



Dr. Ralph E. White

September 1, 2018

Professor, Chemical Engineering
Birth date: November 6, 1942
Citizenship: U.S.
Birthplace: Clovis, New Mexico
Security Clearance: None
Number of Children: 5

Address:

Department of Chemical Engineering
Swearingen Engineering Center, Room
3C11
University of South Carolina
Columbia, South Carolina 29208
Phone: 803 777 3270
Cell: 803 240 7132
[E-mail](mailto:white@cec.sc.edu) white@cec.sc.edu

Research Interests: Electrochemical Systems, Mathematical Modeling, Batteries, Corrosion, & Electrodeposition

EDUCATION

B.S., Engineering, University of South Carolina, 1971
M.S., Chemical Engineering, University of California at Berkeley, 1973 (Advisor – Robert P. Merrill)
Ph.D., Chemical Engineering, University of California at Berkeley, 1977 (Advisor – John S. Newman)

EXPERIENCE

Educational

Assistant Professor, Chemical Engineering, Texas A&M University, 1977–1981
Associate Professor, Chemical Engineering, Texas A&M University, 1981–1985
Professor, Chemical Engineering, Texas A&M University, 1985–1993
Associate Head of the Department of Chemical Engineering, Texas A&M University, 1990–1993
Professor, Chemical Engineering, University of South Carolina, 1993–present
Chairman of the Department of Chemical Engineering, University of South Carolina, 1993–2000
Distinguished Scientist, University of South Carolina, 1993-present
Director, Center for Electrochemical Engineering, University of South Carolina, 1995-2000
Dean, College of Engineering and Computing, Univ. of South Carolina 2000-2005

Industrial

Chemical Engineer, Ethyl Corporation, Summer 1970
Nuclear Engineer, Mare Island Naval Shipyard, Summer 1971
Research Engineer, Chevron, Summer 1972
Consultant, Dow Chemical U.S.A., January 1979–March 1993
Consultant, Exxon Corp., March 1981–March 1982
Consultant, General Motors Corp., June 1984–June 1987
Consultant, Allied Corporation, November 1985–April 1986
Consultant, Boeing Corp., November 1999–December 2000, June 2006–March 2007
Consultant (Expert Witness), Rayovac, August 2002–November 2002
Consultant, (Expert Witness), DeNora North American, March 2002 –May 2003
Consultant, Vulcan, June 1999–2004
Consultant, (Expert Witness), AVANtech, June 2002–October 2005
COMSOL Certified Consultant, 2006–present
Consultant (Expert Witness), Energizer, June 2008–November 2008, November 2011-October 2012
Consultant, General Electric, May 2009-January 2015
Consultant (Expert Witness), Hydro Quebec, January 2011-June 2012
Consultant (Expert Witness), Celgard, October 2014-May 2015
Consultant (Expert Witness), EVE, September 2015-June 2016
Consultant, Energizer, January 2017–December 2017

Military

U. S. Navy Nuclear Submarines, MM2 (SS) DV, 1960–1968

HONORS AND AWARDS

Tau Beta Pi Spencer Fellow No. 16, 1971–1972
Halliburton Education Foundation Award of Excellence, 1987
Texas Engineering Experiment Station Senior Fellow, 1989–1992
Best Applied Paper for 1989, AIChE South Texas Section, paper entitled “Estimation of Electrode Kinetic Parameters of the Lithium/Thionyl Chloride Cell Using a Mathematical Model,” by T. I. Evans and R. E. White
Best Paper of the Conference, “An Electrochemically Based Performance Model of a Nickel-Cadmium Battery Cell,” by D. Fan and R. White, Fifth Annual Battery Conference on Applications and Advances, Long Beach, California, January 16–18, 1990
Texas A&M University Association of Former Students Distinguished Achievement Award for Research, 1990
E. H. Brockett Professor of Chemical Engineering, 1990
Battery Division Research Award, The Electrochemical Society, Inc., 1991
Electrodeposition Division Research Award, The Electrochemical Society, Inc., 1992
Journal of the American Electroplaters and Surface Finishers Society, “Silver Medal Award, Best Paper in '93” award for paper entitled “Characterization of Amorphous Ni-Cr-P Electrodeposits” by Terry R. Guilinger, James E. Voytko, Ralph E. White, and Ken-Ming Yin
Member of the Advisory Board of the *Journal of Applied Electrochemistry*
College of Engineering Research Award, University of South Carolina, Spring, 1998
Fellow, The Electrochemical Society, Inc., 1999.
Scientific Achievement Award, American Electroplaters and Surface Finishers Society, 1999
2004 Palmetto Pillar Award for Technology in Education, Columbia Chamber of Commerce
Fellow, American Institute for Chemical Engineers, 2011
Russell Research Award for Science, Mathematics, and Engineering, University of South Carolina, 2011
NASA Engineering and Safety Center, Group Achievement Award to Wilkinson Microwave Anisotropy Probe Battery Operations Problem Resolution Team, 2012
NASA Engineering and Safety Center, Group Achievement Award to NASA Lithium Ion Thermal Runaway Assessment Team, 2013
Fellow, American Association for the Advancement of Science (AAAS), 2013
Olin Palladium Award, The Electrochemical Society, 2013
Vittorio de Nora Award, The Electrochemical Society, 2016
Henry B. Linford Award, The Electrochemical Society, 2018

Student Awards by The Electrochemical Society

Tom Evans, 1987 Student Research Award of the Battery Division
Jenn-Feng Yan, 1994 Morris Cohen Graduate Student Award of the Corrosion Division
Pauline De Vidts, 1994 Student Research Award of the Battery Division
Venkat Subramanian, 2001 Student Research Award of the Battery Division
Venkat Subramanian, 2002 IE&EE Division Student Achievement Winner

Parthasarathy Gomadam, 2003 IE&EE Division Student Achievement Winner
Long Cai, 2011 H. H. Dow Memorial Student Award of the IE&EE Division of The
Electrochemical Society
Student Award by the American Institute of Chemical Engineers
Bala S. Haran, 1995 Graduate Student Paper Award, First Place, Environmental Division

PROFESSIONAL LICENSES

Registered Professional Engineer, Texas No. 47441

SOCIETY MEMBERSHIPS

American Institute of Chemical Engineers
The Electrochemical Society
National Society of Professional Engineers Member No. 104040478
International Society of Electrochemists
National Association for Surface Finishing (formerly American Electroplaters and Surface
Finishers Society)
Society for Industrial and Applied Mathematics
National Association for the Advancement of Science
Phi Beta Kappa
Tau Beta Pi
Omega Chi Epsilon
Omicron Delta Kappa
Phi Eta Sigma
Pi Mu Epsilon

PROFESSIONAL ACTIVITIES

National Research Council, Commission on Physical Sciences, Mathematics, and Applications

Appointed Member of the Committee on Electrometallurgical Techniques for DOE Spent
Fuel Treatment, 1998-2000
Certificate of Appreciation from Army Research Laboratory Technical Assessment Board
as member of Panel on Sensors and Electron Devices, 2003

The Electrochemical Society

Chairman of the South Texas Section of The Electrochemical Society, 1986–1987
Divisional Editor for Industrial Electrolytic, Electrochemical Society, 1987–1990
Chairman of the Industrial Electrolytic Division of The Electrochemical Society, 1988–
1990
Treasurer of The Electrochemical Society, 1990–1994
Chairman, Contributing Membership Committee of The Electrochemical Society, 1995–
1998
Chairman of the Financial Policy Advisory Committee, The Electrochemical Society,
2007–2010

Member of the Honors and Awards Committee of The Electrochemical Society, Fall 2010
– present

National Science Foundation

Member of Several Review Panels, 1986–present

American Institute of Chemical Engineers

Chairman AIChE Area 1e National Program Planning Committee, 1986–1988
Member of the Executive Committee of the Heat Transfer and Energy Conversion
Division of the AIChE, 1988–1991

American Electroplaters and Surface Finishers Society

Research Board, 1994-1999; Vice Chairman, Finance, 1995–1999

Project Lead The Way, Inc.

Member of the National Oversight Committee, 2003

NASA

Member of NESC Electrical Power Technical Discipline Team, August 2009 – present

DOE

Accepted the invitation and attended the DOE Hydrogen Program and Review
Technologies 2009 Annual Merit Review and Peer Evaluation, Energy Storage, as a
reviewer, which was held 18-22 May 2009.

Accepted the invitation to be a reviewer for the 2010 DOE Hydrogen and Vehicle
Technologies Annual Review and Peer Evaluation, Energy Storage, which was held 6-11
June 2010.

UNIVERSITY SERVICE

Texas A&M University

AIChE Student Chapter Advisor, 1977–1978
Tau Beta Pi Student Chapter Advisor, 1979–1983
Chairman of Council of Principal Investigators, 1990–1991
Member of the Search Committee for Associate Provost for Research, 1991-1992

University of South Carolina

Chairman, Search Committee for Dean of the College of Science and Mathematics, 1993-
1994
Member, Fellowships and Summer Programs Advisory Committee, 1994-1996
Chairman of the Goldwater Scholarship Committee, 1995-1996
Member, University Committee on Tenure and Promotion, 1995-1998
Member, Search Committee for Vice President for Research, 1999-2000
Member, Board of Directors, South Carolina Manufacturing Extension Partnership, 2001-
2003

Member, Board of Directors of the USC Research Foundation, 2002-2004
Member, Incubator Advisory Committee, 2002-2004

RECENT INVITED PRESENTATIONS

- REDCOM Power & Energy IPT Modeling and Simulation Workshop, 30-31 October 2007, Milpitas, CA 95035, Mathematical Modeling of Lithium Ion Batteries
- Invited to speak and co-chair the Industrial and Electrochemical Engineering Session G2 Tutorial Symposium on Electrochemical Engineering in Honor of Professor John Newman's 70th Birthday at the 214th Electrochemical Society, October 2008, and gave a presentation on "Mathematical Modeling of Lithium Ion Batteries."
- Invited to present a lecture at the International Conference on Electrochemical Power Systems (ICEPS-2008, 26-28 November 2008, in Thiruvananthapuram, Kerala, India, which I declined.
- Invited to speak at the 3rd International Conference on Advanced Lithium Battery for Automotive Applications, to be held in Seoul, Korea from 8-10 September 2010, which I declined.
- Invited to speak at the Society for the Advancement of Science and Technology and the Central Electrochemical Institute's 9th International Symposium on advances in Electrochemical Science and Technology, Chennai, India, to be held 2-24 December 2010, which I declined.
- Invited to speak at the University of Maryland, Distinguished Seminar Series, "Physics Based Modeling of Lithium Ion Cells and Batteries," November 4, 2011.
- Invited to speak at GM India Symposium, November 14, 2011.
- Invited talk at the General Electric Global Electrochemistry Symposium 2012, "Mathematical Modeling of Lithium-ion Batteries," September 25, 2012.
- Invited speaker at the ESRN Lithium Ion Battery Degradation Workshop, November 22, 2013, declined.
- Invited speaker, "Mathematical Modeling of Lithium Ion Cells," University of Southern Denmark, Sonderborg, Denmark, February 7, 2017.

PUBLICATIONS

Refereed Papers

1. G. Stoll, Jr., R. E. White, J. J. Erhardt, R. I. Masel, and R. P. Merrill, "Scattering of Light Atoms from Strongly Periodic Surfaces," *Journal of Vacuum Science Technology*, 12 (1975), 192-198.
2. Ralph E. White, Jean-Jacques Erhardt, and Robert P. Merrill, "Scattering of Argon and Neon from W(112)," *The Journal of Chemical Physics*, 64 (1976), 41-44.
3. Ralph White, Charles M. Mohr, Jr., and John Newman, "The Fluid Motion Due to a Rotating Disk," *J. of the Electrochemical Society*, 123 (1976), 383-385.

4. Ralph White, James A. Trainham, John Newman, and Thomas W. Chapman, "Potential Selective Deposition of Copper from Chloride Solutions Containing Iron," *J. of the Electrochemical Society*, 124 (1977), 669–676.
5. Ralph White and John Newman, "Simultaneous Reactions on a Rotating-Disk Electrode," *Journal of Electroanalytical Chemistry*, 82 (1977), 173–186.
6. Ralph E. White, "On Newman's Numerical Technique for Solving Boundary Value Problems," *Industrial and Engineering Chemistry Fundamentals*, 17 (1978), 367–369.
7. John Van Zee, Mark Edmund, and Ralph E. White, "Application of Newman's Technique to Solve Coupled, Nonlinear Partial Differential Equations," *Industrial and Engineering Chemistry Fundamentals*, 19 (1980), 438–440.
8. R. E. White, M. Bain, and M. F. Raible, "Parallel Plate Electrochemical Reactor Model," *J. of the Electrochemical Society*, 130(5) (1983), 1037–1042.
9. R. E. White and S. E. Lorimer, "A Model of the Bromine/Bromide Electrode Reaction at a Rotating Disk Electrode," *J. of the Electrochemical Society*, 130 (5) (1983), 1096–1103.
10. R. E. White, S. E. Lorimer, and R. Darby, "Prediction of the Current Density at an Electrode at which Multiple Electrode Reactions Occur Under Potentiostatic Control," *J. of the Electrochemical Society*, 130(5) (1983), 1123–1126.
11. J. Van Zee and R. E. White, "An Analysis of a Back-Fed Porous Electrode for the Br₂/Br Redox Reaction," *J. of the Electrochemical Society*, 130 (1983), 2003–2012.
12. M. Yamana, R. Darby, H. Dhar, and R. E. White, "Electrodeposition of Cobalt Tetraazaanulene Dibromide Oxygen Reduction Catalyst," *Journal of Electroanalytical Chemistry and Interfacial Electrochemistry*, 152/91-2), (1983), 261–268.
13. J. A. Harrison, D. L. Caldwell, and R. E. White, "Electrocatalysts and the Chlorine Evolution Reaction," *Electrochimica Acta*, 28 (1983), 1561–1568.
14. J. A. Harrison, D. L. Caldwell, and R. E. White, "Electrocatalysts and the Chlorine Evolution Reaction Part II: Comparison of Anode Materials," *Electrochimica Acta*, 29 (1984), 203–209.
15. R. E. White, M. A. Nicholson, L. G. Kleine, J. Van Zee and R. Darby, "Extension of Darby's Model of a Hydrophobic Gas-Fed Porous Electrode," *J. of the Electrochemical Society*, 131(2), (1984), 268–275.
16. M. Yamana, R. Darby, and R. E. White, "Preparation of Iron Phthalocyanine Catalyzed Carbon Electrodes by Chemical Modification," *Electrochimica Acta*, 29(3) (1984), 329–331.
17. J. A. Harrison, D. L. Caldwell, and R. E. White, "Electrocatalysis and the Oxygen Evolution Reaction," *Electrochimica Acta*, 29 (1984), 1139–1145.
18. H. P. Dhar, R. E. White, R. Darby, L. R. Cornwell, R. B. Griffin, and G. Burnell, "Corrosion of Cu and Cu:Ni Alloys in 0.5M NaCl and in Synthetic Seawater," *Corrosion*, 41(6) (1985), 317–323.

19. H. P. Dhar, R. Darby, V. Y. Young, and R. E. White, "The Effect of Heat Transfer Atmospheres on the Electrocatalytic Activity of Cobalt Tetraazaanulene: Preliminary Results," *Electrochimica Acta*, 30(4) (1985), 423–429.
20. J. Van Zee and R. White, "Using Parameter Estimation Techniques with a Simple Model of a Diaphragm-Type Electrolyzer to Predict the Energy Cost for NaOH Production," *J. of the Electrochemical Society*, 132 (1985), 818–826.
21. H. P. Dhar, R. E. White, G. Burnell, L. R. Cornwell, R. B. Griffin, and R. Darby, "Corrosion Behavior of 70Cu -30Ni Alloy in 0.5M NaCl and in Synthetic Seawater," *Corrosion*, 41(4) (1985) 193-196.
22. R. E. White, C. W. Walton, D. J. Wolfe, and K. Plowman, "Oxygen Reduction in a Caustic Solution Using a Gas-Fed Porous Electrode," *Chemical Engineering Communications*, 38(3-6) (1985), 229–264.
23. T. V. Nguyen, C. W. Walton, R. E. White, and J. Van Zee, "Parallel Plate Electrochemical Reactor Model: A Method for Determining the Time-Dependent Behavior and the Effects of Axial Diffusion and Axial Migration," *J. of the Electrochemical Society*, 133(1) (1986), 81–87.
24. R. E. White, C. W. Walton, H. S. Burney, and R. N. Beaver, "Predicting Shunt Currents in Stacks of Bipolar Plate Cells," *J. of the Electrochemical Society*, 133(3) (1986), 485–492.
25. J. Van Zee, A. T. Watson, and R. E. White, "Simple Models for Diaphragm-Type Chlorine/Caustic Cells: I. Dynamic Behavior," *J. of the Electrochemical Society*, 133 (1986), 501–507.
26. J. Van Zee, and R. E. White, "Simple Models for Diaphragm-Type Chlorine/Caustic Cells: II. Effect of Acidic Anolyte on Steady-State Caustic Yield," *J. of the Electrochemical Society*, 133 (1986), 508–515.
27. M. Mader, C. W. Walton, and R. E. White, "Parallel Plate Electrochemical Reactor Model: Material Balance Closure and a Simplification," *J. of the Electrochemical Society*, 133 (1986), 1124–1130.
28. T. V. Nguyen, C. W. Walton, and R. E. White, "A Mathematical Model for a Parallel Plate Electrochemical Reactor, CSTR, and Associated Recirculation System," *J. of the Electrochemical Society*, 133 (1986), 1130–1138.
29. M. Mader and R. E. White, "A Mathematical Model of a Zn/Br₂Cell on Charge," *J. of the Electrochemical Society*, 133 (1986), 1297–1307.
30. P. K. Adanuvor, R. E. White, and S. E. Lorimer, "Modeling the Rotating Disk Electrode for Studying the Kinetics of Electrochemical Reactions," *J. of the Electrochemical Society*, 134 (1987), 625–631.
31. T. I. Evans, and R. E. White, "A Mathematical Model of a Zinc/Bromine Flow Cell," *J. of the Electrochemical Society*, 134 (1987), 866–874.
32. P. K. Adanuvor and R. E. White, "Simulation of the Polarization Curves for Oxygen Reduction at a Rotating Disk Electrode," *J. of the Electrochemical Society*, 134 (1987), 1093–1098.

33. P. K. Adanuvor, R. E. White, and S. E. Lorimer, "The Effect of the Tribromide Complex Reaction on the Charge/Discharge Current of the Br_2/Br^- Electrode," *J. of the Electrochemical Society*, 134 (1987), 1450–1454.
34. C. W. Walton and R. E. White, "Utility of an Empirical Method of Modeling Combined Zero Gap/Attached Electrode Membrane Chlor-Alkali Cells," *J. of the Electrochemical Society*, 134 (1987), 565C-574C.
35. T. V. Nguyen and R. E. White, "A Finite Difference Procedure for Solving Coupled, Nonlinear Elliptic Partial Differential Equations," *Computers and Chemical Engineering*, 11 (1987), 543–546.
36. W. E. Ryan, S. L. Kelly, and R. E. White, "A Mathematical Model for the Initial Corrosion Rate of a Porous Layer on a Rotating Disk Electrode," *J. of the Electrochemical Society*, 134 (1987), 2154–2159.
37. T. I. Evans and R. E. White, "A Review of Mathematical Modeling of the Zinc/Bromine Flow Cell and Battery," *J. of the Electrochemical Society*, 134 (1987), 2725–2733.
38. H. Gu, T. V. Nguyen, and R. E. White, "A Mathematical Model for the Lead-Acid Cell: Discharge, Rest, and Charge," *J. of the Electrochemical Society*, 134 (1987), 2953–2960.
39. E. C. Dimpault-Darcy, T. V. Nguyen, and R. E. White, "A Two-Dimensional Mathematical Model of a Porous Lead Dioxide Electrode in a Lead-Acid Cell," *J. of the Electrochemical Society*, 135 (1988), 278–285.
40. E. C. Dimpault-Darcy and R. E. White, "Secondary Current Distributions Using TOPAZ2D and Linear Kinetics," *J. of the Electrochemical Society*, 135 (1988), 656–658.
41. P. K. Adanuvor and R. E. White, "Analysis of Electrokinetic Data by Parameter Estimation and Model Discrimination Techniques," *J. of the Electrochemical Society*, 135 (1988), 1887–1898.
42. Taewhan Yeu, Trung Nguyen, and R. E. White, "A Mathematical Model for Predicting Cyclic Voltammograms of Electronically Conductive Polypyrrole," *J. of the Electrochemical Society*, 135 (1988), 1971–1976.
43. H. S. Burney and R. E. White, "Predicting Shunt Currents in Stacks of Bipolar Plate Cells with Conducting Manifolds," *J. of the Electrochemical Society*, 135 (1988), 1609–1612.
44. S. Chen, K. M. Yin, and R. E. White, "A Mathematical Model for the Electrodeposition of Alloys on a Rotating Disk Electrode," *J. of the Electrochemical Society*, 135 (1988), 2193–2200.
45. Prosper K. Adanuvor and R. E. White, "Oxygen Reduction on Silver in 6.5 Molar Caustic Soda Solution," *J. of the Electrochemical Society*, 135 (1988), 2509–2517.
46. Jose L. Carbajal and R. E. White, "Electrochemical Production and Corrosion Testing of Amorphous Ni-P," *J. of the Electrochemical Society*, 135 (1988), 2952–2957.

47. R. Y. Ying, P. K. Ng, Z. Mao, and R. E. White, "Electrodeposition of Copper-Nickel Alloys from Citrate Solutions of a Rotating Disk Electrode," *J. of the Electrochemical Society*, 135 (1988), 2964–2971.
48. T. I. Evans, T. V. Nguyen, and R. E. White, "A Mathematical Model of Lithium/Thionyl Chloride Primary Cell," *J. of the Electrochemical Society*, 136 (1989), 328–339.
49. J. L. Carbajal, R. E. White, R. B. Griffin, and J. N. Dubrouillet, "Preliminary Investigation on the Corrosion Behavior of Amorphous (Ti₉₀Ru₁₀)₈₇Si in Saline Solutions," *Electrochimica Acta*, 34 (1989), 317–320.
50. T. I. Evans and R. E. White, "A Thermal Analysis of a Spirally Wound Battery Using a Simple Mathematical Model," *J. of the Electrochemical Society*, 136 (1989), 2145–2152.
51. S. J. Ridge, R. E. White, Y.-M. Tsou, R. N. Beaver, and G. A. Eisman, "Oxygen Reduction in a Proton Exchange Membrane Test Cell," *J. of the Electrochemical Society*, 136 (1989), 1902–1909.
52. G. D. Simpson and R. E. White, "An Algebraic Model for a Zinc/Bromine Flow Cell," *J. of the Electrochemical Society*, 136 (1989), 2137–2144.
53. T. I. Evans and R. E. White, "Estimation of Electrode Kinetic Parameters of the Lithium/Thionyl Chloride Cell Using a Mathematical Model," *J. of the Electrochemical Society*, 136 (1989), 2798–2805.
54. D. A. Curtis, T. I. Evans, and R. E. White, "A Comparison of Newman's Numerical Technique and deBoor's Algorithm," *J. of the Electrochemical Society*, 136 (1989), 3392–3393.
55. H. A. Preisig and R. E. White, "On the Design of A Simple Solver for Nonlinear Two-Point Boundary Value Problems," *Computers and Chemical Engineering*, 14 (1990), 179–196.
56. K.-M. Yin and R. E. White, "A Mathematical Model of Pulse Plating on a Rotating Disk Electrode," *AIChE Journal*, 36 (1990), 187–196.
57. F. A. Jagush, R. E. White, and W. E. Ryan, "Predicted Secondary Current Distributions for Linear Kinetics in a Modified Three Dimensional Hull Cell," *J. of the Electrochemical Society*, 137 (1990), 1848–1851.
58. T. Yeu and R. E. White, "Mathematical Model of a Lithium/Polypyrrole Cell," *J. of the Electrochemical Society*, 137 (1990), 1327–1336.
59. G. D. Simpson and R. E. White, "A Simple Model for a Zinc/Bromine Flow Cell and Associated Storage Tanks," *J. of the Electrochemical Society*, 137 (1990), 1843–1846.
60. R. E. White, F. Jagush, and H. S. Burney, "Three Dimensional Current and Potential Distributions in a Bipolar, Chlor-Alkali Membrane Cell," *J. of the Electrochemical Society*, 137 (1990), 1846–1848.
61. Z. Mao, P. Adanuvor, and R. E. White, "Mathematical Modeling of H₂S Removal Electrolyzer," *J. of the Electrochemical Society*, 137 (1990), 2116–2123.

62. Z. Mao, B. Dandapani, A. Anani, S. Srinivasan, R. E. White, and A. J. Appleby, "Electrochemical Behavior of Graphite and Ni-Cr Electrodes in Sodium Polysulfide in the Absence and Presence of Hydrogen Sulfide," *J. of the Electrochemical Society*, 137 (1990), 2189–2194.
63. P. K. Adanuvor, R. E. White, and A. J. Appleby, "A Computer Simulation of the Oxygen Reduction Reaction in Carbonate Melts," *J. of the Electrochemical Society*, 137 (1990), 2095–2103.
64. M. C. Kimble, R. E. White, Yu-Min Tsou, and R. N. Beaver, "Estimation of the Diffusion Coefficient and Solubility for a Gas Diffusing Through a Membrane," *J. of the Electrochemical Society*, 137 (1990), 2510–2514.
65. Michael C. Kimble and Ralph E. White, "A Five-Point Finite Difference Method for Solving Parabolic Partial Differential Equations," *Computers and Chemical Engineering*, 14 (1990), 921–924.
66. A. Anani, Z. Mao, R. White, S. Srinivasan, and A. J. Appleby, "Electrochemical Production of Hydrogen and Sulphur by Low Temperature Decomposition of Hydrogen Sulfide in an Aqueous Alkaline Solution," *J. of the Electrochemical Society*, 137 (1990) 2703–2709.
67. R. E. Fixel and R. E. White, "Ni-Cr-P Plating Bath Analysis by Ion Chromatography," *Journal of the American Electroplaters and Surface Finishers Society*, 77 (1990), 48–53.
68. T. V. Nguyen, R. E. White, and Hiram Gu, "The Effects of Separator Design on the Discharge Performance of a Starved Lead-Acid Cell," *J. of the Electrochemical Society*, 137 (1990) 2998–3004.
69. Oscar Mendoza Gonzalez, Ralph White, and David Cocke, "Autocatalytic Deposition of Ni-TM-P Alloys," *Journal of the American Electroplaters and Surface Finishers Society*, 77 (1990), 63–67.
70. S. Popova, B. Popov, R. White, and D. Drazic, "Determination of Corrosion Properties of Lacquered Tinplate in Citrate Solutions by Electrochemical DC and AC Methods," *Corrosion*, 46 (1990) 1007–1014.
71. Deyuan Fan and Ralph E. White, "A Mathematical Model of a Sealed Nickel-Cadmium Battery," *J. of the Electrochemical Society*, 138 (1991), 17–25.
72. B. B. Dave, R. E. White, S. Srinivasan, and A. J. Appleby, "Electrode Kinetics of Oxygen Reduction in Lithium Carbonate Melt: Use of Impedance Analysis and Cyclic Voltammetric Techniques to Determine the Effects of Partial Pressure of Oxygen," *J. of the Electrochemical Society*, 138 (1991) 673–678.
73. Ken-Ming Yin, Taewhan Yeu, and Ralph White, "A Mathematical Model of Electrochemical Reactions Coupled with Homogeneous Chemical Reactions," *J. of the Electrochemical Society*, 138 (1991) 1051–1054.
74. Z. Mao, A. Anani, R. E. White, S. Srinivasan, and A. J. Appleby, "A Modified Electrochemical Process for the Decomposition of Hydrogen Sulfide in an Aqueous Alkaline Solution," *J. of the Electrochemical Society*, 138 (1991) 1299–1303.

75. B. N. Popov, M. C. Kimble, R. E. White, J. B. Wagner, Jr., and H. Wendt, "Electrochemical Behavior of Titanium (II) and Titanium (III) Compounds in Molten Lithium-Chloride Potassium-Chloride Eutectic Melts," *Journal of Applied Electrochemistry*, 21 (1991) 351–357.
76. Z. Mao, R. E. White, and B. Jay, "Current Distribution in a HORIZON Lead-Acid Battery During Discharge," *J. of the Electrochemical Society*, 138 (1991) 1615–1620.
77. D. Fan and R. E. White, "Modification of Newman's BAND(J) Subroutine to Multi-Region Systems Containing Interior Boundaries: MBAND," *J. of the Electrochemical Society*, 138 (1991) 1688–1691.
78. Egwu E. Kalu and Ralph E. White, "Zn/Br₂ Cell: Effects of Plated Zinc and Complexing Organic Phase," *AIChE Journal*, 37 (1991) 1164-1174.
79. Bhasker B. Dave, Ralph E. White, S. Srinivasan, and A. J. Appleby, "Impedance Analysis for Oxygen Reduction in a Lithium Carbonate Melt," *J. of the Electrochemical Society*, 138 (1991) 2675-2683.
80. R. E. Fixel and R. E. White, "Ni-Cr-P Plating Bath Characterization by Ion Chromatography," *Journal of the American Electroplaters and Surface Finishers Society*, 78 (1991) 76–81, 97.
81. Taewhan Yeu, Ken-Ming Yin, Jose Carbajal, and Ralph E. White, "Electrochemical Characterization of Electronically Conductive Polypyrrole on Cyclic Voltammograms," *J. of the Electrochemical Society*, 138 (1991) 2869–2877.
82. Deyuan Fan and Ralph E. White, "Mathematical Modeling of a Nickel-Cadmium Battery-Effects of Intercalation and Oxygen Reactions," *J. of the Electrochemical Society*, 138 (1991) 2952-2960.
83. Z. Mao and R. E. White, "Mathematical Model of the Self Discharge of a Ni-H₂ Battery," *J. of the Electrochemical Society*, 138 (1991) 3354-3361.
84. B. N. Popov, R. E. White and J. V. Ivshin, "Cementation of Copper from Acidic Sulfate Electrolytes on Nickel Plated Steel," *Journal of the American Electroplaters and Surface Finishers Society*, 78 (1991) 61–65.
85. D. Fan and R. E. White, "Optimization and Extension of Pentadiagonal BAND(J) Solver to Multi-Region Systems Containing Interior Boundaries," *Computers & Chemical Engineering*, 15 (1991) 797-800.
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Papers Accepted

1. None

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50. Pankaj Arora, Marc Doyle, and Ralph E. White, "Mathematical Modeling of Capacity Fade Mechanisms in Lithium-ion Batteries: Lithium Deposition Overcharge Reaction on the Negative Electrode," *Proceedings-Electrochemical Society* (1999), 98-16(Lithium Batteries), 553-572.
51. Yuanwu Xie, Branko N. Popov, Bala S. Haran, and Ralph E. White, "A Novel Electrochemical Method for Detection of Nerve Gases," *Proceedings-Electrochemical Society* (1999), 99-5(New Directions in Electroanalytical Chemistry II), 178-192.

52. Manikandan Ramani, Bala S. Haran, Branko N. Popov, and Ralph E. White, "Development of Carbon Metal Oxide Supercapacitors by Electroless Deposition," *Proceedings-Electrochemical Society* (1999), 98-15(Selected Battery Topics), 226-235.
53. Chuan Lin, James A. Ritter, Branko N. Popov, and Ralph E. White, "A Mathematical Model of an Electrochemical Capacitor with Double-layer and Faradaic Processes," *Proceedings-Electrochemical Society* (1999), 98-15(Selected Battery Topics), 236-247.
54. Anand Durairajan, Bala S. Haran, and Ralph E. White, "Development of High Performance Metal Hydride Alloys By Cobalt Microencapsulation," *Proceedings-Electrochemical Society* (1999), 98-15(Selected Battery Topics), 368-378.
55. Dong Zhang, Branko N. Popov, and Ralph E. White, "Optimization of Cobalt Doped Chromium Oxide as Cathode Material for Secondary Lithium Batteries," *Proceedings of the SAE Intersociety Energy Conversion Engineering Conference* (1999), 34th, 670-675.
56. Venkat R. Subramanian and Ralph E. White, "A Semi-Analytical Method for Predicting Current and Potential Distributions," *Proceedings-Electrochemical Society* (1999), 99-14(Tutorials in Electrochemical Engineering – Mathematical Modeling), 36-53.
57. Venkat R. Subramanian and Ralph E. White, "Separation of Variables for Diffusion in Composite Electrodes with Flux Boundary Conditions," *Proceedings-Electrochemical Society* (1999), 99-14(Tutorials in Electrochemical Engineering – Mathematical Modeling), 100-113.
58. Anand Durairajan, Bala S. Haran, Branko N. Popov, and Ralph E. White, "Battery Research at the University of South Carolina Development of High Performance Metal Hydride Alloys by Cobalt Microencapsulation," Annual Battery Conference on Applications and Advances, 14th, Long Beach, CA, Jan. 12-15, 1999 (1999), 111-117.
59. Gerardine G. Botte and Ralph E. White, "Modeling Lithium Intercalation in a Porous Carbon Electrode," *Proceedings-Electrochemical Society* (2000), 99-25(Lithium Batteries), 99-128.
60. Venkat R. Subramanian, Harry J. Ploehn, and Ralph E. White, "Shrinking Core Model for the Discharge of a Metal Hydride Electrode," *Proceeding-Electrochemical Society* (2000), 2000-16(Hydrogen at Surface and Interfaces), 123-132.
61. Bala S. Haran, Anand Durairajan, Branko N. Popov, and Ralph E. White, "Studies on the Hydrogen Transport Rate in Metal Hydride Alloys," *Proceedings-Electrochemical Society* (2000), 2000-16(Hydrogen at Surface and Interfaces), 219-232.
62. Venkat R. Subramanian, James A. Ritter, and Ralph E. White, "Modeling the Discharge of Electrode Particles-Utility of the Parabolic Concentration Profiles," *Proceedings-Electrochemical Society*, (2001), 2000-21(Rechargeable Lithium Batteries), 467-477.
63. Lorna Soto, Bala S. Haran, Branko N. Popov, and Ralph E. White, "Evaluation of Protective Strategies for Protecting Steel in Concrete," *Proceedings-Electrochemical Society*, (2001), 2001-22(Corrosion and Corrosion Protection), 939-949.
64. Dragan Slavtsov, Bala S. Haran, Branko N. Popov, Ralph E. White, and Frank Fleming, "Effect of Sn and Ca doping on the Corrosion of Pb Anodes in Lead Acid Batteries,"

- Proceedings- Electrochemical Society* (2003), 2001-21(Batteries and Capacitors), 313-326.
65. Venkat R. Subramanian, Ping Yu, Branko N. Popov, and Ralph E. White, "Lithium Intercalation into Graphite: Predicting Diffusion Coefficient and Exchange Current from the Discharge Curves," *Proceedings- Electrochemical Society* (2004), 2000-34 (Electrochemistry of Carbon Materials), 124-136.
 66. Harry J. Ploehn, Premanand Ramadass, Ralph E. White, Diego Altomare, and Perla B. Balbuena, "Continuum and Statistical Mechanics-Based Models for Solid Electrolyte Interfaces in Lithium-Ion Batteries," *Lithium-Ion Batteries: Solid-Electrolyte Interphase*, P. B. Balbuena and Y. Wang, Eds., Imperial College Press, London, 2004, 276-307.
 67. Karthikeyan Kumaresan, Godfrey Sikha, and Ralph E. White, "Comparison of Thermal-electrochemical Model Predictions with Experimental Discharge Data for Lithium-ion Batteries," *ECS Transactions* (2007) 3(27, Lithium-Ion Batteries), 173-190.
 68. Shriram Santhanagopalan and Ralph E. White, "Modeling Parametric Uncertainty Using Polynomial Chaos Theory," *ECS Transactions* (2007), 3(27, Lithium-Ion Batteries), 243-256.
 69. Shriram Santhanagopalan and Ralph E. White, "Online Estimation of State of Charge in a Lithium Ion Cell," *ECS Transactions* (2007), 3(27, Lithium-Ion Batteries), 191-208.
 70. Andrew T. Stamps and Ralph E. White, "A LiCF_x/Li-ion Hybrid Power System for Pulsed-Power Applications," *Proceedings of the Power Sources Conference*, 43rd, (2008), 473-476.
 71. Qingbo Dong and Ralph E. White, "Parameter Evaluation of ORR at a RRDE," *ECS Transactions* (2008), 6 (22, Power Sources for EV and HEV Applications), 15-31.
 72. Qi Zhang and Ralph E. White, "Moving Boundary for the Discharge of a LiCoO₂ Electrode," *ECS Transactions* (2008), 6(22, Power Sources for EV and HEV Applications), 33-52.
 73. Shriram Santhanagopalan, Long Cai, and R. White, "Mathematical Modeling of Lithium Ion Batteries," *ECS Transactions* (2008) 16 (13, Tutorial Symposium on Electrochemical Engineering, in Honor of Professor John Newman's 70th Birthday), 81-90.
 74. Long Cai and Ralph E. White, "Simulation of a Parallel Plate Electrochemical Reaction used to reduce Cr(VI) via Electrocoagulation Method," *ECS Transactions* (2008), 11(32, Battery/Energy Technology (General)), 151-165.
 75. Long Cai and Ralph E. White, "Model Reduction via Proper Orthogonal Decomposition for the Lithium Ion Battery," *ECS Transactions* (2008), 13(19, Batteries (General)), 13-26.
 76. Godfrey Sikha, W. A. McPhee, Qi Zhang, M. T. Koslowski, T. T. Tao, and R. E. White, "One-dimensional Modeling of a Liquid Tin Anode Solid Oxide Fuel Cell," *ECS Transactions* (2009), 17 (1, Fuel Cell Seminar 2008), 161-173.
 77. Parthasarathy M. Gomadam, Ralph E. White, and John W. Weidner, "Electrochemical-thermal Modeling of Spirally Wound Batteries," *ECS Transactions* (2009), 19(19, Tutorials in Electrochemical Technology-Current Distribution), 1-10.

77. S. Santhanagopalan and R. E. White, "Porous Electrodes," In: Juergen Garche, Chris Dyer, Patrick Moseley, Zempachi Ogumi, David Rand and Bruno Scrosati, editors. Encyclopedia of Electrochemical Power Sources, Vol. 2. Amsterdam: Elsevier; 2009. pp. 110-120.
78. Ralph E. White and Venkat Subramanian, "Computational Methods in Chemical Engineering with Maple," Springer, 2010, 860 pages, ISBN 978-3642043109.
79. Shriram Santhanagopalan and Ralph E. White, "*Mathematical Modeling of Batteries*," in Linden's Handbook of Batteries, Ed. Thomas B. Reddy, McGraw-Hill, 2011, Chapter 6, page 6.1. 80. Shriram Santhanagopalan and Ralph E. White, "*Electrocatalytic Reactor Design*," Surfactant Science Series (2010), 149(Electrocatalysis), 417-441.

Other Publications

1. R. E. White, Charles M. Mohr, Jr., Pete Fedkiw, and John Newman, "The Fluid Motion Generated by a Rotating Disk: A Comparison of Solution Techniques," Lawrence Berkeley Laboratory, University of California at Berkeley, LBL-3910, September 1975.
2. R. E. White and K. R. Hall, "Chemical Engineering at Texas A&M," *Chemical Engineering Education*, September 1979.
3. J. Van Zee, M. A. Edmund and R. E. White, "Application of Newman's Technique to Coupled Nonlinear Partial Differential Equations," TEES Tech. Bul. No. 81-1, January 1981.
4. Venkat R. Subramanian and Ralph E. White, "Simulating Series Reactions with Maple," *CACHE Newsletter*, Spring 2002, web only document.

PATENTS U.S. Patent No. 5,019,227 Electrochemical Method for Producing Hydrogen and Sulfur

INTELLECTUAL PROPERTY DISCLOSURES

USCRF 00332	A Software for the Estimation of Solid Phase Diffusion Coefficient of Lithium-Ion Batteries
USCRF 00430	On-line Fuel Cell Parameter Estimation
USCRF 00563	Online Estimation of the State of Charge of an Electrochemical Cell e.g., a Li ion Cell) using a First Principles-based Model
USCRF 00498	Software for Predicting the EIS of a Fuel Cell
USCRF 00481	Mathematical Modeling of a Li-Ion Cell Using 1D-2D Coupled Approach
USCRF 00479	Software for Predicting the Cycle Life of a Lithium Ion Battery Using a Particle Model
USCRF 00478	Software for Determining Kinetic Parameters for the Oxygen Reduction Reaction Using the RDE Technique and Nonlinear Regression
USCRF 00574	A VTB Module (the Programmable Arbin Controller) for Controlling Battery Cycling in VTB
USCRF 95110sw	Nickel Hydrogen Battery Model Version 2.0

USCRF 93086sw Nickel/Hydrogen Battery Model
 USCRF xxxxx A Method to Convert Differential Algebraic Equation (DAE) Models to Resistive Companion, (RC) with Form, Andrew T. Stamps, Ralph E. White, Edward P. Gatzke, 12/13/2006
 USCRF xxxxx A Dynamic Systems Solver, Andrew T. Stamps, Ralph E. White, Edward P. Gatzke, 9/21/2006

RESEARCH GRANTS AND CONTRACTS - CURRENT SUPPORT AS CO-PI

Agency or Company	Title	Amount	Period
1. Huawei	Electrochemical Thermal Coupled Model and Model Development for Specified Lithium-Ion Battery Project	\$613,783	2/20/2018-2/20/2019

PROPOSALS PENDING

Agency (date)	Title	Amount Status
None		

RECENT TEACHING EXPERIENCE

Advanced Mass Transfer (Graduate), Fall 2015
 Mathematical Modeling of Batteries and Fuel Cells (Graduate), Spring 2016
 Chemical Process Analysis (Graduate), Fall 2016
 Chemical Reactor Design (Graduate), Spring 2017
 Chemical Process Analysis (Graduate), Fall 2017
 Mass Transfer (Undergraduate), Spring 2018
 Chemical Process Analysis (Graduate), Fall 2018

TEACHING EXPERIENCE

Undergraduate

Elementary Chemical Engineering
Chemical Engineering Fluid Operations
Numerical Analysis for Chemical Engineers
Chemical Engineering Heat Transfer Operations
Mathematical Models of Chemical Processes
Chemical Engineering Mass Transfer Operations
Process Control and Instrumentation
Chemical Engineering Kinetics
Chemical Engineering Seminar
Mass Transfer

Graduate

Chemical Engineering Process Analysis
Chemical Engineering Numerical Methods
Chemical Engineering Advanced Mass Transfer
Corrosion and Materials of Construction
Transport Phenomena
Electrochemical Processes
Chemical Reactor Design
Mathematical Modeling of Batteries and Fuel Cells

RESEARCH STUDENTS GRADUATED

Ph.D. 50 M.S. 35 M.E. 4

Ph.D. Students Graduated

1. John Van Zee, Sodium Hydroxide Production in Diaphragm-Type Electrolyzers, *Ph.D.*, Summer, 1984. U. of Alabama
2. Clifford Walton, Modeling of Transport Behavior of Zero Gap/Porous Electrode Membrane Chlor-Alkali Electrolysis Cells, *Ph.D.*, Spring, 1987.
3. Prosper Adanuvor, Model Development and Kinetic Studies of Oxygen Reduction in Alkaline Solutions at a Rotating Disk Electrode, *Ph.D.*, Summer, 1987. Exide
4. Trung Nguyen, Modeling and Characterization of a Lead-Acid Cell, *Ph.D.*, Spring, 1988. U. of Kansas

5. Thomas Evans, Mathematical Modeling of a Zinc/Bromine Flow Cell and a Lithium/Thionyl Chloride Primary Cell, *Ph.D.*, Fall, 1988. DuPont
6. Zhenhua Mao, Electrolysis of Hydrogen Sulfide in Aqueous Solutions and Molten Salts, *Ph.D.*, Spring, 1989. Conoco Phillips
7. Taewhan Yeu, New Secondary Batteries Utilizing Electronically Conductive Polypyrrole Cathode, *Ph.D.*, Fall, 1990. Univ. in Korea
8. Ken-Ming Yin, Mathematical Analysis of the Electrodeposition of Nickel-Chrome Alloys, *Ph.D.*, Spring, 1991. Univ. in Tiawan
9. Bhasker Dave, Oxygen Reduction in Lithium Carbonate Melt: Determination of Electrode Kinetic and Mass Transfer Parameters, *Ph.D.*, Spring, 1991.
10. Eric Kalu, A Study of Li/BrCl₂ in SOCl₂ (Li/BCX) and Zn/Br₂ Cells, *Ph.D.*, Spring, 1991. Florida State
11. Oscar Mendoza, Preparation, Characterization, Surface Chemistry and Corrosion Properties of Ni-TM-P Alloys Produced by Autocatalytic Reduction, *Ph.D.*, Spring, 1991. U. in Mexico
12. Deyuan Fan, Mathematical Modeling of a Sealed Nickel-Cadmium Cell, *Ph.D.*, Summer, 1991. Shell
13. Michael Kimble, Mathematical Modeling of an Alkaline Fuel Cell, *Ph.D.*, Summer, 1991. Kimble and Associates
14. Junbom Kim, Thermal Modeling of a Nickel-Hydrogen Battery, *Ph.D.*, Summer, 1992. U. in Korea
15. Jenn-Feng Yan, Formation of Calcareous Deposits on Cathodically Protected Steel Structures in Seawater, *Ph.D.*, Summer, 1992.
16. Gautam Pillay, Transport through Ion Exchange Membranes, *Ph.D.*, Fall, 1992. West Chester U. of Penn.
17. Guanghong Zheng, Electrodeposition of Thin Films, *Ph.D.*, Fall, 1994. Energizer
18. Pauline De Vidts, Mathematical Modelling of a Nickel/Hydrogen Cell, *Ph.D.*, Summer, 1995. Company in Chile
19. Rick Prieto, Polymer Battery Model, *Ph.D.*, Spring, 1996. Shell
20. Surya Pakalapati, Electrochemical Effects in Graphite Composites, *Ph.D.*, Fall, 1996.
21. Darryl Coleman, Thin Film Zinc Deposition, *Ph.D.*, Fall, 1996.
22. Haraldo Duarte, Pitting Corrosion, *Ph.D.*, Fall, 1996. Shell
23. Dawn See, Ni/H₂ Battery Model, *Ph.D.*, Spring, 1998. Shell
24. Murali Ramasubramanian, Ni-Fe Alloy Plating, *Ph.D.*, Spring, 1998.
25. Pranatharthi Haran Balasubramanian, Electrokinetic Modelling, *Ph.D.*, Summer, 1998. IBM
26. Bradley Johnson, Lithium Ion Battery-Thermal Models, *Ph.D.*, Summer, 1998.
27. Dong Zhang, Investigations of Cathode Materials for Lithium-Ion Batteries: Emphasis on Synthesis and Characterization of Chromium Oxides based Compounds, *Ph.D.*, Summer, 1999.

28. Pankaj Arora, Capacity Fade Studies and High Performance Cathode Materials for Secondary Lithium Batteries, *Ph.D.*, Summer, 1999. DuPont
29. Shannon Baxter, Mathematical Modeling of a Direct Methanol Fuel Cell, *Ph.D.*, Summer, 1999.
30. Ping Yu, Synthesis and Characterization of Anode Materials for Li-ion Batteries, *Ph.D.*, Fall, 1999.
31. Bin Wu, Modeling and Simulation of a Nickel-Hydrogen Cell, *Ph.D.*, Summer, 2000.
32. Gerardine Botte, Thermal Stability and Modeling of Lithium Ion Batteries, *Ph.D.*, Summer, 2000. Ohio University
33. Anand Durairajan, Synthesis and Characterization of Novel Coatings For Corrosion Protection and Hydrogen Embrittlement Inhibition, *Ph.D.*, Summer, 2001.
34. Venkat Subramanian, Simulation and Analysis of Electrochemical Systems, *Ph.D.*, Fall, 2001. U. of Washington
35. Andrew Haug, Development of Low-loading, Carbon Monoxide Tolerant PEM Fuel Cell Electrodes, *Ph.D.*, Spring, 2002. Hamilton Standard
36. Parthasarathy Gomadam, Electrochemical-Thermal Modeling of Lithium-Ion Batteries, *Ph.D.*, Spring, 2003, co-advisor with Dr. John W. Weidner. Medtronic
37. Premanand Ramadass, Capacity Fade Analysis of Commercial Li-Ion Batteries, *Ph.D.*, Summer, 2003. Apple
38. Qingzhi Guo, Modeling of a Polymer Electrolyte Membrane Fuel Cell Cathode, *Ph.D.*, Spring, 2004. Apple
39. Godfrey Sikha, Performance Analysis of Lithium Ion Battery/Electrochemical Capacitor Hybrid Systems, *Ph.D.*, Summer 2005, co-advisor with Dr. Branko N. Popov. Tesla
40. Sheba Devan. Transient Analysis of Intercalation Electrodes for Parameter Estimation, *Ph.D.*, Spring 2006. Apple
41. Shriram Santhanagopalan, Parameter Estimation for Lithium Ion Battery, *Ph.D.*, Fall 2006. NREL
42. Qi, Zhang, Modeling of Lithium Ion Batteries, *Ph.D.*, Fall 2007. Battery company in China
43. Qingbo Dong, Modeling and Kinetic Studies of Oxygen Reduction Reaction in Acidic Solutions at a Rotating Ring Disk Electrode, *Ph.D.*, Fall 2007. FMC
44. Karthikeyan Kumaresan, Theoretical Analysis of the Discharge Performance of Lithium Ion and Lithium/Sulfur Cells, *Ph.D.*, Spring 2008. Acme Battery
45. Sean Rayman, Modeling of Parallel Plate Electrochemical Reactors and Liquid Tin Anode Solid Oxide Fuel Cells, *Ph.D.*, Fall 2009. US Air Force
46. Sindhuja Renganathan, Theoretical Analysis of Stress Generation and Volume Change in Lithium Ion and Lithium Thermal Batteries, Spring 2010. GM India
47. Long Cai, Efficient Modeling of a Lithium Ion Cell Using the Proper Orthogonal Decomposition Method, Fall 2010. Apple
48. Meng Guo, Thermal Models for Lithium-Ion Cells and Batteries, Fall 2011.

49. Saeed Khaleghi Rahimian, Optimization and State Estimation of Li ion cells Using Single Particle Model, Fall 2012. A123
50. Yiling Dai, Studying on Capacity Fade Mechanisms of Li-Ion Batteries through Modeling, Fall 2013. Wilson Greatbatch

Former Ph.D. Students in Academia

1. J. Van Zee, U. of Alabama
2. C. Walton, U. of Nebraska (no longer at U. of Nebraska)
3. T. Nguyen, U. of Kansas
4. K. Yin, Yuan-Ze Institute of Technology, Taiwan
5. E. Kalu, Florida State U.
6. O. Mendoza, the Institute Tecnologica de Saltillo, Mexico
7. J. Kim, U. of Ulsan, Korea
8. G. Botte, Ohio University
9. R. Prieto, U of Puerto Rico-Mayaguez (no longer at U. of Puerto Rico-Mayaguez)
10. Venkat Subramanian, University of Washington, Seattle WA
11. Taewhan Yeu, Chung Ang University, Korea
12. G. Pillay, Western Washington University, Bellingham, WA.

M.S. Students Graduated

1. Mark Edmund, The Mass Transfer and Kinetics for Zinc Deposition from Bromide Media, *M.S.*, Spring, 1980.
2. Raju K. Hirani, The Influence of Chloride Ions on the Corrosion of Copper in Soil, *M.S.*, Spring, 1980.
3. Bruce Blenkarn, Cell Performance of a Miniature Chlorine Diaphragm Cell as a Function of Current Density, Flow, and pH, *M.S.*, Spring, 1981.
4. Susan Lorimer, A Mathematical Model of the Current-Potential Characteristics of the Br₂/Br- Electrochemical System, *M.S.*, Spring, 1982.
5. John Van Zee, The Optimal Thickness of a Br₂ Back-Fed Electrode in a Zn Br₂ Battery, *M.S.*, Fall, 1982.
6. Joseph Holmes, Determination of Bypass Currents in Bipolar Plate Cells Using Finite Elements, *M.S.*, Spring, 1984.
7. Don Wolfe, A Model for Oxygen Reduction in a Gas-Fed Porous Electrode in Caustic Electrolyte, *M.S.*, Summer, 1984.
8. Trung Nguyen, A Mathematical Model for a Parallel Plate Electrochemical Reactor, CSTR, and Associated Recirculation System, *M.S.*, Spring, 1985.
9. Michael Mader, A Mathematical Model of a Zn/Br₂ Cell on Charge, *M.S.*, Summer, 1985.
10. Shiuan Chen, A Mathematical Model for the Electrodeposition of Amorphous Alloys on a Rotating Disk Electrode, *M.S.*, Spring, 1986.

11. William Ryan, A Mathematical Model of a Porous Layer on a Rotating Disk Electrode for the Determination of Current-Potential Characteristics of Corrosion Processes in Aerated Caustic Solutions, *M.S.*, Spring, 1986.
12. Eric Dimpault-Darcy, A Two-Dimensional Mathematical Model of a Porous Lead Dioxide Electrode in a Lead-Acid Cell, *M.S.*, Spring, 1987
13. Rodolfo Morales, Jr., A Description of the Vapor Phase in the Lithium Thionyl Chloride Battery, *M.S.*, Summer, 1988.
14. Stephen Ridge, A Mathematical Model of a Gas-Fed Oxygen Reduction Porous Electrode, *M.S.*, Summer, 1988.
15. Gary Simpson, An Algebraic Model for a Zinc/Bromine Flow Cell, *M.S.*, Summer, 1988.
16. Frederic Jagush, Current Density Distribution Tool, *M.S.*, Spring, 1989.
17. Ralph Fixel, Ni-Cr-P Plating Bath Time Dependent Characterization by Ion Chromatography, *M.S.*, Spring, 1990.
18. Teshome Hailu, The Numerical Solution of a Ni-Cd Battery Modeling Equations Using the Method of Lines, *M.S.*, Fall, 1990.
19. Rahul Bindlish, Electrodeposition of Ni-Cr-P, *M.S.*, Summer, 1991.
20. Donald A. Curtis, A Multipoint Boundary Value Problem Solver with Implicit Time Stepping, *M.S.*, Summer, 1991.
21. Steven Lee, Hydrogen and Oxygen Permeation through Nafion 117 and XUS13204.10 Fuel Cell Membranes, *M.S.*, Spring, 1992.
22. Makoto Kawanami, A Mathematical Model of a Copper Oxide/Copper “Vaporvolt” Cell, *M.S.*, Summer, 1992.
23. Surya Pakalapati, BEM for Cathodic Protection, *M.S.*, Summer, 1992.
24. Mohammed A. Alwohaibi, Determination of Delaminated Area of Coated Steel Using Electrochemical Impedance Spectroscopy, *M.S.*, Fall 1992.
25. Snezana Popova, Corrosion Under Biofilms, *M.S.*, Fall, 1992.
26. Gurmeet Singh, Data Reconciliation and Gross Error Detection, *M.S.*, Fall, 1992.
27. Darryl Coleman, Parallel Plate Electrochemical Reactor, *M.S.*, 1994.
28. Ping Yu, Synthesis and Characterization of Anode Materials for Li-ion Batteries, *M.S.*, 2002.
29. Sheba Devan, Analytical Solution for the Impedance of a Porous Electrode, *M.S.*, Summer, 2003.
30. Sindhuja Renganathan, Polymer Electrolyte Membrane Resistance Model, *M.S.*, Fall, 2005.
31. Venkatasailanathan Ramadesigan, Mathematical Modeling of a Nickel Hydride Cell, *M.S.*, Summer 2008.
32. Deepakkumar Kandasamykarthikeyan, Thermodynamics Model Development for LithiumD Intercalation Electrodes, *M.S.*, Fall 2008
33. Derek Strange, Physics-based Li-SVO Cathode Model, *M.S.*, Summer 2011

34. Tingting Yang, Mathematical Modeling of the LiAl/FeS₂ High Temperature Battery System, *M.S.*, Fall 2011.
35. Eric Walker, Comparison of Particle Filter and Other State Estimation Methods for Prognostics of Lithium-ion Batteries, *M.S.*, Fall 2013.

M.E. Students Graduated

1. Mike Bain, Model Development and Kinetic Studies of Oxygen Reduction in Alkaline Solutions at a Rotating Disk Electrode, *M.E.*, Fall, 1981.
2. Nydia Hurtado, An SMP-Fortran Solver for Systems of Nonlinear Algebraic and Differential Equations Including Two and Three Point Boundary Value Problems, *M.E.*, Summer, 1989.
3. Anand Krishniyer, Thermal Battery Model, *M.E.*, 1999.
4. Dhanwa Thirumalai, Proton Exchange Membrane Fuel Cell Model *M.E.*, 1999.

CURRENT RESEARCH GROUP

Post Doctoral Fellows

Dr. N. Xu (coadvised with Dr. Kevin Huang)
Dr. Paul Coman

PhD Students

Viki Mattick (coadvised with Dr. Kevin Huang), Started Jan 2015
Niloofer Kamyab (coadvised with Dr. John Weidner), Started Aug 2017

MS Students

None