WILLIAM J. KOROS
School of Chemical & Biomolecular Engineering
Georgia Institute of Technology
Atlanta, GA 30332

EDUCATION

The University of Texas	June 1969 B.S.	Chemical Engineering
The University of Texas	Dec. 1975 M.S.	Chemical Engineering
The University of Texas	Aug. 1977 Ph.D.	Chemical Engineering

EMPLOYMENT

1969-1973	Chemical Engineer, Polymer Processing Group, E. I. duPont Co.
1973-1977	Graduate School, University of Texas at Austin
1977-1980	Assistant Professor, ChE, North Carolina State University
1980-1983	Associate Professor, ChE, North Carolina State University
1983-1984	Professor, ChE, North Carolina State University
1984-2001	Professor, ChE, University of Texas at Austin
1986-1990	Paul D. & Betty Robertson Meek & American Petrofina Foundation Professor, University of Texas at Austin
1990-1991	Z.D. Bonner Professor, University of Texas at Austin
1991-1993	Associate ChE Department Chairman, University of Texas at Austin
1993-1997	ChE Department Chairman, University of Texas at Austin
1991-2001	B. F. Goodrich Professor, University of Texas at Austin
2001-	Roberto C. Goizueta Chair and Georgia Research Alliance Eminent Scholar in Membranes, Georgia Institute of Technology

MEMBERSHIPS

National Academy of Engineering
American Association for the Advancement of Science
North American Membrane Society
American Chemical Society
American Institute of Chemical Engineers
American Society for Engineering Education
European Membrane Society
International Union of Pure and Applied Chemistry
Materials Research Society
Phi Kappa Phi
Registered Professional Engineer in Texas
Sigma Xi
Society of Plastics Engineering
TAPPI
Tau Beta Pi

HONORS

2012 Jack A. Gerster Memorial Lectureship Award, University of Delaware
2011 First KAIST CBE Global Distinguished Lectureship Award, KAIST
2011 63rd Institute Lecturer Award, American Institute of Chemical Engineers
2011 30th Blue-Green Seminar Award, University of Michigan & Michigan State University
2010 William H. Walker Award, American Institute of Chemical Engineers
2008 Alan S. Michaels Award, North American Membrane Society
2008 King Abdullah University of Science & Technology Investigator Award
2005 Patten Distinguished Lecturer Award, University of Colorado, Boulder
2004 Chemcon Distinguished Lecturer Award, India-US Joint Meeting, Mumbai India
2004 Distinguished Visiting Professorship, Universidad Ibero-Americana, Mexico
2004 Selected Faculty Member of the Year by Georgia Tech Graduate Student Government
2003 Elected Fellow, American Association for the Advancement of Science
2002 Elected Fellow, American Institute of Chemical Engineers
2000 Elected to National Academy of Engineering
2000 Distinguished Graduate Award, University of Texas College of Engineering
2000 Schechter-Wissler-Stice Undergraduate Teaching Award, University of Texas
1999 Clarence Gerhold AIChE Separations Division Award
1995 AIChE Institute Award for Excellence in Industrial Gases Technology
1991 Halliburton Engineering Faculty Leadership Award
1990 General Dynamics Outstanding Teaching Award
1989 Tau Beta Pi Outstanding Teaching Award
1988 University of Texas Outstanding Young Texas Ex Award
1987 Engineering Foundation Research Award
1984 NSF Presidential Young Investigator Award
1987 College of Engineering Faculty Leadership Award
1983 Alcoa Foundation Research Achievement Award (North Carolina State University)
1983 Tau Beta Pi Distinguished Chapter Advisor Award (North Carolina State University)
1980 Sigma Xi Outstanding Young Scientist Award (North Carolina State University)
1980 Outstanding Teacher Award (North Carolina State University)

BOARDS AND MEETING ORGANIZATION

Editor-in-Chief Emeritus, *Journal of Membrane Science*, (2008 – Present)
Editor-in-Chief, *Journal of Membrane Science*, (1991 – 2008)
Editor, Learning in Industry Feature, *Chemical Engineering Education* (1997 – Present)
Editorial Board, *Polymer Contents* (2003 – Present)
Editorial Advisory Board, *Industrial & Engineering Chemistry Research* (2006 – 2008)
North American Membrane Society, Secretary of Society (1987 – 2004)
Editorial Board, *Journal of Macromolecular Science* (1998 – 2004)
International Membrane Conference, Chair- Gas & Gas-Liquid Separations, Sydney (2003)
South African Chemical Engineering Congress Chair- Separations (2003)
IUPAC Membrane Working Group, Co-Chair (1992 – 1997)
Gordon Research Conference Chairman on Membranes (1989)

SIGNIFICANT LECTURES (past 5 years)

Plenary Lecture, Congress of the Mexican Polymer Society, Merida, Mexico, Nov. 2012
Jack A. Gerster Memorial Lecture, University of Delaware, Newark, DE. Sept. 2012
Zhejiang Distinguished Invited Lecture, Zhejiang, China, May 2012
University of Connecticut Distinguished Faculty Lecture, Univ. Conn, Feb. 2012

Bill & Ann Doumas/Dow Endowed Lecture, Virginia Tech, Blacksburg, VA , Dec. 2011
30th Blue Green Lecture, University of Michigan & Michigan State, Ann Arbor, MI. Nov. 2011
Inaugural KAIST Global Distinguished Lecture, Daejeon, South Korea. Nov. 2011
63rd AICHE Institute Lecture, Minneapolis, MN. Oct. 2011
Invited Lecture Dow-Corning Technical Advisory Board, Midland, MI Oct. 2011
Plenary Lecture, 25th Biennial Meeting of the IOP Polymer Physics, Guildford, U.K. Sept. 2011
Demokritos Research Center 50th Anniversary Invited Speaker, Athens, Greece, April 2011
Plenary Lecture, Second Congress on Membranes, Mexico City, Mexico. June 2011
Keynote Lecture, International Congress on Membranes, Amsterdam, Netherlands, July 2011
Reilly Lectureship, Notre Dame University, Mar. 2010
Hoyt C. Hottel Lectureship, Massachusetts Institute of Technology, Dec. 2010
Invited Lecture, VII Symposium of Chemical Research, Tijuana, Mexico Nov. 2009
Keynote Lecture, 5th US-Sino Conference, Beijing, China, Oct. 2009
Plenary Lecture, Euromembranes 2009, Montpellier, France, Sept. 2009
Invited Lecture, Advanced Membrane Technology IV, Trondheim, Norway, June 2009
Distinguished Chemical Engineering Seminar, Imperial College London, May 2009
Plenary Lecture, First National Congress on Membranes, Mexico City, Mexico, Apr. 2009
Lyman Handy Colloquium Lecture, University So. California, Los Angeles, CA, Mar. 2009
Invited Lecture, European Marie Curie Conference and Course, Oslo, Norway, Mar. 2009
ExxonMobil Lectureship, University of Massachusetts, Amherst, MA Dec. 2008
Pirkey Lecture, University of Texas at Austin, Austin TX, Nov. 2008
Invited Lecture, Shell Nanotech Conference, Woodlands, TX, Oct. 2008
Invited Lecture, International Congress on Membranes, Honolulu, Hawaii, July 2008
Invited Lecture, IUPAC 42nd World Polymer Congress (MACRO 2008), Taiwan, July 2008
Plenary Lecture, 2008 International Membrane Conference, Taiwan, June 2008
Invited International Lecturer, Istanbul Technical University, Mar. 2008

CITATIONS

Over 13,900 listed by Science Citation Index as of December 2012.
H-index = 65, ISI Web of Science

RESEARCH FOCUS

My group is a leader in the creation of materials for use in advanced membrane, sorbent and barrier applications. The underlying theme in all of these topics is the understanding and control of thermodynamic partitioning and molecular movement processes. Polymers are generally a feature in all of the work in my group; however, the detailed materials can vary greatly depending upon the ultimate use that is desired. Highly glassy materials and hybrid inorganic-polymer materials are often topics we consider, since they offer diverse properties that can be engineered. Moreover pyrolysis of selected polymers to form glassy carbons is increasingly important in our studies due to the combination of molecular sieving and ease of processing they offer. For barriers, sheets are most commonly studied; however for membranes and sorbents, fibers are popular in our group. For membranes and sorbents, control of nanoscopic morphology in the fiber wall is critically important and is a special focus of our group.

PUBLICATIONS

Edited Books:

1. Barrier Polymers and Barrier Structures, ACS Symposium Series #423, Edited, 1990, 393 pages.

Contributed Book Chapters:

2. Chern, RT; Koros, WJ; Sanders, ES; Chen, SH; Hopfenberg, HB, "Implications of the dual mode and transport models for mixed gas permeation", ACS Symposium Series 223 on Industrial Gas Separations, Ed. by T. E. Whyte, C. M. Yon and E. H. Wagener, American Chemical Society, Washington DC, Chapter 3 (1983) .

3. Iler, L; Koros, WJ; Yang, DK; Yui, RE, "Sorption and transport of physically and chemically interacting penetrants in Kapton® polyimide", Polyimides: Synthesis, Characterization and Applications, Ed. by K. L. Mittal, Plenum New York, Vol. 1, p. 443-460 (1984).

4. Chern, RT; Koros, WJ; Hopfenberg, HB; Stannett, VT, "Material selection for gas separations using membranes", ACS Symposium Series No. 269: Materials Science of Synthetic Membranes, Ed. by D. R. Lloyd, American Chemical Society, Washington DC, Chapter 2 (1985).

5. Koros, WJ; Paul, DR, "Current aspects of membrane-based separation of gases", Synthetic Membranes, Ed. by M. B. Chenoweth, Harwood Academic New York, p. 155-190 (1986).

6. Koros, WJ; Chern, RT, "Separation of gaseous mixtures using polymer membranes", Handbook of Separation Process Technology, Ed. by R. W. Rousseau, John Wiley and Sons, New York, Chapter 20 (1987).

7. Koros, WJ, "Membranes and membrane processes", Encyclopedia of Chemical Processing and Design, Ed. by J. J. McKetta, Marcel Dekker, New York, Vol. 29 (1988).

8. Koros, WJ; Hellums, MW, "Transport properties", Encyclopedia of Polymer Science, 2nd Edition, Ed. by J. I. Kroschwitz, Wiley-Interscience, New York, Supplement Volume 724 (1989).

9. Koros, WJ; ed. "Barrier polymers and structures: overview", ACS Symposium Series No. 423, American Chemical Society, Washington DC, Chapter 1 (1990).

10. Woods, DD; Walker, DRB; Koros, WJ, "Membrane separation", CRC- Engineering Handbook, Ed. by R. C. Dorf, CRC, Boca Raton, Chapter 61 (1994).

11. Koros, WJ; Pinnau, I, "Membrane formation for gas separation processes", Polymeric Gas Separation Membranes, Ed. by D. R. Paul and Y. P. Yampol`skii, CRC, Boca Raton, Chapter 5 (1994).

12. Moaddeb, M; Koros WJ, "Gas barrier polymers", Polymeric Materials Encyclopedia: Synthesis, Properties, and Applications, Ed. by J. C. Salamone, CRC, Boca Raton (1996).

13. Mahajan, RC; Zimmerman, CM; Koros, WJ, "Fundamental and practical aspects of mixed matrix gas separation membranes", ACS Symposium Series No. 733, Ed. by B. D. Freeman and I. Pinnau, American Chemical Society, Washington DC, pp. 277-286 (1999).

14. Koros, WJ; Punsalan, D, "Diffusion in polymer glasses", Encyclopedia of Materials: Science and Technology, Ed. K. H. Jurgen Buschow…[et al.], Elsevier Science Editors, Amsterdam, Vol. 8, pp. 7305-7315 (2001).

15. Lee, EK; Koros, WJ, "Membranes, synthetic, applications", Encyclopedia of Physical Science and Technology, 3rd Edition, Ed. R. A. Meyers, Academic, New York p. 279-345 (2002).

16. Koros, WJ; Zimmerman, CM, "Transport and barrier properties", Comprehensive Desk Reference of Polymer Characterization and Analysis (Chemistry), Ed. R. F. Brady, Oxford University, p. 680-699 (2003).

17. Koros, WJ; Madden, W, "Transport properties", Encyclopedia of Polymer Science and Technology Volume 12, 3rd Edition, Ed. H. F. Mark and J. I. Kroschwitz, John Wiley & Sons Incorporated, pp. 291-381 (2004).

18. Moore, TT; Damle, S; Wallace, D; Koros, WJ; "Membrane separation", The Engineering Handbook, 2nd Edition, Ed. R. C. Dorf, CRC, p. 63-1–63-15 (2004).

19. Williams PJ; Koros, WJ, "Carbon membranes for gas separations", in Advanced Membrane Technology and Applications, Ed. by N. Li, A. Fane, T. Matsuura, and W. Ho, Wiley, New York, p. 599-631 (2008).

20. Liu, C; Hillock, A; Husain, S; Koros WJ; Kulprathipanja, S, "Review of recent progress in Mixed Matrix Membranes", in Advanced Membrane Technology and Applications, Ed. by N. Li, A. Fane, T. Matsuura, and W. Ho, Wiley, New York, p. 789-819 (2009).

21. Koros, WJ; Kratochvil, A; Shu, S; Husain, S, "Energy & environmental issues & impacts of membranes in industry", in Membrane Operation in Molecular Separation, Transformation and Membrane Contactors, Ed. By E. Drioli, Wiley-VCH Publishers, Weinheim, Germany (2009).

22. Kiyono, M; Koros, WJ; Williams, PJ, Chapter 7, "Correlation between pyrolysis atmosphere and carbon molecular sieve membrane performance properties", in Correlations in Membrane Science, Ed. by S. T. Oyama and S. S. Williams, Elsevier Science Publishers, Advances in Membrane Science Series, p. 137-171 (2011).

Refereed Journal Publications:

23. Koros, WJ; Kuhlman, RP; Dalrymple, DA; Brockmeir, NF, "Crystallization of sodium chloride in a continuous mixed-suspension crystallizer", *AIChE Symposium Series No. 121*, **68**, 67-73 (1972).

24. Paul, DR; Koros, WJ; "Effect of partially immobilizing sorption on permeability and diffusion time lag", *J. Polym. Sci.: Part B: Polym. Phys.*, **14**, 675-85 (1976).

25. Koros, WJ; Paul; Rocha, A, "Carbon dioxide sorption and transport in polycarbonate", *J. Polym. Sci.: Part B: Polym. Phys.*, **14**, 687-702 (1976).

26. Koros, WJ; Paul, DR, "Design considerations for measurement of gas sorption in polymers by pressure decay", *J. Polym. Sci.: Part B: Polym. Phys.*, **14**, 1903-7 (1976).

27. Koros, WJ; Paul, DR; Fuiji, M; Hopfenberg, HB; Stannett, VT, "Effect of pressure on CO_2 transport in poly(ethylene terephthalate)", *J. Appl. Polym. Sci.*, **21**, 2899-904 (1977).

28. Koros, WJ; Chan A; Paul, DR, "Sorption and transport of various gases in polycarbonate", *J. Membr. Sci.*, **2**, 165-90 (1977).

29. Chan, A; Koros, WJ; Paul, DR, "Analysis of hydrocarbon gas sorption and transport in ethyl cellulose using the dual mode sorption/partial immobilization models", *J. Membr. Sci.*, **3**, 117-30 (1978).

30. Koros, WJ; Paul, DR, "CO_2 sorption in poly(ethylene terephthalate) above and below the glass transition", *J. Polym. Sci.: Part B: Polym. Phys.*, **16**, 1947-63 (1978).

31. Koros, WJ; Paul, DR, "Transient and steady-state permeation in poly(ethylene terephthalate) above and below the glass transition", *J. Polym. Sci.: Part B: Polym. Phys.*, **16**, 2171-87 (1978).

32. Koros, WJ; Hopfenberg, HB, "Small molecule migration in products derived from glassy polymers", *I&EC Product Research and Dev.*, **18**, 353-8 (1979).

33. Stannett, VT; Koros, WJ; Paul, DR; Baker R; Lonsdale, H, "Recent advances in membrane science and technology", *Adv. in Polym. Sci.*, **32**, 69-121 (1979).

34. Koros, WJ,; Paul DR; Huvard, GS; "Energetics of gas sorption in glassy polymers", *Polymer*, **20**, 956-60 (1979).

35. Koros, WJ; Hopfenberg, HB; "Scientific aspects of migration of indirect additives from plastics to food", *Food Technology*, **33**, 56-60 (1979).

36. Koros, WJ; Paul, DR, "Sorption and transport of CO_2 above and below the glass transition of poly(ethylene terephthalate)", *Polym. Engr. and Sci.*, **20**, 14-19 (1980).

37. Stannett, VT; Haider, MI; Koros WJ; Hopfenberg, HB; "Sorption and transport of water vapor in glassy poly(acrylonitrile)", *Polym. Engr. and Sci.*, **20**, 300-4 (1980).

38. Huvard, GS; Stannett, VT; Koros, WJ; Hopfenberg, HB,"The pressure dependence of CO_2 sorption and permeation in poly(acrylonitrile)", *J. Membr. Sci.*, **6**, 185-201 (1980).

39. Yi-Yan, N; Felder, RM; Koros, WJ, "Selective permeation of hydrocarbon gases in poly(tetrafluoroethylene) and poly(fluoroethylene/propylene) copolymer", *J. Appl. Polym. Sci.*, **25**, 1755-74 (1980).

40. Ranade, G; Stannett VT; Koros, WJ, "Temperature dependence and energetics of the equilibrium sorption of water vapor in glassy poly(acrylonitrile)", *J. Appl. Polym. Sci.*, **25**, 2179-86 (1980).

41. Koros, WJ, "Model for sorption of mixed gases in glassy polymers", *J. Polym. Sci.: Part B: Polym. Phys.*, **18**, 981-92 (1980).

42. Koros, WJ; Patton, CJ; Felder RM; Fincher, SJ, "Kinetics and equilibria of sulfur dioxide sorption in Kapton® polyimide", *J. Polym. Sci.: Part B: Polym. Phys.*, **18**, 1485-95 (1980).

43. Felder, RM; Wang, J; Koros, WJ, "Reduction of the oxygen effect in flame ionization detection", *J. Environ. Sci. Health*, **A16(2)**, 157-74 (1981).

44. Koros, WJ, Smith, GN; Stannett, VT; "High pressure sorption of carbon dioxide in solvent cast poly(methyl methacrylate) and poly(ethyl methacrylate) films", *J. Appl. Polym. Sci.*, **26**, 159-70 (1981).

45. Hopfenberg, HB; Ward, MZ; Rierson, RD; Koros, WJ; "The effect of component partitioning on potassium picrate transport across multicomponent supported liquid membranes", *J. Membr. Sci.*, **8**, 91-101 (1981).

46. Fechter, JMH; Hopfenberg HB; Koros, WJ, "Characterization of glassy state relaxations by low pressure carbon dioxide sorption in poly(methyl methacrylate)", *Polym. Engr. and Sci.*, **21**, 23-5 (1981).

47. Koros, WJ; Chern, RT; Stannett, VT; Hopfenberg, HB, "A model for permeation of mixed gases and vapors in glassy polymers", *J. Polym. Sci.: Part B: Polym. Phys.*, **19**, 1513-30 (1981).

48. Koros, WJ; Paul, DR, "Observations concerning the temperature dependence of the Langmuir sorption capacity of glassy polymers", *J. Polym. Sci.: Part B: Polym. Phys.*, **19**, 1655-6 (1981).

49. Koros, WJ; Wang, J; Felder, RM; "Oxygen permeation through PFEP Teflon and Kapton® polyimide", *J. Appl. Polym. Sci.*, **26**, 2805-9 (1981).

50. Felder, RM; Patton, CJ; Koros, WJ, "Dual mode sorption and transport of sulfur dioxide in Kapton® polyimide", *J. Polym. Sci.: Part B: Polym. Phys.*, **19**, 1895-909 (1981).

51. Stannett, VT; Ranade, G; Koros, WJ; "Characterization of water vapor transport in glassy polyacrylonitrile by combined permeation and sorption techniques", *J. Membr. Sci.*, **10**, 219-33 (1982).

52. Koros, WJ; Stannett, VT; Hopfenberg, HB, "Estimation of the effective permeability of thin surface layers created by exposure of polyethylene to fluorine", *Polym. Engr. and Sci.*, **22**, 738-46 (1982).

53. Iler, LR; Laundon, RC; Koros, WJ, "Characterization of penetrant interactions in Kapton® polyimide using a gravimetric sorption technique", *J. Appl. Polym. Sci.*, **27**, 1163-75 (1982).

54. Sanders, ES; Koros, WJ; Hopfenberg, HB; Stannett, VT, "Mixed gas sorption in glassy polymers: Equipment design considerations and preliminary results", *J. Membr. Sci.*, **13**, 161-74 (1983).

55. Duncan, T; Koros, WJ; Felder, RM, "Permeation of methyl chloride and benzene through FEP Teflon®", *J. Appl. Polym. Sci.*, **28**, 209-18 (1983).

56. Chern, RT; Koros, WJ; Hopfenberg, HB; Stannett, VT, "Reversible isopentane-induced depression of carbon dioxide permeation through polycarbonate", *J. Polym. Sci.: Part B: Polym. Phys.*, **21**, 753-63 (1983).

57. Ayres, JL; Osborne, JL; Hopfenberg, HB; Koros, WJ, "Effect of variable storage times on the calculation of diffusion coefficients characterizing small molecule migration in polymers", *I&EC Product Research and Dev.*, **22**, 86-9 (1983).

58. Osborne, JL; Sarti, GC; Koros, WJ; Hopfenberg, HB, "Zero migration of monomers in glassy polymers: a possible artifact of thermal depolymerization", *Polym. Engr. and Sci.*, **23**, 473-88 (1983).

59. Chern, RT; Koros, WJ; Sanders, ES; Yui, RE, "'Second component' effects in sorption and permeation of gases in glassy polymers", *J. Membr. Sci.*, **15**, 157-69 (1983).

60. Patton, CJ; Felder RM; Koros, WJ, "Sorption and transport of benzene in poly(ethylene terephthalate)", *J. Appl. Polym. Sci.*, **29**, 1095-110 (1984).

61. Sanders, ES; Koros, WJ; Hopfenberg, HB; Stannett, VT, "Pure and mixed gas sorption of carbon dioxide and ethylene in poly(methyl methacrylate)", *J. Membr. Sci.*, **18**, 53-74 (1984).

62. Kamlet, MJ; Doherty, RM; Taft, RW; Abraham, MH; Koros, WJ, "Solubility properties in polymers and biological media. Part 3. Prediction methods for critical temperatures, boiling points and solubility properties (R_G values) based on molecular size, polarizability and dipolarity", *J. Am. Chem. Soc.*, **106**, 1205-12 (1984).

63. Chern, RT; Koros, WJ; Hopfenberg, HB; Stannett, VT, "Selective permeation of CO_2 and CH_4 through Kapton® polyimide: effects of penetrant competition and gas phase nonidealities", *J. Polym. Sci.: Part B: Polym. Phys.*, **22**, 1061-84 (1984).

64. Koros, WJ; Al Hussani, H; Hopfenberg HB; Howard, M, "A simple apparatus for measurement of liquid permeability through polymeric films", *I&E.C. Prod. Res. and Dev.*, **23**, 317-20 (1984).

65. Koros, WJ; Yang, DK; Stannett, VT, "Sorption and transport studies of water in Kapton® Polyimide films: as-received films" *J. Appl. Polym. Sci.*, **30**, 1035-47 (1985).

66. Chern, RT; Koros, WJ; Fedkiw, PS, "Simulation of a hollow fiber gas separator: effects of process and design variables", *I&E.C. Prod. Des. and Dev.*, **24**, 1015-22 (1985).

67. Koros, WJ, "Simplified analysis of gas/polymer selective solubility behavior", J. Polym. Sci.: Part B: Polym. Phys., **23**, 1611-28 (1985).

68. Koros, WJ; Sanders, ES, "Multicomponent gas sorption in glassy polymers", *J. Polym. Sci., Polym. Symp.*, **72**, 141-9 (1985).

69. Sanders, ES; Koros, WJ, "Sorption of CO_2, C_2H_4, N_2O and their binary mixtures in poly(methyl methacrylate)", *J. Polym. Sci.: Part B: Polym. Phys.*, **24,** 175-88 (1986).

70. Yang, DK; Koros, WJ, Hopfenberg, HB; Stannett, VT, "The effects of morphology and hygrothermal aging on water sorption and transport in Kapton® polyimide", *J. Appl. Polym. Sci.*, **31**, 1619-29 (1986).

71. Fleming, GK; Koros, WJ, "Dilation of polymers by sorption of carbon dioxide at elevated pressures: silicone rubber and unconditioned polycarbonate", *Macromolecules*, **19**, 2285-91 (1986).

72. O'Brien, KC; Koros, WJ; Barbari, TA; Sanders, ES, "A new technique for the measurement of multicomponent gas transport through polymer films", *J. Membr. Sci.*, **29**, 229-38 (1986).

73. Uragami, T; Koros, WJ; Hopfenberg, HB; Yang, DK; Stannett, VT, "Dual mode analysis of subatmospheric pressure carbon dioxide sorption and transport in Kapton® polyimide films", *J. Polym. Sci.: Part B: Polym. Phys.*, **24**, 779-92 (1986).

74. Koros, WJ; Story, BJ; Jordan, SM; O'Brien, KC; Husk, GR, "Material selection for gas separation processes", *Polym. Engr. and Sci.*, **27**, 603-10 (1987).

75. Jordan, SM; Koros, WJ; Fleming, GK, "The effects on carbon dioxide exposure on pure and mixed gas permeation behavior of polymers: comparison of glassy polycarbonate and silicone rubber", *J. Membr.* Sci., **30**, 191-212 (1987).

76. O'Brien, KC; Husk, GR; Koros, WJ, "Influence of casting and curing conditions on gas sorption and transport in polyimide films", *Polym. Engr. and Sci.*, **27**, 211-17 (1987).

77. Fleming, GK; Koros, WJ, "Comments on measurements of gas-induced polymer dilation by different optical methods", *J. Polym. Sci.: Part B: Polym. Phys*., **25**, 2033-8 (1987).

78. Connelly, R; McCoy, NR; Hopfenberg, HB; Stewart, ME; Koros, WJ, "The effect of sorbed penetrants on the aging of previously dilated glassy polymer powders. Part I: lower alcohols and water sorption in polystyrene", *J. Appl. Polym. Sci.*, **34,** 703-19 (1987).

79. McCoy, NR; Hopfenberg, HB; Stewart, ME; Koros, WJ, "The effect of sorbed penetrants on the aging of previously dilated glassy polymer powders. Part II: n-propane sorption in polystyrene", *J. Appl. Polym. Sci.*, **34**, 721-35 (1987).

80. Stewart, ME; Hopfenberg, HB; McCoy, NR; Koros, WJ, "The effect of sorbed penetrants on the aging of previously dilated glassy polymer powders. Part III: The effect of exposure to lower alcohols during aging on enthalpy relaxations in PMMA", J. Appl. Polym. Sci., **34,** 2493-505 (1987).

81. Abraham, MH; Grellier, PL; Doherty, RA; Kamlett, RM; Hall, TH; Taft, RW; Carr, PW; Koros, WJ, "The solubility of gaseous solutes in polymers in terms of solute-polymer interactions", *Polymer*, **28**, 1363-9 (1987).

82. Kim, TH; Koros, WJ; Husk, GR; O'Brien, KC, "Reverse permselectivity of nitrogen over methane in aromatic polyimides", J. *Appl. Polym. Sci.*, **34**, 1767-71 (1987).

83. Muruganadam, N; Paul, DR; Koros, WJ, "Gas sorption and transport in substituted polycarbonates", *J. Polym. Sci.: Part B: Polym. Phys.*, **25**, 1999-2026 (1987).

84. Barbari, TA; Paul, DR; Koros, WJ, "Gas transport in polymers based on bisphenol-A", *J. Polym. Sci.: Part B: Polym. Phys.*, **26**, 709-27 (1988).

85. Barbari, TA; Paul, DR; Koros, WJ, "Gas *sorption* in polymers based on bisphenol-A", *J. Polym. Sci.: Part B: Polym. Phys*., **26**, 729-44 (1988).

86. Koros, WJ; Fleming, GK; Jordan, SM; Kim, TH; Hoehn, HH, "Polymeric membrane materials for solution-diffusion based permeation separations", *Prog. Polym. Sci.*, **13**, 339-401 (1988).

87. O'Brien, KC; Koros; Husk, GR, "Polyimide materials based on pyromellitic dianhydride for the separation of carbon dioxide and methane gas mixtures", *J. Membr. Sci.*, **35**, 217-30 (1988).

88. Kim, TH; Koros, WJ; Husk, GR; O'Brien, KC, "Relationship between gas separation properties and chemical structure in a series of aromatic polyimides", *J. Membr. Sci.*, **37**, 45-62 (1988).

89. Moe, MB; Koros, WJ; Paul, DR, "Effects of molecular structure and thermal annealing on gas transport in two tetramethyl bisphenol-A-polymers", *J. Polym. Sci.: Part B: Polym. Phys.*, **26**, 1931-45 (1988).

90. Moe, MB; Koros, WJ; Hoehn, HH; Husk, GR,"Effects of film history on gas transport in a fluorinated aromatic polyimide", *J. Appl. Polym. Sci.*, **36**, 1833-46 (1988).

91. Kim, TH; Koros, WJ; Husk, GR, "Advanced gas separation membrane materials: rigid aromatic polyimides", *Sepn. Sci. and Techn.*, **23**, 1611-26 (1988).

92. Barbari, TA; Paul, DR; Koros, WJ, "Polymeric membranes based on bisphenol-A for gas separations", *J. Membr. Sci.*, **42**, 69-86 (1989).

93. Jordan, SM; Koros, WJ; Beasley, JK, "Characterization of CO_2-induced conditioning of polycarbonate films using penetrants with different solubilities", *J. Membr. Sci.*, **43**, 103 (1989).

94. Pope, DS; Koros, WJ; Fleming, HK, "Measurement of thickness dilation in polymer films", *J. Polym. Sci.: Part B: Polym. Phys.*,**27**, 1173-7 (1989).

95. Koresh, JE; Kim, TH; Koros, WJ, "Study of ultramicroporous carbons by high pressure sorption. Part I. Nitrogen, carbon dioxide, oxygen, and helium isotherms", *J. Chem. Soc., Trans. Faraday Soc.*, **85**, 1537-44 (1989).

96. Koresh, JE; Kim, TH; Walker, DRB; Koros, WJ, "Study of ultramicroporous carbons by high pressure sorption. Part II. nitrogen diffusion kinetics", *J. Chem. Soc., Trans. Faraday Soc.* , **85**, 1545-56 (1989).

97. Koresh, JE; Kim, TH; Walker, DRB; Koros, Koros, "Study of ultramicroporous carbons by high pressure sorption. Part III. Complex transport phenomena as sensed by carbon dioxide & nitrogen kinetics", *J. Chem. Soc., Trans. Faraday Soc*, **85**, 1557-44 (1989).

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13. Polymeric membrane for separation of fluids under elevated temperature and/or pressure conditions (with R. L. Burns) ,U.S. Patent No. 6,602,415, Aug. 2003.
14. Dithiolene functionalized polymer membrane for olefin/paraffin separation (with R. Burns), U. S. Patent 7,160,356, Jan.9, 2007.

15. Crosslinked and crosslinkable hollow fiber mixed matrix membrane and method of making same (with D. Wallace, J. D. Wind, S. J. Miller, C. Staudt-Bickel, and D. Q. Vu), U.S. Patent Nos. 6,755,900, June 2004; 6,932,859, Aug. 2005; 7,247,191, July 2007.
16. Sorbent Fiber Compositions And Methods of Temperature Swing Adsorption (with R. Lively, R. Chance, H. Deckman and B. Kelley) US Patent 8,133,308 Mar. 13, 2012

Major Reports:

1. Technology panel report on advanced materials in Japan, JTECH-TAR-8502, Submitted to Science Applications International Corporation under contract to the National Science Foundation, 146 pages, May 1986 (with J. Economy, M. Jaffe, R. Ottenbrite, E. Reichmanis and J. Schaefgen).

2. Membrane separation systems: a research needs assessment, DOE/ER/30133-H1, Submitted to DOE Office of Program Analysis, 345 pages, April 1990 (with R. W. Baker, E. L. Cussler, W. Eykamp, R. L. Riley and H. Strathmann).

3. Review of the Desalination and water purification technology roadmap, WSTB-U-02-07-A, Submitted to the Water Science and Technology Board of the National Research Council, 84 pages, Jan. 2004 (with D. Marks, M. Balaban, B. A. Falagan, M. C. Gibson, J. G. Jacangelo, S. E. Johnson, K. L. Jones, J. Letey Jr., T. M. Pankratz, R. H. Sakaji, J. Q. Sanders, C. D. Turner, and M. Wilf).

Invited Presentations (past 5 years—major lectures noted on pages 2-3 are indicated by *)

1. "GT-Boeing On-Board Inert Gas Program", invited presentation to University Board of Regents, Atlanta, Dec. 2012.
2. **"*Polymer-Derived Membranes and Sorbents",* Plenary lecture, Congress of the Mexican Polymer Society, Merida, Mexico, Nov. 2012.
3. **"*Jack A. Gerster Memorial Lecture*", University of Delaware, Newark, DE. Sept. 2012.
4. 2012 ACS Tess Award Symposium, Invited Presentation, Phila., PA, Aug. 2012.
5. *"Crosslinked Polymeric Membranes for Natural Gas Treating*", Invited Presentation, IUPAC World Congress on Polymers, Blacksburg, VA, June 2012.
6. *"Evolving Toward Greatly Improved Separation Efficiency Using Advanced Membranes and Sorbents"*, Jiaotong University Invited Lecture, Shanghai, China, May 2012.
7. * *"Enabling Low Energy Intensive Large Scale Separations via Advanced Membrane Processes",* University-wide Distinguished Invited Lecture, Zhejiang University, Zhejiang China, May 2012.
8. *"Evolution to an Advanced Separations Platform"*, South Dakota School of Mines & Technology, Apr. 2012.
9. *"Synthesis and Analysis of Membrane Materials with High Permeabilities, Permselectivities for Economical Large Scale Energy-Intensive Separations",* invited lecture, DOE Basic Energy Sciences Workshop, Annapolis, MD, Apr. 2012.

10. *"Membranes and Sorbents—Large Scale Separation Change Agents*", invited presentation, 7th Chemical Engineering Conference for Collaborative Research in Eastern Mediterranean Countries, Corfu, Greece, Apr. 2012.

11. *"Hollow Fiber Sorbents for CO_2 Capture from Flue Gases",* invited presentation, Symposium on Physical Chemistry of CO_2 Separations, 243rd ACS National Meeting, San Diego, CA, Mar. 2012.

12. * *"University of Connecticut Distinguished Faculty Lecture -I. "Hiding in Plain Sight—the Invisible Energy Cost of Current Separation Processes"; II."Evolutionary Steps towards a Revolution in Separation and Purification Processes"*, University of Connecticut, Storrs, CN, Feb. 2012.

13. *"Generation Four, Low Energy Intensive Separation Processes"*, Georgia Tech Energy Strategic Planning Meeting", Convened by VP Research, Steve Cross, Atlanta, Jan. 2012.

14. *"GT Contribution to GE-GT-NETL Composite Membrane Project for CO_2 Captu*re", Kickoff meeting for NETL-supported project lead by GE with GT as a collaborator, Pittsburgh, PA, Jan. 2012.

15. * "*Evolutionary Steps Toward a Revolution in Separation and Purification Processes",* The Bill and Ann Doumas/Dow Endowed Lecture, Virginia Tech, Dec. 2011.

16. * "*Engineering a Revolution in Membranes and Sorbents",* 2011 Blue Green Seminar, University of Michigan & Michigan State University. Ann Arbor, MI. Nov. 2011.

17. * *"KAIST Global Distinguished Lecture",* Korean Institute for Advanced Science and Technology (KAIST), Daejeon, South Korea. Nov. 2011.

18. *"Membranes and Sorbents: Large Scale Separation Change Agents for a Sustainable Future"*, Invited departmental lecture, Hanyang University, Department of Energy Engineering, Seoul, South Korea. Nov. 2011.

19. *"Pushing the Limits on Economical Membrane-Based High Performance CO_2/CH_4 Separations",* AICHE Annual Meeting, Gerhold Honorary Lecture Session. Invited Lecture. Minneapolis, MN. Oct. 2011.

20. * *"Beyond Water: Expanding the Spectrum of Efficient Large Scale Separations",* 63rd Institute Lecture, AICHE Annual Meeting. Minneapolis, MN. Oct. 2011.

21. * *"Membranes and sorbents: Large Scale Separation Change Agents",* Dow-Corning Technical Advisory Board. Invited external lecturer, Midland. Oct. 2011.

22. * *"Plasticization and Antiplasticization in Membranes and Barrier Materials",*25th Biennial Meeting of the IOP Polymer Physics Group, Plenary Lecture. University of Surrey. Guildford, U.K. Sept. 2011.

23. * *"Carbon Molecular Sieve (CMS) Membranes for Large Scale Gas Separations",* International Congress on Membranes, Keynote Lecture, Amsterdam, The Netherlands, July 2011.

24. * *"Evolution of Membrane Processes—Beyond Water",* Second Congress on Membranes, Universidad Nacional Autonoma de Mexico. Plenary Lecture, Mexico City, Mexico. June 2011.

25. *"Carbon Molecular Sieve Membranes: Their Special Nature and Applicability for Large Scale Challenging Gas Separations",* Invited Seminar, Instituto Mexicana del Petroleo, Mexico City, Mexico. June 2011.

26. *"Carbon Molecular Sieve Membranes for Large Scale Natural Gas Separations*", Invited Lecture, Cornell-KAUST Annual Meeting, Ithaca, NY, May 2011.

27. * "*Carbon Molecular Sieve Membranes*", Demokritos National Research Center of Physical Sciences, Athens, Greece, 50th Anniversary Invited Speaker Lecture, Apr. 2011.

28. "*An Evolutionary Path to a Revolution in Separation and Purification Processes"*, Invited Lecture, National Technical University of Athens, Athens, Greece, Apr 2011.

29. *"Effects of Pyrolysis Atmosphere on Asymmetric Hollow Fiber Carbon Molecular Sieve Membranes*", Invited Murphree Award Symposium lecture, 241st ACS National Meeting, Anaheim, CA, Mar. 2011.

30. *"Engineering of Large Scale High Performance Membrane Devices",* Invited Lecture, Vanderbilt University, Department of Chemical & Biomolecular Engineering, Nashville, Tenn., Mar. 2011, Invited Departmental Seminar.

31. *"Materials Engineering of Large Scale Separation Devices",* Invited Stein Award, AICHE Annual Meeting, Salt Lake City, UT, Nov. 2010.

32. *"An Evolutionary Path to a Revolution in Low Energy Intensive Separation Processes",* Separations Division Session in honor of Anthony Fane, AIChE Annual Meeting, Salt Lake City, UT, Nov. 2010.

33. *"Realistically Expanding the Membrane Platform to Address Energy & Environmental Challenges",* Gordon Conference on Membranes & Membrane Processes, Colby-Sawyer College, New London, NH, Aug. 2010.

34. *"Advanced Separations Using Hollow Fiber Membranes and Sorbents",* National Institute for Clean Energy, Beijing, China, May 2010.

35. * *"Membrane Processes: Tools to Reshape the Landscape in Energy Intensive Industries"***,** Council of Chemical Research, Atlanta, GA, Apr. 2010.

36. *"Alternatives to Large Scale Thermally-Driven Separation Processes: Realistic Paths Around Difficult Hurdles"*, Purdue University, West Lafayette, IN, Apr. 2010.

37. *"Membranes for Aggressive CO_2 Separation Applications",* DOE Basic Energy Sciences workshop on Carbon Capture, Gaithersburg, MD., Mar. 2010.

38. *"Correlation Between Pyrolysis Atmosphere and Carbon Molecular Sieve Membrane Performance Properties"*, Keynote Lecture, American Chemical Society Meeting, Mar. 2010.

39. * *Membranes and Sorbents: Large Scale Separation Change Agents-Lecture 1", "Engineering a Revolution in Membranes and Sorbents-Lecture 2*" (Reilly Lectureship), Notre Dame University, Notre Dame, IN, Mar. 2010.

40. *"Opportunities and Hurdles for Using Membranes in CO_2 Capture*", Invited Lecture, North Alabama AICHE Section, Huntsville, AL**:** Feb. 2010,

41. *"Promoting Global Sustainability via Energy Efficient Membrane-Based Separations", Lecture 1: "Membrane Pathways to Low Energy Intensive Large Scale Separations";*

Lecture 2: "Pragmatic Steps to Broaden the Practical Membrane Platform", Invited Lecture, Dalian University of Technology: Jan. 2010

42. *"KAUST Winter Enrichment Period Invited Lecture-Reshaping the Landscape in Energy Intensive Industries with Advanced Separation Systems*", Thuwal, Saudi Arabia:, Jan. 2010

43. * *"Membranes: The Vanguard of Large Scale Low Energy Intensity Separations"* (Hoyt Hottel Lecture, Massachusetts Institute of Technology, Cambridge, MA, Dec. 2009.

44. *"Realism vs. Rhetoric: Implementing Energy Efficient Separations",* Chinese- American Chemical Society (CACS) Meeting (held in conjunction with the AIChE annual meeting). Nashville, TN., Nov. 2009.

45. *"Crosslinkable Polyimides for Natural Gas Purification"* Keynote Lecture, American Chemical Society Meeting, Salt Lake City, UT Nov. 2009

46. * *"Enabling Low Energy Intensive Large Scale Separations via Advanced Membrane Processes,"* (*Keynote Lecture*) VII International Symposium of Chemical Research in the Border Region. Tijuana, Mexico. Nov. 2009.

47. "Opportunities and Challenges to Promote Global Sustainability via Energy Efficient Membrane-Based Separations", Invited Seminar, Univ. of Arkansas. Fayetteville, AR, Oct. 2009.

48. * *"Low Energy Intensive Large Scale Separations: Tools to Promote Sustainable Development"*, Keynote Lecture, 5th U.S.-Sino Meeting. Beijing, China, Oct. 2009.

49. * *"Polymeric and Hybrid Membranes for Aggressive CO_2 Separation Applications"*, Keynote Lecture, 5th U.S.-Sino Meeting. Beijing, China, Oct. 2009.

50. * *"Closing Technology Gaps to Enable Energy Efficient Membrane-Based Separations,"* (*Plenary Lecture*) 2009 EuroMembrane Meeting. Montpelier, France. Sept. 2009.

51. *"Effects of Supercritical CO2 Conditioning on Uncrosslinked Polyimide Membranes for Natural Gas Purification",* ACS National Fall Meeting. Washington, District of Columbia (DC). 16-20 Aug. 2009.

52. * *"Polymeric and Hybrid Membranes for Aggressive CO2 Separations Applications"*, Advanced Membrane Technology (IV) Conference. Trondheim, Norway. June 2009

53. *"Polymer-Inorganic Membrane Materials for Energy-Efficient Separations*", with J.R. Johnson, North American Membrane Society Meeting, Charleston, SC, June 2009.

54. **"Distinguished Chemical Engineering Seminar"*, Imperial College, London, UK, May 2009

55. * *"Game-changing Transformational Technologies Focusing on the Forest Products Industry,"* Institute for Paper Science and Technology, Technology Roadmap for the Forest Products Industry Workshop. Atlanta, GA, Apr. 2009.

56. *"Advanced Membranes for Energy Conservation,"* Worcester Polytechnic Institute. Worcester, MA. Apr. 2009.

57. * *"Advanced Membrane Processes to Enable Energy & Environmental Progress,"* Plenary Speaker, 1st National Mexican Membrane Congress: Science, Technology and Applications. Mexico City, Mexico. Apr. 2009.

58. *"*Status and Applications of Polymeric & Hybrid Membranes for CO_2 Separation,"* NanoMemCourse European Membrane Society, Nanomaterials and Membranes for Energy. Lillestrøm, Norway. Mar. 2009

59. *"Crosslinkable Polyimides for Natural Gas Purification*", with A. Kratochvil & D.R. Paul, ACS Spring Meeting. Salt Lake City, Utah. Mar. 2009.

60. * *"Lyman Handy Colloquium--Opportunities and Challenges in the Pursuit of Energy Savings Using Membranes for Large Scale Chemical Processes*," University of Southern California, Los Angeles, CA. Mar. 2009.

61. "*Enabling Low Energy Intensive Large Scale Separations via Advanced Membrane Processes*", University of Nebraska. Lincoln, NE. Mar. 2009.

62. *"Membrane Processes in the Energy & Environmental Framework,"* State of Georgia, Science and Technology Committee, State Legislature Building, Atlanta, GA., Feb. 2009.

63. * *"ExxonMobil Lectureship -Membranes Processes: Low Energy-Intensive Enablers of Energy Conservation"*, University of Massachusetts, Amherst, MA, Dec. 2008.

64. *"Membranes, System Design & Materials—Why All Three Ultimately Relate to Membrane Formation",* Gordon Conference on Membranes Materials & Processes, New London, NH, Aug. 2008.

65. *"Economical Lower Energy Intensive Large Scale Separation Devices*", Special Symposium on 100 Years of Separations, AICHE Annual Meeting, Philadelphia, PA, Nov. 2008.

66. *"Membrane Based Processes: Change Agents for Enabling Large Scale Low Energy Intensive Purification Processes",* Arizona State University, Tempe, AZ, Nov. 2008.

67. * *"Pirkey Invited Lecture--Low Energy Intensive Large Scale Separations via Advanced Membranes"*, University of Texas at Austin, Austin TX, Nov. 2008.

68. * *"Broadening the Platform for Practical Large Scale Membrane Processes",* Shell Nanotech Conference, Woodlands, TX, Oct. 2008.

69. *"Advanced Membranes: A Win-Win Option to Minimize Energy Use & CO_2 Emissions for Large Scale Separation Systems",* U. Florida, Gainsville, FL, Oct. 2008.

70. *"Low Energy Intensity Large Scale Separations",* Princeton University, Princeton, NJ, Oct. 2008.

71. *"Low Energy Intensive Large Scale Separations Based on Membrane Processes",* SOLVAY, Alpharetta, GA, Oct. 2008

72. *"Enabling Practical Large Scale Membrane Processes in Energy & Fuels Applications",* European Membrane Conference on Membranes and Membrane Processes, Montpellier, France, Sept. 2008.

73. *"Membranes, System Design & Materials—Why All Three Ultimately Relate to Membrane Formation",* Gordon Conference on Membranes Materials & Processes, New London, NH, Aug. 2008.

74. *"Broadening the Platform for Practical Large Scale Membrane Processes to Address Energy & Environmental Challenges"* ACS Symposium on Membranes for Energy and Fuel Application, ACS FUELS Division, ACS National Meeting, Philadelphia, PA, Aug. 2008.

75. * *Michaels Award Symposium-Reflections and Projections on Membranes"*, International Conference on Membranes, Honolulu, HI, July 2008.

76. *"Membrane Technology and Polymer Science: A Synergistic Pair to Enable A Sustainable Future Separations"*, Macro 2008, Taipei, Taiwan, June 2008.

77. *"Carbon Molecular Sieve Membranes for Gas Separations: Tradeoffs & Opportunities",* International Membrane Conference 8th Conference on Membrane Science & Technology, Taipei, Taiwan, June 2008.

78. * *"Carbon Molecular Sieve Membranes for Gas Separations: Tradeoffs & Opportunities"*, Distinguished International Lecturer, Istanbul Technical University Istanbul, Turkey, Mar. 2008.