

David G. Rethwisch

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EDUCATION

Ph.D. - Chemical Engineering, University of Wisconsin-Madison, 1985

B.S. - Chemistry, University of Iowa, 1979

WORK EXPERIENCE

University of Iowa, Iowa City, Iowa (1985 - present)

Assistant Professor - Chemical and Biochemical Engineering (1985 - 1990)

Associate Professor - Chemical and Biochemical Engineering (1990 - 1995)

Professor - Chemical and Biochemical Engineering (1995 - present)

Univ. of Bologna, Bologna, Italy (1999)

Visiting Professor – Chemical Engineering

University of Delaware, Newark, Delaware (1992)

Visiting Research Professor - Chemical Engineering and Chemistry & Biochemistry

Argonne National Laboratories, Argonne, Illinois (Summer 1986)

Visiting Scientist.

Amoco Chemical, Naperville, Illinois (Summer 1990)

Technical Consultant

Consultant for Dow Corning, DuPont, Climax Molybdenum, and CSM.

RESEARCH ACTIVITIES

- Established successful research laboratories in polymer and membrane science and enzyme catalysis.
- Member Optical Science and Technology Center, Univ. of Iowa, 1994-present.
- Member Center for Environmentally Beneficial Catalysis, Univ. of Iowa, 2003-present.
- Principal Investigator on grants from NSF, PRF/ACS, NIH, USDA, Camille & Henry Dreyfus Foundation, U.S. Army, Whitaker Foundation, and the Idaho National Engineering Laboratory.
- Have graduated 10 Ph.D., 10 M.S. candidates, and supervised 3 postdoctoral fellows, and currently supervise 3 Ph.D. students.
- Developed chemoenzymatic synthesis of biodegradable, water-absorbent polymers and hydrogels based on sugars.

- Developed photoresponsive polymers which allow real-time control of polymer and membrane properties. Allows greater flexibility to optimize membrane separation properties while onstream.
- Reviewer for Journal of Membrane Science, Journal of Catalysis, Journal of Physical Chemistry, Separation Science and Technology, Langmuir, Environmental Science and Technology, Macromolecular Chemistry and Physics, Biotechnology and Bioengineering, Industrial & Engineering Chemistry Research, MRS, NSF, NIH, and ACS/PRF

TEACHING ACTIVITIES

- Coauthor of leading textbooks in Materials Science – Callister, W.D., Jr. “Materials Science and Engineering an Introduction,” 7th Ed., Wiley, NY 2007; and Callister, W.D., Jr. and Rethwisch, D.G. “Fundamentals of Materials Science and Engineering,” 3rd Ed., Wiley, NY 2008.
- Director of Project Lead the Way Iowa– This is a joint program among the Colleges of Engineering at the University of Iowa and Iowa State, Iowa community colleges, the Iowa Department of Education, and Iowa industries to provide college credit engineering courses in Iowa high schools.
- Received University of Iowa Collegiate Teaching Award (College of Engineering) 1990-91. This is a competitive award with only one award per college per year.
- Received Department Outstanding Teaching Award for 1987/88 school year
- Developed undergraduate curriculum and obtained funding for implementation from Camille & Henry Dreyfus Foundation
- Taught courses in Chemical Engineering Thermodynamics, Intermediate Thermodynamics, Unit Operations Laboratory I & II, Chemical Reaction Kinetics, Engineering I, Mass Transfer, Materials Science, Polymer Science & Technology, Membrane Separation Processes, and Catalysis and Kinetic Theory.

SERVICE ACTIVITIES

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| AIChE - | Organization Committee for Separations Division, National-1990
Programming Committee, Separations Division, National Meeting, May 1990
Session Chairman, Iowa Section Meeting-1987, 1989
Session Chairman, National Meeting, November 1991, 1994, 2004 |
| ACS - | Session Chairman, National Meeting, June 1988, April 1990, August 1990,
April 1997 |
| 1991 | 2nd Pan American Chemical Congress - session chairman, San Juan, Puerto Rico, September 1991. |
| 1992 | Organization Committee for Blue Hen NMR Symposium, Newark, DE |
| 1999-2000 | Vision 2020 - Participated in Biocatalysis Workshop for Vision 2020, a joint effort by a group of chemically related organizations including ACS, AIChE, NRC, NSF, the Chemical Manufacturers Association, and others to identify the challenges and lay a roadmap for the chemical industry to the year 2020. |
| 2005- | Director of Project Lead the Way Iowa - a program to provide college credit engineering courses in Iowa high schools. |
| 2006- | Organization Committee for National Educators Workshop (NEW) – an annual workshop to enhance the teaching of materials science. |

HONORS AND ORGANIZATIONS

Collegiate Teaching Award (University of Iowa, 1990-91)

Department of Chemical Engineering Outstanding Teacher (University of Iowa, 1987-88)

Old Gold Faculty Fellowship (University of Iowa, 1986)

American Institute of Chemical Engineers - (Chairman, Iowa Section 1991)

American Chemical Society - member

Sigma Xi - member

Tau Beta Pi - member

Alpha Chi Sigma - member

PUBLICATION LIST

1. Rethwisch, D.G., Phillips, J., Chen, Y., Hayden, T., and Dumesic, J.A., "Water-Gas Shift over Magnetic Particles Supported on Graphite: Effects of Treatments in CO/CO₂ or H₂/H₂O Gas Mixtures", J.Catal. **91**, 167 (1985).
2. Rethwisch, D.G. and Dumesic, J.A., "The Effect of Metal Oxygen Bond Strength on Properties of Oxides: I. Infrared Spectroscopy of Adsorbed CO & CO₂", Langmuir **2**, 73 (1986).
3. Rethwisch, D.G. and Dumesic, J.A., "The Effect of Metal-Oxygen Bond Strength on Properties of Oxides: II. Water-Gas Shift over Bulk Oxides", Applied Catalysis **21**, 97 (1986).
4. Rethwisch, D.G. and Dumesic, J.A., "Adsorptive and Catalytic Properties of Supported Metal Oxides: I. Mössbauer Spectroscopy of Supported Iron Oxides", J. Phys. Chem. **90**, 1863 (1986).
5. Rethwisch, D.G. and Dumesic, J.A., "Adsorptive and Catalytic Properties of Supported Metal Oxides: II. Infrared Spectroscopy of Nitric Oxide Adsorbed on Supported Iron Oxides", J. Phys. Chem. **90**, 1625 (1986).
6. Rethwisch, D.G. and Dumesic, J.A., "Adsorptive and Catalytic Properties of Supported Metal Oxides: III. Water-Gas Shift Over Supported Iron and Zinc Oxides", J.Catal. **101**, 35 (1986).
7. Rethwisch, D.G. and Dumesic, J.A., "Adsorptive and Catalytic Properties of Supported Metal Oxides", Activation of Carbon Dioxide, (Ed., William M. Ayers), ACS Symposium Series 233, (1988).
8. Friedrich, H.B., Sevenich, D.M., Gasper-Galvin, L.D., and Rethwisch, D.G., "Infrared Spectroscopic Determination of Methylchlorosilanes from the Direct Process Reaction", Analytica Chimica Acta **222**, 221-234 (1989).
9. Hauenstein, D.E. and Rethwisch, D.G., "Photocontraction of Polyethylene Containing Photochromic Dyes", Journal of Materials Science Letters **9**, 500-502 (1990).
10. Rethwisch, D.G., Subramanian, A., Yi, G., and Dordick, J.S., "Enzyme-Facilitated Transport and Separation of Organic Acids Through Liquid Membranes", Journal of the American Chemical Society **112**, 1649-1650 (1990).
11. Dordick, J.S., Parida, S., Patil, D.R., Ryu, K., and Rethwisch, D.G., "The Use of Enzymes in Organic Solvents to Overcome Common Catalytic Constraints", in "Industrial Use of Enzymes" (Ed. Wolnak, B. and Scher, M.), pp. 136-163, Bernard Wolnak and Assoc., Chicago (1990).
12. Hauenstein, D.E. and Rethwisch, D.G., "Photocontrol of Gas Separation Properties", Separation Science and Technology **25**, 1441-1454 (1990).
13. Patil, D., Rethwisch, D.G., and Dordick, J.S., "Enzymatic Synthesis of Sucrose-Containing Linear Polyester in Nearly Anhydrous Media", Biotechnology and Bioengineering **37**, 639-646 (1991).
14. Rethwisch, D.G. and Dordick, J.S., "Enzymatic Catalysis in Bioseparations", in "Biocatalysts for Industry" (Ed. Dordick, J.S.), pp. 311-323, Plenum, New York (1991).
15. Gasper-Galvin, L.D., Sevenich, D.M., Friedrich, H.B., and Rethwisch, D.G., "Role of Metallic Promoters in the Direct Synthesis of Methylchlorosilanes", Journal of Catalysis **128**, 468-478 (1991).

16. Patil, D.R., Rethwisch, D.G., and Dordick, J.S., "Chemoenzymatic Synthesis of Novel Sucrose-Containing Polymers", Macromolecule **24**, 3462-3463 (1991).
17. Kim, J.P. and Rethwisch, D.G., "The Direct Synthesis of Methylchlorosilanes: I. Steady-State and Transient Reaction Kinetics", Journal of Catalysis **134**, 168-178 (1992).
18. Edens, R.E., Al-Hakim, A., Weiler, J.M., Rethwisch, D.G., Fareed, J., and Linhardt, R.J., "Gradient Polyacrylamide Gel Electrophoresis for Determination of the Molecular Weight of Heparin Preparations and Low Molecular Weight Heparin Derivatives", Journal of Pharmaceutical Sciences **81**(8), 823-827 (1992).
19. Dordick, J.S., Patil, D.R., Parida, S., Ryu, K., and Rethwisch, D.G., "Enzymatic Catalysis in Organic Media: Prospects for the Chemical Industry", in "Catalysis of Organic Reactions" (Ed. W.E. Pascoe) Marcel Dekker, Inc., New York (1992).
20. Gasper-Galvin, L.D., Sevenich, D.M., Friedrich, H.B., and Rethwisch, D.G., "Effect of Promoters on the Catalytic Synthesis of Methylchlorosilanes", Catalyzed Direct Reactions of Silicon (Eds., K.M. Lewis and D.G. Rethwisch), Elsevier, Amsterdam, pp. 279-298, 1993.
21. Friedrich, H.B., Sevenich, D.M., Gasper-Galvin, L.D., and Rethwisch, D.G., "In-line Fourier Transform Spectroscopic Analysis of Methylchlorosilanes Produced by the Direct Reaction", Catalyzed Direct Reactions of Silicon (Eds., K.M. Lewis and D.G. Rethwisch), Elsevier, Amsterdam, pp. 219-236, 1993.
22. Hauenstein, D.E. and Rethwisch, D.G., "Photoreversible Polymeric Membranes", Separation and Purification Methods **22**(1), 23-53 (1993).
23. Rethwisch, D.G., Jacintha, M. and Dybowski, C.R., "Quantification of ^{13}C in Solids Using CPMAS-DD NMR Spectroscopy", Analytica Chimica Acta **283**, 1033 (1993).
24. Rethwisch, David G. and Lewis, Kenrick M., Catalyzed Direct Reactions of Silicon, Elsevier, Amsterdam, 1993.
25. Dordick, J.S., Linhardt, R.J., and Rethwisch, D.G., "Enzymatic and Chemoenzymatic Preparation of Hydrophilic Polymers and Gels", Chemtech **24**, 33-39 (1994).
26. Provine, W.D., Jung, B., Jacintha, M.A., Rethwisch, D.G., Huang, H., Calkins, W.H., Klein, M.T., Scouten, C., and Dybowski, C.R., Catalysis Today **19**, 409-420 (1994).
27. Rethwisch, D.G., Chen, X., Martin, B.D., and Dordick, J.S., "Chemoenzymatic Preparation of Sugar-Based Hydrogels", in Biomolecular Materials by Design (Eds., M. Alper, H. Bayley, D. Kaplan and M. Navia), MRS Symposium Series, Vol. 330, 225-230 (1994).
28. Rethwisch, D.G., Van Alsten, J., and Dybowski, C.R., "NMR Measurement of the Surface Dynamics of Poly(Dimethylsiloxane) Adsorbed on Silica Gel", Macromolecular Symposia **86**, 171-180 (1994).
29. Chen, X., Johnson, A., Dordick, J.S., and Rethwisch, D.G., "Chemoenzymatic Synthesis of Linear Poly(Sucrose Acrylate): Optimization of Enzyme Activity and Polymerization Conditions", Macromolecular Chemistry and Physics **195**, 3567-3578 (1994).
30. Rethwisch, D.G., Yi, G., Parida, S., and Dordick, J.S., "Use of Alcohols as Cosolvents in Enzyme-Facilitated Transport of Organic Acids", Journal of Membrane Science **95**, 83-91 (1994).

31. Chen, X., Dordick, J.S., and Rethwisch, D.G., "Chemoenzymatic Synthesis and Characterization of Novel α -Methylgalactoside Acrylate-Based Hydrogels", Macromolecules **28**, 6014-6019 (1995).
32. Wang, P., Martin, B.D., Parida, S., Rethwisch, D.G., and Dordick, J.S., "Multienzymic Synthesis of Poly(Hydroquinone) for Use as a Redox Polymer", Journal of the American Chemical Society **117**, 12885-12886 (1995).
33. Rethwisch, D.G., Martin, B.D., Chen, X., Linhardt, R.J. and Dordick, J.S., "Enzymatic and Chemoenzymatic Approaches to Synthesis of Sugar-Based Polymer and Hydrogels", Carbohydrate Polymers **28**, 15-21 (1995).
34. Dordick, J.S., Martin, B.D., Chen, X., Rich, J.O., Linhardt, R.J. and Rethwisch, D.G., "Enzymatic Synthesis of Polymeric Materials", Polymer Materials Science and Engineering **7**, 90-91 (1995).
35. Wessel, T.J. and Rethwisch, D.G., "Activation of CuSi and CuZnSnSi Contact Masses for the Direct Synthesis of Methylchlorosilanes", Reaction Kinetics and Catalysis Letters **58**, 7-12 (1996).
36. Wessel, T.J. and Rethwisch, D.G., "Deactivation of CuSi and CuZnSnSi Contact Masses due to Coke Formation during the Direct Synthesis of Methylchlorosilanes", Journal of Catalysis **161**, 861-866 (1996).
37. Patil, N.S., Dordick, J.S., and Rethwisch, D.G., "Macroporous Poly(Sucrose Acrylate) Hydrogel for Controlled Release of Macromolecules", Biomaterials **17**, 2343-2350 (1996).
38. Rethwisch, D.G. and Wessel, T.J., "Kinetics of the Direct Reaction: Mechanistic Implications", Silicon for the Chemical Industry III, Sandefjord, Norway (June 1996).
39. Schoenwald, R.D., Deshpande, G., Rethwisch, D.G., and Barfknecht, C.F., "Penetration into the Anterior Chamber via the Conjunctival/Scleral Pathway", Journal of Ocular Pharmacology and Therapeutics **13**, 41-59 (1997).
40. Patil, N.S., Rethwisch, D.G., and Dordick, J.S., "Sucrose Diacrylate: Unique Chemically and Biologically Degradable Crosslinker for Polymeric Hydrogels", J. Polym. Sci.:Part A Polym. Chem. **35**, 2221-2229 (1997).
41. Kodzwa, M.G. and Rethwisch, D.G., "Rhotoresponsive Control of Ion-Exchange in Leucohydroxide Containing Hydrogel Membranes," Polym Mater Sci Eng. **76**, 279-280 (1997).
42. Kodzwa, M.G., Staben, M.E., and Rethwisch, D.G., "Rhotoresponsive Control of Ion-Exchange in Leucohydroxide Containing Hydrogel Membranes," J. Membrane Sci. **158**, 85-92 (1999).
43. Kaufmann, K.J. and Rethwisch, D.G., "Introducing Engineering Design in Materials Science," J. Mat. Education **19**, 29-38 (1999).
44. Olakangil, J.F., Rethwisch, D.G., Yilmaz, S. and Kuivila, C.S., "Effect of Promoters on the Reaction Kinetics of the Direct Process," Silicon Chem. Ind. **V**, 325-330 (2000).
45. Rethwisch, D.G. and Olakangil, J.F., "Kinetics of Coking in the Direct Process," Silicon Chem. Ind. **V**, 399-405 (2000).
46. Li, Y. and Rethwisch, D.G., "Quantitative Production of α -Methyl Glucoside Acrylate using *Candida Antarctica* Lipase in Acetone," Biotechnology & Bioengineering **79**, 15-22 (2002).
47. Capila, I., Yi, W., Rethwisch, D.G., Matte, A., Cygler, M., and Linhardt, R.J., "Role of Arginine 292 in the Catalytic Activity of Chondroitin AC Lyase from *Flavobacterium heparinum*,"

Biochimica et Biophysica Acta - Protein Structure and Molecular Enzymology 1597, 260-270 (2002).

48. Doghieri, F., Ghedini, M., Quinzi, M., Rethwisch, D.G., and Sarti, G.C., "Gas Solubility in Glassy Polymers: Predictions from Non-Equilibrium EOS," *Desalination* 144, 73-78 (2002).
49. Rethwisch, D.G., Olakangil, J.F., Wood, L.H., Miller, D.C., and Wineland, J.D., "Coking of Contact Masses Containing High Purity and Technical Grade Silicon," *Silicon Chem. Ind.* VI, 313-322 (2002).
50. Jain, K., Rethwisch, D.G., and Scranton, A.B., "Microemulsion Photopolymerization", *Recent Research Developments in Polymer Science* 7, 35 (2003).
51. Doghieri, F., Ghedini, M., Quinzi, M., Rethwisch, D.G., and Sarti, G.C., "Predicting Gas Solubility in Glassy Polymers through Non-Equilibrium EOS," in *Advanced Materials for Membrane* (Ed., I. Pinnau and B.D. Freeman) ACS Symposium Series, Vol. 876, 55-73 (2004).
52. Doghieri, F., Quinzi, M., Rethwisch, D.G., and Sarti, G.C., "Predicting Gas Solubility in Glassy Polymers through Non-Equilibrium EOS," in *Advanced Materials for Membrane* (Ed., I. Pinnau and B.D. Freeman) ACS Symposium Series, Vol. 876, 74-90 (2004).
53. Doghieri, F., Quinzi, M., Rethwisch, D.G., and Sarti, G.C., "Predicting Gas Solubility in Glassy Polymers through Non-Equilibrium EOS," in *Materials Science of Membranes for Gas and Vapor Separation* (Ed., Yu. Yampolskii, I. Pinnau & B.D. Freeman), Wiley NY (2006).
54. Rethwisch, D.G., "Kinetics of Coking in the Direct Process," *Silicon Chem. Ind.* VIII, 103-120 (2006).

PATENTS

1. Dordick, J.S., Rethwisch, D.G., and Patil, D.R. (1993) U.S. Patent #5,270,421, "Sugar-Based Polymers".
2. Dordick, J.S., Martin, B.D., Linhardt, R.J., and Rethwisch, D.G. (1995) U.S. Patent #5,474,915, "Method of Making Poly(Sugar Acrylates) Using Hydrolytic Enzymes".
3. Dordick, J.S., Rethwisch, D.G., and Patil, D.R., (1997) U.S. Patent #5,618,933, "Sugar-Based Polymers".
4. Dordick, J.S., Rethwisch, D.G., and Patil, D.R., (1998) Canadian Patent #2,088,366, "Sugar-Based Polymers".
5. Dordick, J.S., Rethwisch, D.G., and Patil, D.R., (1999) European Patent pending, "Sugar-Based Polymers".

PRESENTATION LIST

1. Rethwisch, D.G. and Dumesic, J. A., "Water-Gas Shift over Magnetite on Grafoil: Effects of Treatments in CO/CO₂ and H₂/H₂O Mixtures", ACS National Meeting, Philadelphia, PA (August, 1984).
2. Rethwisch, D.G. and Dumesic, J.A., "The Influence of Metal-Oxygen Bond on Water-Gas Shift over Oxides", AIChE National Meeting, Chicago, IL (November, 1985).
3. Rethwisch, D.G. and Dumesic, J.A., "Adsorptive and Catalytic Properties of Supported Metal Oxides", ACS National Meeting, New York, NY (April, 1986).
4. Hauenstein, D.E., Hulett, G.L., Rethwisch, D.G., and Dogan, A.U., "The Effects of Electron Beam Irradiation on the Morphology of Photosensitive Polymeric Materials", Conference on Frontiers of Electron Microscopy in Materials Science, Argonne, IL (April 1986).
5. Rethwisch, D.G., Gasper-Galvin, L.D., Sevenich, D.M, .and Friedrich, H.B., "Effect of Promoters on the Direct Reaction", Third Chemical Congress of North American, Toronto, Canada (June 1988).
6. Chaired symposium entitled, "Direct Catalyzed Reaction of Metallic Silicon", Third Chemical Congress of North American, Toronto, Canada (June 1988).
7. Subramanian, A., Rethwisch, D.G., and Dordick, J.S., "Development of Enzyme-Containing Liquid Membrane for Bio-Separations", 23rd ACS Midwest Regional Meeting, Iowa City, IA (November 1988).
8. Kim, J.-P. and Rethwisch, D.G., "Promoter Effects in the Catalyzed Synthesis of Silanes", 23rd ACS Midwest Regional Meeting, Iowa City, IA (November 1988).
9. Wessel, T.J. and Rethwisch, D.G., "Laser Nucleation of Monodisperse Metal Clusters", 23rd ACS Midwest Regional Meeting, Iowa City, IA (November 1988).
10. Rethwisch, D.G. and Hauenstein, D.E., "Photoresponsive Control of Polymer Membrane Properties", IUPAC International Symposium on Molecular Design of Functional Polymers, Seoul, Korea (June 1989).
11. Chaired session entitled, "Polymers for Separation Processes", IUPAC International Symposium on Molecular Design of Functional Polymers, Seoul, Korea (June 1989).
12. Subramanian, A., Rethwisch, D.G., and Dordick, J.S., "Selective Bioseparations Involving Enzyme-Assisted Liquid Membrane", 198th ACS National Meeting, Miami Beach, FL (September 1989).
13. Rethwisch, D.G. and Hauenstein, D.E., "Photoresponsive Control of Membrane Separations", DOE Sixth Symposium on Separations Science and Technology for Energy Applications, Knoxville, TN (October 1989).
14. Rethwisch, D.G., Subramanian, A., and Dordick, J.S., "Separations with an Enzyme-Assisted Liquid Membrane", AIChE 1989 National Meeting, San Francisco, CA (November 1989).
15. Rethwisch, D.G. and Hauenstein, D.E., "Photoresponsive Control of Membrane Separations", AIChE 1989 National Meeting, San Francisco, CA (November 1989).

16. Rethwisch, D.G. and Gasper-Galvin, L.D., "Metallic Promoters in the Copper Catalyzed Production of Methylchlorosilanes", AIChE 1989 National Meeting, San Francisco, CA (November 1989).
17. Kim, J.-P. Rethwisch, D.G., "Catalytic Gasification of Silicon to Form Methylchlorosilanes", 199th ACS National Meeting, Boston, Massachusetts (April 1990).
18. Rethwisch, D.G. and Hauenstein, D.E., "Photoresponsive Membranes", The 1990 International Conference on Membranes, Chicago, IL (August 1990).
19. Dordick, J.S., Rethwisch, D.G., and Gao, Y., "Enzyme-Facilitated Transport of Organic Acids Through a Liquid Membrane", The 1990 Int. Conf. on Membranes, Chicago, IL (August 1990).
20. Rethwisch, D.G., Yi, G., and Dordick, J.S., "Enzyme-Facilitated Transport of Organic Acids", 200th ACS National Meeting, Washington, DC (August 1990).
21. Patil, D., Dordick, J.S., and Rethwisch, D.G., "Enzymatic Synthesis of Novel Sucrose-Containing Polymers", AIChE 1990 National Meeting, Chicago (November 1990).
22. Rethwisch, D.G., Patil, D., Adigal, R., and Dordick, J.S., "Enzyme-Catalyzed Production of Sugar-Based Linear Polyesters", Antec '91, Montreal (May 1991).
23. Rethwisch, D.G., Gao, Y., and Dordick, J.S., "Enzyme-Facilitated Transport of Biologically Active Materials", Midwest Biotechnology Symposium, Madison, WI (May 1991).
24. Rethwisch, D.G., Gao, Y., and Dordick, J.S., "Enzyme-Facilitated Transport of Organic Acids", Fourth Pan-American Chemical Congress, San Juan, Puerto Rico (September 1991).
25. Dordick, J.S., Patil, D.R., and Rethwisch, D.G., "Production of Novel Sugar-Based Polymers by Enzyme-Catalyzed Polyester Synthesis", AIChE 1991 Annual Meeting, Los Angeles, CA (November 1991).
26. Dordick, J.S., Yi, G., and Rethwisch, D.G., "Enzyme-Facilitated Separations of Organic Acids", AIChE Annual Meeting, Los Angeles, CA (November 1991).
27. Rethwisch, D.G., Yi, G., and Dordick, J.S., "Effect of Alcohol Concentration on the Enzyme-Facilitated Transport of Organic Acids in a Liquid Membrane", Gordon Conference, New London, NH (July 1992).
28. Rethwisch, D.G., Van Alsten, J., and Dybowski, C.R., "CPMAS Study of the Surface Dynamics of Polydimethylsiloxane Adsorbed on Silica Gel", Blue Hen Symposium, Newark, DE (June 1992).
29. Rethwisch, D.G., Yi, G., and Dordick, J.S., "Alcohol Enhancement of Enzyme-Facilitated Separations of Organic Acids", Gordon Conference, New London, NH (Aug. 1992).
30. Rethwisch, D.G., VanAlsten, J., and Dybowski, C.R., "CPMAS Study of the Surface Dynamics of Polydimethylsiloxane Adsorbed on Silica Gel", AIChE Special Meeting: Solid-State NMR Spectroscopy of Polymers, Keystone, CO (February 1993).
31. Rethwisch, D.G. and Dordick, J.S., "Chemoenzymatic Preparation of Sugar-Based Hydrogels", National Meeting of the Materials Research Society, Boston, MA (November 1993).
32. Rethwisch, D.G. and Melquist, J., "Evaluation of Thermodynamic Models for the Solubility of Gases in Polymers", AIChE Annual Meeting, San Francisco, CA (November 1994).

33. Dybowski, C.R., Gaffney, E., Calkins, W., Rethwisch, D.G., "Quantitative NMR Characterization of Argonne Premium Coal Samples with Single-Pulse and CPMAS Carbon-13 NMR Spectroscopy", paper #342, Eastern Atlantic Symposium and Exposition, Somerset, NJ (November 1994).
34. Dordick, J.S., Patil, N., and Rethwisch, D.G., "Enzymes in Pharmaceutical Synthesis and Delivery", Keystone Meeting on Drug Delivery, Hilton Head Island, SC (January 1995).
35. Dordick, J.S., Patil, N., Martin, B., and Rethwisch, D.G., "Enzymes in Polymer Synthesis", Gordon Conference on Biodegradable Polymers, Oxnard, CA (March 1995).
36. Dordick, J.S., Patil, N., Martin, B., and Rethwisch, D.G., "Enzymatic Preparation of Carbohydrate-Based Biomaterials", Carbohydrate Bioengineering Meeting, Helsingor, Denmark (April 1995).
37. Dordick, J.S., Patil, N., Martin, B., and Rethwisch, D.G., "Sugar-Based Biodegradable Polymers for Drug Delivery", Colorcon Symposium on Controlled Release, Princeton, NJ (October 1995).
38. Rethwisch, D.G., Zhuang, Z., Wang, P., "PFG-NMR Determination of Diffusivity of Small Molecules in Polymer Systems", paper #142g, AIChE Annual Meeting, Miami Beach, FL (November 1995).
39. Rethwisch, D.G. and Wessel T.J., "Kinetics of the Direct Reaction: Mechanistic Implications", Silicons for the Chemical Industry III, Sandefjord, Norway (June 1996).
40. Rethwisch, D.G. and Kodzwa, M.G., "Photoresponsive Control of Ion-Exchange in Leucohydroxide-Containing Hydrogel Membranes", paper #171 (PMSE), 213th ACS National Meeting, San Francisco, CA (April 1997).
41. Rethwisch, D.G. and Wessel, T.J., "Coke Formation During the Direct Synthesis of Methylchlorosilanes", AIChE Annual Meeting, Los Angeles, CA (November 1997).
42. Rethwisch, D.G., Patil, N. S., Li, Y., and Dordick, J. S., "Enzymatic, Pseudo-Solid Phase Synthesis of α -Methyl Glucoside-6-Acrylate", AIChE Annual Meeting, Los Angeles, CA (November 1997).
43. Rethwisch, D.G. and Dordick, J.S., "Chemoenzymatic Synthesis of Monomers and Polymers from Biomass," Gordon Conference on Green Chemistry, Meriden NH (August 1998).
44. Rethwisch, D.G. and Dordick, J.S., "Chemoenzymatic Synthesis of Monomers, Polymers, and Hydrogels from Corn-Based Sugars," Materials in the Heartland Meeting, Southern Illinois University, Carbondale IL (October 1998).
45. Rethwisch, D.G., "Chemoenzymatic Synthesis of Monomers, Polymers, and Hydrogels from Corn-Based Sugars," Materials in the Heartland Meeting, Southern Illinois University, Carbondale IL (October 1998).
46. Olakangil, J.F., Rethwisch, D.G., Yilmaz, S. and Kuivila, C.S., "Effect of Promoters on the Reaction Kinetics of the Direct Process," Silicon for the Chemical Industry V, Tromsø, Norway (June 2000).
47. Rethwisch, D.G. and Olakangil, J.F., "Kinetics of Coking in the Direct Process," Silicon for the Chemical Industry V, Tromsø, Norway (June 2000).

48. Doghieri, F., Ghedini, M., Quinzi, M., Rethwisch, D.G., and Sarti, G.C., "Gas Solubility in Glassy Polymers: Predictions from Non-Equilibrium EOS," AIChE Annual Meeting, Reno, NV (November 2001).
49. Doghieri, F., Ghedini, M., Quinzi, M., Rethwisch, D.G., and Sarti, G.C., "Predicting Gas Solubility in Glassy Polymers through Non-Equilibrium EOS," ACS Annual Meeting (2001).
50. Rethwisch, D.G. and LaCrosse, J., "Increasing Molecular Weight of Poly(Lactic Acid) by Reactive Extrusion," Bioremediation National Meeting, Des Moines, IA (December 2001).
51. Rethwisch, D.G. and LaCrosse, J., "Chain Extension of Poly(Lactic Acid) by Reactive Extrusion," 197c, AIChE National Meeting, Indianapolis (November 2002).
52. Rethwisch, D.G. and Kodzwa, M.G., "Photoresponsive Control of Polyethylacrylate Membranes Containing a Spiropyran," 195h, AIChE National Meeting, Indianapolis (November 2002).
53. Rethwisch, D.G., Ghedini, M., Sarti, G.C., and Doghieri, F., "Modeling of Gas-Polymer Solubility at Infinite Dilution: Empirical Models vs. PHSC," 41b, AIChE Annual Meeting, Indianapolis (November 2002).
54. Sarti, G.C., Doghieri, F., Quinzi, M., and Rethwisch, D.G., "Calculation of Gas Solubility in Glassy Polymers Using Non-equilibrium Equations of State," 113g, AIChE Annual Meeting, Indianapolis (November 2002).
55. Jain, K., Ficek, B.A., Rasmussen, P., Scranton, A.B., and Rethwisch, D.G., "Microemulsions of Soybean Oil," 107bt, AIChE Annual Meeting, San Francisco (November 2003).
56. Rethwisch D, Scranton A.B., Jain K., and Rasmussen P.G., "Enhanced epoxidation of soybean oil through microemulsion technique," ACS National Meeting #228: U391-U391 440-POLY Part 2 (August 2004).
57. Rethwisch, D.G., Jain, K., Rasmussen, P., Rethwisch, K.T., Peeples, T.L., and Scranton, A.B., "Epoxidation of Soybean Oil in a Microemulsion-Assisted Environment," AIChE Annual Meeting, Cincinnati (November 2005).
58. Rethwisch, D.G., "Kinetics of Coking in the Direct Process," Silicon Chem. Ind. VIII, Trondheim, Norway (June 2006).
59. Rethwisch, D.G., "Project Lead the Way: Introducing High School Students to Engineering," AIChE Annual Meeting, San Francisco (November 2006).
60. Scholten, M. and Rethwisch, D.G., "Use of Lipoxygenases in the Production of Monools in Agricultural Oils," AIChE Annual Meeting, San Francisco (November 2006).

Invited Symposia

1. UOP Corporation, Des Plaines, Illinois, "Effect of Promoters on the Copper Catalyzed Reaction of Silicon", May 1989.
2. AMOCO Corporation, Naperville, Illinois, "Photoresponsive Control of Membrane Separations", June 1989.
3. Korean National Institute of Science and Technology (KAIST), Seoul, Korea, "Promoter Effects in the Copper Catalyzed Reaction of Silicon", June 1989.

4. Seoul National University, Seoul, Korea, "Promoter Effects in the Copper Catalyzed Reaction of Silicon", June 1989.
5. Tokyo Denki University, Tokyo, Japan, "Promoter Effects in the Copper Catalyzed Reaction of Silicon", June 1989.
6. Tokyo Denki University, Tokyo, Japan, "Photoresponsive Control of Membrane Separations", June 1989.
7. Tokyo Medical and Dental University, Tokyo, Japan, "Photoresponsive Control of Membrane Separations", June 1989.
8. University of Florida, Gainesville, Florida, "Promoter Effects in the Copper Catalyzed Reaction of Silicon", September 1989.
9. University of Kansas, Wichita, Kansas, "Applications of Enzymes to Separations and Polymer Chemistry", November 1990.
10. Kansas State University, Manhattan, Kansas, "Applications of Enzymes to Separations and Polymer Chemistry", November 1990.
11. University of Nebraska, Lincoln, Nebraska, "Applications of Enzymes to Separations and Polymer Chemistry", November 1990.
12. Iowa State University, Ames, Iowa, "Applications of Enzymes to Separations and Polymer Chemistry", January 1991.
13. Amoco Chemical Corporation, Naperville, Illinois, "Solubility of Gases in Molten-Polymers", December 1991.
14. DuPont Corporation, Wilmington, DE, "Photoresponsive Control of Membrane Separations", March 1992.
15. Department of Chemistry and Biochemistry, University of Delaware, "Photoresponsive Membranes", March 1992.
16. Department of Chemical Engineering & Department of Chemistry and Biochemistry, University of Delaware, "Direct Copper Catalyzed Reactions of Silicon to Produce Silanes", November 1992.
17. Frontiers in Carbohydrate Chemistry-4, National Conference, Purdue University, "Chemoenzymatic Approaches to Synthesis of Sugar-Based Polymer and Hydrogels", May 1994.
29. North Carolina State University, Department of Chemical Engineering, "Controlled Release Delivery of Macromolecules from Poly(Sucrose Acrylate) Hydrogels", August 1995.
30. Bectin-Dickinson, Research Triangle, NC, "Enzymatic Synthesis of Sugar Based Polymers", August 1995.
31. Hercules, Wilmington DE, "Enzymatic Synthesis of Sugar Based Polymers", November 1995.
32. Rethwisch, D.G. and Wessel T.J., "Kinetics of the Direct Reaction: Mechanistic Implications", Silicons for the Chemical Industry III, Sandefjord, Norway (June 1996).
33. Rethwisch, D.G. and Wessel T.J., "Kinetics and Coking in the Direct Reaction", Rhone-Poulenc, Lyon, France (June 1996).

34. Rethwisch, D.G., "PFG-NMR Determination of Diffusion Coefficients", Ciba-Geigy, Marly, Switzerland (June 1996).
35. Rethwisch, D.G., "Applications of PFG-NMR to Membrane Science", University of Bologna, Bologna, Italy (June 1996).
36. Rethwisch, D.G., "Coking in the Direct Synthesis Reaction", Dow Corning, Carrolton, Kentucky, (August 1996).
37. Rethwisch, D.G., "Foaming of Polylactic Acid", Chronopol, Golden, CO (Feb 1997).
38. Rethwisch, D.G., "Enzymatic Synthesis of Sugar Based Polymers", Medtronic, Minneapolis, MN (Feb. 1997).
39. Rethwisch, D.G., "Coking in the Direct Synthesis Reaction", General Electric, Schenectady, NY, (March 1997).
40. Rethwisch, D.G., "Measurement of in-situ Diffusion Coefficients by Pulsed-Field Gradient NMR", Amoco Chemical, Naperville, IL (May 1997).
41. Dow Corning, Carrolton, Kentucky, "Kinetics of the Direct Reaction: Mechanistic Implications", April 1997.
42. Gordon Conference on Green Chemistry, Meriden NH, "Chemoenzymatic Synthesis of Monomers and Polymers from Biomass," August 1998.
43. Southern Illinois University, Carbondale IL, Materials in the Heartland, "Chemoenzymatic Synthesis of Monomers, Polymers, and Hydrogels from Corn-Based Sugars," October 1998.
44. National Workshop for Italian Doctoral Students, "Modeling of Drug-Delivery in the Human Eye," Vico-Equense, Italy, March 1999.
45. National Workshop for Italian Doctoral Students, "Development and Modeling of a Photoresponsive Ion-Exchange Membrane," Vico-Equense, Italy, March 1999.
46. University of Bologna, Department of Chemical Engineering, "Modeling of Gas-Polymer Solubility", April 1999.
47. Ecole Polytechnique Federal di Lausanne, Lausanne, Switzerland, "Chemoenzymatic Synthesis of Sugar-Based Monomers and Hydrogels," April 1999.
48. ETH – Zurich, Zurich, Switzerland, "Chemoenzymatic Synthesis of Sugar-Based Monomers and Hydrogels," April 1999.
49. University of Bologna, Department of Chemical Engineering, "Photoresponsive Control of Membrane Separations", April 1999.
50. University of Bologna, Department of Chemical Engineering, "Chemoenzymatic Synthesis of Sugar-Based Monomers and Hydrogels," May 1999.

51. University of Bologna, Department of Chemical Engineering, "PFG-NMR Determination of Diffusivity of Small Molecules in Polymer Systems," May 1999.
52. University of Bologna, Department of Chemical Engineering, "Mechanistic Studies of the Direct Synthesis Reaction over Silicon Metal," May 1999.
53. University of Bologna, Department of Chemical Engineering, "Enzyme Facilitated Transport," May 1999.
54. Dow Corning, Carrolton, Kentucky, "Coking in the Direct Reaction", April 2000.
55. NASA Glenn Research Laboratories, Cleveland, Ohio, "Photoresponsive Control of Membrane Separations", January 2004.
56. University of Nebraska- Lincoln, Department of Chemical Engineering, "Epoxidation of Soybean Oil: Microemulsions and Biocatalysis," March 2005.
57. Kansas State University, Department of Chemical Engineering, "Epoxidation of Soybean Oil: Microemulsions and Biocatalysis," April 2005.