  
Back Bay D (Sheraton)

**4:00 PM AA12.1**

SELECTIVE DEPOSITION OF Pd ON POROUS ALUMINA SUPPORT USING SUPERCRITICAL CO<sub>2</sub>. Masahiko Matsukata, Takashi Nishizuka, Yaushi Sekine, Eiichi Kikuchi, Waseda Univ, Dept of Applied Chemistry, Tokyo, JAPAN.

**4:15 PM AA12.2**

PREPARATION OF V-BASED ALLOY MEMBRANES USING CHEMICAL TRANSPORT PROCESS. Tetsuya Ozaki, Yi Zhang, Masao Komaki, Chikashi Nishimura, National Institute for Materials Science, Ecomaterials Center, Tsukuba, JAPAN.

**4:30 PM AA12.3**

THE HYDROGEN PERMEABILITY AND SULFUR RESISTANCE OF PALLADIUM-COPPER ALLOYS AT ELEVATED TEMPERATURE AND PRESSURE. Bret Howard, Kurt Rothenberger, Richard Killmeyer, Robert Enick, Anthony Cugini, US DOE NETL, Pittsburgh, PA; Bryan Morreale, Michael Ciocco, Parsons, Pittsburgh, PA.

**4:45 PM AA12.4**

ANISOTROPIC CHARACTERISTICS OF HYDROGEN PERMEATION IN NANO-POLY-Ni MEMBRANES. Y. Cao, H. Li, J.A. Szipunar, Department of Metals and Materials Engineering, McGill University, Montreal, PQ, CANADA; W.T. Shmayda, Lab for Laser Energetics, University of Rochester, Rochester, NY.

SESSION AA13: APPLICATION TO MEMBRANE REACTORS

Chair: Madhukar B. Rao  
Thursday Morning, December 5, 2002  
Back Bay D (Sheraton)

**8:30 AM \*AA13.1**

USE OF ZEOLITE FILMS IN REACTION APPLICATIONS. Jesus Santamaria, Department of Chemical Engineering, University of Zaragoza, SPAIN.

**9:00 AM AA13.2**

YIELD AND PRODUCTIVITY ENHANCEMENT IN A PACKED-BED MEMBRANE REACTOR: A CASE STUDY. Victor E. Diakov and Arvind Varma, Dept of Chemical Engineering, and Center for Molecularly Engineered Materials, University of Notre Dame, Notre Dame, IN.

**9:15 AM AA13.3**

THE USE OF POLYMERS IN CATALYTIC MEMBRANE REACTORS AS A WAY TO HETEROGENISE HOMOGENEOUS CATALYSTS. Ivo F.J. Vankelecom, Adi Wolfson, Erika Van Meerbeek and Pierre A. Jacobs, Centre for Surface Chemistry and Catalysis Faculty of Agricultural and Applied Biological Sciences Katholieke Universiteit Leuven, Leuven, BELGIUM.

**9:30 AM AA13.4**

SOLVENT RESISTANT NANOFILTRATION: TRANSPORT MECHANISM AND RECYCLING OF HOMOGENEOUS CATALYSTS. Koen De Smet, Sven Aerts, Lieven Gevers, Ivo F.J. Vankelecom and Pierre A. Jacobs, Centre for Surface Chemistry and Catalysis, Faculty of Agricultural and Applied Biological Sciences, Katholieke Universiteit, Leuven, Leuven, BELGIUM.

**9:45 AM BREAK**

SESSION AA14: APPLICATION IN BIOTECHNOLOGY AND BIOMEDICINE  
Chairs: Andrew L. Zydney and Matthias Wessling  
Thursday Morning, December 5, 2002  
Back Bay D (Sheraton)

**10:15 AM \*AA14.1**

CHARGED ULTRAFILTRATION MEMBRANES FOR BIOPROCESSING. Andrew Zydney, Department of Chemical Engineering, The Pennsylvania State University, University Park, PA.

**10:45 AM AA14.2**

EVALUATION OF HUMAN PLASMA PROTEIN ADSORPTION ON COMMERCIAL AND NOVEL MEMBRANES RELATED TO SURFACE FREE ENERGY PARAMETERS. L. Debartolo, B. Cirillo, A. Gugliuzza, S. Morelli and E. Drioli, Research Institute on Membranes and Modelling of Chemical Reactors, IRMERC-CNR, University of Calabria, Cosenza, ITALY.

**11:00 AM AA14.3**

EFFECTS OF BLEACH REPROCESSING ON HEMODIALYSIS MEMBRANES. Susanne Wolff, Andrew Zydney, The Pennsylvania State University, Dept of Chemical Engineering, State College, PA.

**11:15 AM AA14.4**

FILTRATE FLUX AND SIEVING CHARACTERISTICS OF VIRUS FILTRATION MEMBRANES. Andrew Zydney, David Bohonak, Pennsylvania State University, Department of Chemical Engineering, University Park, PA.

**11:30 AM AA14.5**

MODELING FLOCCULATED CELL SUSPENSIONS USING A POPULATION BALANCE APPROACH: APPLICATIONS TO MICROFILTRATION. Ranil Wickramasinghe and Binbing Han, Dept of Chemical Engineering and Xianghong Qian, Dept of Physics, Colorado State University, Fort Collins, CO.

**11:45 AM AA14.6**

FABRICATION OF MEMS DEVICES WITH MACROPOROUS SILICON MEMBRANE EMBEDDED WITH MODULATED 3D STRUCTURES FOR OPTIMAL CELL SORTING. Natalya Tokranova, Xiaojun Feng, Steve Olson, Bai Xu, James Castracane, School of Nanosciences and NanoEngineering, University at Albany (SUNY), Albany, NY.

SESSION AA15: MEMBRANES IN INDUSTRIAL AND EMERGING APPLICATIONS

Chairs: Jesus Santamaria and Robert A. Beyerlein  
Thursday Afternoon, December 5, 2002  
Back Bay D (Sheraton)

**1:30 PM \*AA15.1**

CHALLENGES AND OPPORTUNITIES FOR MEMBRANE SEPARATIONS IN THE SEMICONDUCTOR INDUSTRY. Madhukar B. Rao and James H. Yang, Air Products and Chemicals, Inc., Allentown, PA.

**2:00 PM AA15.2**

NIST's ADVANCED TECHNOLOGY PROGRAM: NEW DEVELOPMENTS IN MEMBRANE TECHNOLOGY R&D. Robert Beyerlein, Gerald Ceasar, NIST, Gaithersburg, MD.

**2:15 PM AA15.3**

AROMATICS ENRICHMENT IN REFINERY STREAMS USING SOLVENT RESISTANT MEMBRANES. Lloyd S. White, W.R. Grace, Columbia, MD; Craig R. Wildemuth, Grace Davison Membranes, Littleton, CO.

**2:30 PM AA15.4**

CHARACTERIZATION AND MODELING OF PARTICLE DEPTH FILTRATION BY NEUTRAL MEMBRANES. Chase Duclos-Orsello, Millipore Corporation, Bedford, MA; Joseph Zahka, Mykrolis Corporation, Bedford, MA; Wayne Kelly, Donald C. Grant, CT Associates Inc., Bloomington, MN; Volkmur Thom, Millipore Corporation, Bedford, MA.

**2:45 PM AA15.5**

EFFECT OF FLOW REVERSAL ON PERMEATE FLUX IN CROSSFLOW MEMBRANE FILTRATION. H. Parthasarathy, S. Ilias, Department of Chemical Engineering, North Carolina A&T State University, Greensboro, NC.

**3:00 PM BREAK**

**3:15 PM CONCLUDING REMARKS**