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. du Pont
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 AND NAMED LECTURES

2015 Centennial Lecturer, University of Texas at Austin
2015 Y. H. (ED) MA Honorary Lecture, Worcester Polytechnic University
2014 Berkeley Lecturer, University of California
2014 UOP Invitational Lecturer
2014 Plenary Lecturer, International Conference on Membranes, Suzhou, China
2014 Reuel Shinnar Lecture Series, City College, NY
2014 Lindsay Lecturer, Texas A&M University
2012 Jack A. Gerster Memorial Lectureship Award, University of Delaware
2012 Zhejiang Distinguished Invited Lecture, Zhejiang, China
2012 International Invited Lecture, Jiaotong University, Shanghai, China
2012 University of Connecticut Distinguished Faculty Lecture, University of Connecticut
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
2011 Bill & Ann Doumas/Dow Endowed Lecture, Virginia Tech
2011 30th Blue Green Lecture, University of Michigan & Michigan State, Ann Arbor, MI
2011 Inaugural KAIST Global Distinguished Lecture, Daejeon, South Korea.
2011 63rd AICHE Institute Lecture, Minneapolis, MN.
2011 Plenary Lecture, 25th Biennial Meeting of the IOP Polymer Physics, Guildford, U.K.
2011 Plenary Lecture, Second Congress on Membranes, Mexico City, Mexico
2011 Demokritos Research Center 50th Anniversary Invited Speaker, Athens, Greece
2010 Hoyt C. Hottel Lectureship, Massachusetts Institute of Technology
2010 William H. Walker Award, American Institute of Chemical Engineers
2010 Reilly Lectureship, Notre Dame University
2010 Invited International Lectureship, Dalian University of Technology, Dalian, China
2009 Plenary Lecture, Euro Membranes 2009, Montpellier, France
2009 Distinguished Chemical Engineering Seminar, Imperial College London
2009 Plenary Lecture, 1st National Congress on Membranes, Mexico City, Mexico
2009 Lyman Handy Colloquium Lecture, University So. California, Los Angeles, CA
2009 Invited Lecture, European Marie Curie Conference, Oslo, Norway
2008 ExxonMobil Lectureship, University of Massachusetts, Amherst, MA
2008 Pirkey Lecture, University of Texas at Austin, Austin TX, Nov. 2008
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 Award, Universidad Ibero-Americana, Mexico
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 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, , University of Texas
1990 General Dynamics Outstanding Teaching Award, , University of Texas
1989 Tau Beta Pi Outstanding Teaching Award, , University of Texas

1988 University of Texas Outstanding Young Texas Ex Award, , University of Texas
1984 NSF Presidential Young Investigator Award, , University of Texas
1987 College of Engineering Faculty Leadership Award, University of Texas
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, MEETING ORGANIZATION AND AICHE SERVICE

Editorial Advisory Board, *Macromolecules* (2014 – Present)
Editorial Advisory Board, AICHE J (2013 – Present)
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)
AICHE Chemical Technology Operating Council Member (1995-96)
Separations Division Chair (1995-96)
Separations Division Director (1992-94)
Publications Committee Chair (1995-96)
Publications Committee Member (1988-99)
Gordon Research Conference Chairman on Membranes (1989)

CITATIONS

22,000 listed by Web of Science as of August 2017, H-index = 81, ISI Web of Science
32,500 listed by Google Scholar as of August 2017, H-index= 98, Google Scholar

RESEARCHERS SUPERVISED (1977-2016)

91 PhD's; 26 MS's; 22 Post Doctoral Fellows

RESEARCH FOCUS

My group is a leader in creating materials and devices for advanced membrane, sorbent and barrier applications. The underlying theme in all of these topics is understanding and controlling thermodynamic partitioning and molecular movement processes. Polymers are generally part of the work in my group; however, the detailed materials vary greatly depending upon the ultimate goal that is desired. Glassy materials and hybrid inorganic-polymer materials are often topics we consider, since they offer diverse properties that can be engineered. Moreover pyrolysis of carefully selected polymers to form glassy carbons is increasingly important in our work, due to the combination of molecular sieving and ease of processing that such materials offer. For barriers, sheets are typically 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, p. 277-286 (1999).

14. Koros, WJ; Punsalan, D, "Diffusion in polymer glasses", Encyclopedia of Materials: Science and Technology, Ed. K. H. Jurgen Buschow, Elsevier Science Editors, Amsterdam, Vol. 8, p. 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, Section VIII, 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).

23. Adams, R; Johnson, JR; Zhang, C; Lively, RP; Dai, Y; Esekhile O; Liu, J; Koros, WJ, " Mixed Matrix Membranes", Chapter 3.4 in Encyclopedia of Membrane Science and Technology, *John Wiley and Sons* (2013).

24. Koros, WJ; Burgess, S and Zhang, C, "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. (2015).

Refereed Journal Publications:

25. 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).

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

27. Koros, WJ; Paul, DR, "Design considerations for measurement of gas sorption in polymers by pressure decay", *J. Polym. Sci.: Part B: Polym. Phys.*, **14**, 1903-1907 (1976).

28. 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**, 2899-2904 (1977).

29. Koros, WJ; Chan A; Paul, DR, "Sorption and transport of various gases in polycarbonate", *J. Membr. Sci.*, **2**, 165-190 (1977).

30. 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**, 117-130 (1978).

31. 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**, 1947-1963 (1978).

32. 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**, 2171-2187 (1978).

33. Koros, WJ; Hopfenberg, HB, "Small molecule migration in products derived from glassy polymers", *I&EC Product Res. & Dev.*, **18**, 353-358 (1979).

34. 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).

35. Koros, WJ; Paul DR; Huvard, GS; "Energetics of gas sorption in glassy polymers", *Polymer*, **20**, 956-960 (1979).

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

37. 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).

38. 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).

39. 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).

40. 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**, 1755-1774 (1980).

41. 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**, 2179-2186 (1980).

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

43. 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**, 1485-1495 (1980).

44. Felder, RM; Wang, J; Koros, WJ, "Reduction of the oxygen effect in flame ionization detection", *J. Environ. Sci. Health*, **A16**, 157-174 (1981).

45. 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**, 159-170 (1981).

46. 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).

47. 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).

48. 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).

49. 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**, 1655-1656 (1981).

50. Koros, WJ; Wang, J; Felder, RM; "Oxygen permeation through PFEP Teflon and Kapton® polyimide", *J. Appl. Polym. Sci.,* **26**, 2805-2809 (1981).

51. 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**, 1895-1909 (1981).

52. Stannett, VT; Ranade, G; Koros, WJ; "Characterization of water vapor transport in glassy polyacrylonitrile by combined permeation and sorption techniques", *J. Membr. Sci.,* **10**, 219-233 (1982).

53. 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**, 738-746 (1982).

54. Iler, LR; Laundon, RC; Koros, WJ, "Characterization of penetrant interactions in Kapton® polyimide using a gravimetric sorption technique", *J. Appl. Polym. Sci.,* **27**, 1163-1175 (1982).

55. Sanders, ES; Koros, WJ; Hopfenberg, HB; Stannett, VT, "Mixed gas sorption in glassy polymers: Equipment design considerations and preliminary results*", J. Membr. Sci.,* **13**, 161-174 (1983).

56. Duncan, T; Koros, WJ; Felder, RM, "Permeation of methyl chloride and benzene through FEP Teflon®", *J. Appl. Polym. Sci.,* **28**, 209-218 (1983).

57. 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**, 753-763 (1983).

58. 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**, 86-89 (1983).

59. 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).

60. Chern, RT; Koros, WJ; Sanders, ES; Yui, RE, "'Second component' effects in sorption and permeation of gases in glassy polymers", *J. Membr. Sci.*, **15**, 157-169 (1983).

61. Patton, CJ; Felder RM; Koros, WJ, "Sorption and transport of benzene in poly(ethylene terephthalate)", *J. Appl. Polym. Sci.*, **29**, 1095-1110 (1984).

62. 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).

63. 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**, 1205-1212 (1984).

64. 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**, 1061-1084 (1984).

65. 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**, 317-320 (1984).

66. Koros, WJ; Yang, DK; Stannett, VT, "Sorption and transport studies of water in Kapton® Polyimide films: as-received films" *J. Appl. Polym. Sci.*, **30**, 1035-1047 (1985).

67. Chern, RT; Koros, WJ; Fedkiw, PS, "Simulation of a hollow fiber gas separator: effects of process and design variables", *I&E.C. Prod. Des. & Dev.*, **24**, 1015-1022 (1985).

68. Koros, WJ, "Simplified analysis of gas/polymer selective solubility behavior", J. Polym. Sci.: Part B: Polym. Phys., **23**, 1611-1628 (1985).

69. Koros, WJ; Sanders, ES, "Multicomponent gas sorption in glassy polymers", *J. Polym. Sci., Polym. Symp.*, **72**, 141-149 (1985).

70. 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,** 175-188 (1986).

71. 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).

72. Fleming, GK; Koros, WJ, "Dilation of polymers by sorption of carbon dioxide at elevated pressures: silicone rubber and unconditioned polycarbonate", *Macromolecules,* **19**, 2285-2291 (1986).

73. 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**, 229-238 (1986).

74. 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).

75. 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).

76. 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).

77. 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**, 211-217 (1987).

78. Fleming, GK; Koros, WJ, "Comments on measurements of gas-induced polymer dilation by different optical methods", *J. Polym. Sci.: Part B: Polym. Phys*., **25**, 2033-2038 (1987).

79. 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,** 703-719 (1987).

80. 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**, 721-735 (1987).

81. 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,** 2493-2505 (1987).

82. 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**, 1363-1369 (1987).

83. Kim, TH; Koros, WJ; Husk, GR; O'Brien, KC, "Reverse permselectivity of nitrogen over methane in aromatic polyimides", J. *Appl. Polym. Sci.,* **34**, 1767-1771 (1987).

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

85. Barbari, TA; Paul, DR; Koros, WJ, "Gas transport in polymers based on bisphenol-A", *J. Polym. Sci.: Part B: Polym. Phys.*, **26**, 709-727 (1988).

86. Barbari, TA; Paul, DR; Koros, WJ, "Gas *sorption* in polymers based on bisphenol-A", *J. Polym. Sci.: Part B: Polym. Phys*., **26**, 729-744 (1988).

87. 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).

88. 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**, 217-230 (1988).

89. 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).

90. 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**, 1931-1945 (1988).

91. 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).

92. Kim, TH; Koros, WJ; Husk, GR, "Advanced gas separation membrane materials: rigid aromatic polyimides", *Sepn. Sci. & Techn.*, **23**, 1611-1626 (1988).

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

94. Jordan, SM; Koros, WJ; Beasley, JK, "Characterization of CO_2-induced conditioning of polycarbonate films using penetrants with different solubilities", *J. Membr. Sci.,* **43**, 103-120 (1989).

95. Pope, DS; Koros, WJ; Fleming, HK, "Measurement of thickness dilation in polymer films", *J. Polym. Sci.: Part B: Polym. Phys.*, **27**, 1173-1177 (1989).

96. 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**, 1537-1544 (1989).

97. 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**, 1545-1556 (1989).

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Major Reports:

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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, January, 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 8 years—Named Lectures also noted on page 2 are indicated by * in the list below)

1. Plenary Lecture, International Congress of Membranes, *"Using Fundamentals to Pragmatically Reach Advanced Membrane Objectives:Our Community's Charter"*, San Francisco, Ca July, 2017
2. L. W. Shemilt Lecture, "Merging Science & Engineering for Energy-Efficient Gas Separations", McMaster University, March, 2017
3. Gerhold-Kunesh Award Lecture Session, "*Using All Available Tools for Advanced Membranes for Gas Separations"*, AICHE Annual Meeting, San Francisco, CA, October, 2016.
4. Keynote Lecture, MOF 2016 Meeting,*"Materials Science & Processing Issues in Polymer-MOF Gas Separation Membranes",* Long Beach, CA, September, 2016.
5. Keynote Lecture, *Division of Energy and Fuels, "Advanced Membranes for Gas Separations: Entropy Engineering at the Sub-nanometer Scale",* 252nd ACS- Philadelphia, PA, August, 2016
6. *Y.H.(Ed) Ma, Honorary Lecture, "*Membranes: Changing the Gas Separation Process Landscape*" Worcester Polytechnic University, October, 2015
7. *Centennial Lecturer, "*Advanced Membranes for Gas Separations: Entropy Engineering at the Sub-nanometer Scale*", University of Texas at Austin, September, 2015
8. Department of Chemical & Biological Engineering, University of Colorado, Boulder, CO, September, 2015.
9. * Reuel Shinnar Lecture Series, "*Membranes as Large Scale Separation Change Age*nts" City College, NY, December, 2014
10. Keynote Lecture, ACS, Transport in Polymers Symposium, San Francisco, CA, August, 2014.
11. * Plenary Lecture, "*Membrane Technology Pathways to Low Energy Intensity Large-Scale Gas Separations*", International Congress on Membranes, Suzhou, China, June, 2014.
12. Keynote Lecture, 20th Anniversary Membrane Center, Trondheim, Norway, May, 2014.
13. *UOP Invitational Lecture Series, "*Carbon Molecular Sieve Membranes for Gas Separations*", Des Plaines, IL, May, 2014.
14. *Berkeley Lectures, 1. "*Maxwell's Demon is Hiding in Advanced Gas Separation Membranes*", 2. "*Engineering the Science of Energy-Efficient Gas Separations*", U. Calif., Berkeley, CA, April, 2014.
15. *Lindsay Lecturer, "*Energy-Saving Large Scale Separation and Purification Process Options*", Texas A&M University, College Station, Texas, February, 2014.

16. Carnegie-Mellon University, Department of Chemical Engineering Seminar, Pittsburgh, PA, Department of Chemical Engineering, December, 2013.
17. Cornell University, Department of Chemical Engineering Seminar, Ithaca, NY, November, 2013.
18. Keynote Lectures, 7th Sino US Joint Conference of Chemical Engineering, 1. "*Large Scale Gas Separations Using Membranes—A Pragmatic Perspective*", 2. "*Emergence of Shale Gas Resources: Special Separation Opportunities and Challenges*", Beijing, China, October, 2013.
19. Department of Chemical & Environmental Engineering Seminar, Beijing University of Technology, Beijing, China, October, 2013.
20. Keynote Lecture, *"Strategies to Broaden the Platform for Large Scale Membrane Separations"*, 6th International Zeolite Membrane Meeting (IZMM-6), Jeju Island, Korea, June, 2013.
21. Korean Institute of Science and Technology, Seoul, Korea, June, 2013.
22. Dow Chemical Company, Freeport, TX and Plaquemine, May, 2013.
23. Northwestern University, Department of Chemical & Biological Engineering Seminar, May, 2013.
24. Shell Global Solutions, Houston, TX, May 2013.
25. University of Santa Barbara, Department of Chemical Engineering Seminar, Santa Barbara, CA, April 2013.
26. Columbia University, Department of Chemical Engineering Seminar, New York City, NY, April 2013.
27. * Plenary lecture, Congress of the Mexican Polymer Society, *"Membranes & Sorbents: Large Scale Separation Change Agents"*, Merida, Mexico, November, 2012.
28. *Jack A. Gerster Memorial Lecture, *"Membranes & Sorbents: Large Scale Separation Change Agents for Energy Efficiency",* University of Delaware, Newark, DE. September, 2012.
29. Invited Presentation, 2012 ACS Tess Award Symposium, Phila., PA, August, 2012.
30. Invited Presentation, IUPAC World Congress on Polymers, Blacksburg, VA, June, 2012.
31. * Jiaotong University Invited International Lecture, "*Evolutionary Steps towards a Revolution in Separation and Purification Processes*", Shanghai, China, May, 2012.
32. * University-wide Distinguished Invited Lecture, "*Enabling Low Energy Intensive Large Scale Separations via Advanced Membrane Processes*", Zhejiang University, Zhejiang China, May, 2012.
33. South Dakota School of Mines & Technology, Department of Chemical Engineering Seminar, April, 2012.
34. Invited Lecture, DOE Basic Energy Sciences Workshop, Annapolis, MD, April, 2012.
35. Invited Lecture, 7th Chemical Engineering Conference for Collaborative Research in Eastern Mediterranean Countries, Corfu, Greece, April, 2012.

36. Invited Lecture, Symposium on Physical Chemistry of CO_2 Separations, 243rd ACS National Meeting, San Diego, CA, March, 2012.

37. * University of Connecticut Distinguished Faculty Lectureship, 1. *"Hiding in Plain Sight—The Invisible Energy Cost of Current Separation Processes"*, 2*."Evolutionary Steps towards a Revolution in Separation and Purification Processes"*, University of Connecticut, Storrs, CN, February, 2012.

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

39. * 2011 Blue Green Seminar: University of Michigan & Michigan State University, *"Engineering a Revolution in Membranes and Sorbents*". Ann Arbor, MI. November, 2011.

40. * KAIST Global Distinguished Lectureship, *"Membranes and Sorbents: Large Scale Separation Change Agents for a Sustainable Future",* Korean Institute for Advanced Science and Technology (KAIST), Daejeon, South Korea. November, 2011.

41. Hanyang University, Department of Energy Engineering Seminar, Seoul, South Korea. November, 2011.

42. Invited Lecture, Gerhold Honorary Lecture Session. Minneapolis, MN. October, 2011.

43. * 63rd Institute Lecture, *"Beyond Water: Expanding the Spectrum of Efficient Large Scale Separations",* AICHE Annual Meeting. Minneapolis, MN. October, 2011.

44. Dow-Corning Technical Advisory Board. Invited external lecturer, Midland. October, 2011.

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

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

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

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

49. Invited Lecture, Cornell-KAUST Annual Meeting, Ithaca, NY, May 2011.

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

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

52. Invited Murphree Award Symposium lecture in honor of Norman Li, 241st ACS National Meeting, Anaheim, CA, March, 2011.

53. Vanderbilt University, Department of Chemical & Biomolecular Engineering Seminar, Nashville, Tenn., March, 2011.

54. Invited lecture, Stein Award in honor of Nicholas Abbott, AICHE Annual Meeting, Salt Lake City, UT, November, 2010.

55. Invited lecture, Separations Division Session in honor of Anthony Fane, AIChE Annual Meeting, Salt Lake City, UT, November, 2010.

56. Invited lecture, Gordon Conference on Membranes & Membrane Processes, Colby-Sawyer College, New London, NH, August, 2010.

57. Invited Lecture, National Institute for Clean Energy, Beijing, China, May, 2010.

58. Invited Lecture, Council of Chemical Research, Atlanta, GA, April, 2010.

59. Purdue University, Department of Chemical Engineering Seminar, West Lafayette, IN, April, 2010.

60. Invited lecture, DOE Basic Energy Sciences workshop on Carbon Capture, Gaithersburg, MD, March, 2010.

61. * Reilly Lectureship, *1. "Membranes and Sorbents: Large Scale Separation Change Agents", 2. "Engineering a Revolution in Membranes and Sorbents"*, Notre Dame University, Notre Dame, IN, March, 2010.

62. Invited Lecture, North Alabama AICHE Section, Huntsville, AL**:** February, 2010,

63. * Invited International Lectureship, *"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",* Dalian University of Technology: January, 2010.

64. Invited Lecture, KAUST Winter Enrichment Period, Thuwal, Saudi Arabia:, January, 2010.

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

66. Invited Lecture, Chinese- American Chemical Society (CACS) Meeting (held in conjunction with the AIChE annual meeting). Nashville, TN., November, 2009.

67. Invited Lecture, American Chemical Society Meeting, Salt Lake City, UT November, 2009

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

69. University of Arkansas, Department of Chemical Engineering Seminar, Fayetteville, AR, October, 2009.

70. Keynote Lecture 1, 5th U.S.-Sino Meeting, *"Low Energy Intensive Large Scale Separations: Tools to Promote Sustainable Development"*, Beijing, China, October, 2009.

71. Keynote Lecture 2, 5th U.S.-Sino Meeting. *"Polymeric and Hybrid Membranes for Aggressive CO_2 Separation Applications"*, Beijing, China, October, 2009.

72. * Plenary Lecture, 2009 Euro-Membrane Meeting, *"Closing Technology Gaps to Enable Energy Efficient Membrane-Based Separations"*. Montpelier, France. September, 2009.

73. * Keynote Lecture, Advanced Membrane Technology (IV) Conference. Trondheim, *"Polymeric and Hybrid Membranes for Aggressive CO_2 Separations Applications"*, Norway. June, 2009.

74. * Distinguished Chemical Engineering Seminar, "*Membrane Processes: Tools to Reshape the Landscape in Energy Intensive Industries",* Imperial College, London, UK, May, 2009.

75. Invited Lecture, Institute for Paper Science and Technology—Technology Roadmap for the Forest Products Industry Workshop, Atlanta, GA, April, 2009.

76. Worcester Polytechnic Institute, Department of Chemical Engineering Seminar,. Worcester, MA, April, 2009.

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

78. * Keynote Lecture, NanoMemCourse European Membrane Society, *"Status and Applications of Polymeric & Hybrid Membranes for CO_2 Separation"*, Lillestrøm, Norway, March, 2009.

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

80. University of Nebraska, Department of Chemical Engineering Seminar, Lincoln, NE. March, 2009.

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

82. Invited Lecture, Gordon Conference on Membranes Materials & Processes, New London, NH, August, 2008.

83. Invited Lecture, Special Symposium on 100 Years of Separations, AICHE Annual Meeting, Philadelphia, PA, November, 2008.

84. Arizona State University, Chemical Engineering Seminar, Tempe, AZ, November, 2008.

85. * Pirkey Lecture, "*Low Energy Intensive Large Scale Separations via Advanced Membranes"*, University of Texas at Austin, Austin TX, November, 2008.

86. Invited Lecture, Shell Nanotech Conference, Woodlands, TX, October, 2008.

87. University of Florida, Department of Chemical Engineering Seminar, Gainesville, FL, October, 2008.

88. Princeton University, Department of Chemical Engineering Seminar, Princeton, NJ, October, 2008.

89. Invited Lecture, SOLVAY, Alpharetta, GA, October, 2008.

90. Keynote Lecture, European Membrane Conference on Membranes and Membrane Processes, *"Enabling Practical Large Scale Membrane Processes in Energy & Fuels Applications",* Montpellier, France, September, 2008.

91. Invited Lecture, Gordon Conference on Membranes Materials & Processes, New London, NH, August, 2008.

92. Invited Lecture, ACS Symposium on Membranes for Energy and Fuel Application, ACS FUELS Division, ACS National Meeting, Philadelphia, PA, August, 2008.

93. * Alan S. Michaels Award Symposium, *"My Reflections and Projections on Membranes"*, International Conference on Membranes, Honolulu, HI, July 2008.

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

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

96. * Distinguished International Lectureship, *"Carbon Molecular Sieve Membranes for Gas Separations: Tradeoffs & Opportunities"*, Istanbul Technical University Istanbul, Turkey, March, 2008.