

## **R. Bertrum Diemer, Jr., Ph.D., P.E.**

Professor of Practice of Chemical & Biomolecular Engineering  
Co-Director of the Master of Engineering in Particle Technology Program

University of Delaware  
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<http://www.che.udel.edu/grad/MEngPT.html>

### **PROFESSIONAL INTERESTS**

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I am currently Co-Director of the University of Delaware's new Master of Engineering in Particle Technology (MEPT) program. I share responsibility with a faculty associate for all aspects of the program including curriculum development, teaching, recruiting, admissions, and industrial relations. At the time of my DuPont retirement (May 5, 2014), I provided internal consulting expertise in the general field of chemical reaction engineering, which includes reactor design and modeling, reaction kinetics and mechanism determination, and reaction thermochemistry. Within this field, my sub-specialties include inorganic high temperature thermochemistry, especially slag/melt phase equilibria, particle-forming reactors, fixed bed catalytic reactors, incinerators, and free radical kinetics. During my DuPont career I successfully directed more than a dozen summer interns and I ran the Belle Plant's summer engineering program for several years.

### **EDUCATION**

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| <b>University of Delaware</b>  | 1999 |
| Department of Chemical Engineering, Degree: Ph.D.<br>Advisor: Jon H. Olson<br>Thesis: Moment Methods for Coagulation, Breakage and Coalescence Problems                            |      |
| <b>University of Delaware</b>  | 1980 |
| Department of Chemical Engineering, Degree: MChE<br>Advisor: Bruce C. Gates<br>Thesis: The Effects of Catalyst Structure on Methanol Dehydration Catalyzed by Sulfonic Acid Resins |      |
| <b>Lehigh University</b>   | 1973 |
| Department of Chemical Engineering, Degree: BSChE<br>Highest Honors  |      |

## **PROFESSIONAL REGISTRATION**

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Professional Engineer, State of Delaware, Registration Number 5478

## **EXPERIENCE**

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<b>Professor of Practice</b>	2014-present
Chemical & Biomolecular Engineering, University of Delaware, Newark	
<b>Co-Director, Master of Engineering in Particle Technology Program</b>	2014-present
Chemical & Biomolecular Engineering, University of Delaware, Newark	
<b>Engineering Fellow</b>	2004-2014
Reaction Engineering, DuPont Engineering, Wilmington, Delaware	
<b>Principal Consultant</b>	1996-2004
Reaction Engineering, DuPont Engineering, Wilmington, DE	
<b>Senior Consultant</b>	1990-1996
Reaction Engineering, DuPont Engineering, Louviers, Wilmington, DE	
<b>Consultant</b>	1985-1990
Reaction Engineering, DuPont Engineering, Louviers, Wilmington, DE	
<b>Senior Engineer</b>	1982-1985
Reaction Engineering, DuPont Engineering, Louviers, Wilmington, DE	
<b>Technical Area Supervisor</b>	1980-1982
Manufacturing, DuPont Agricultural Chemicals, Belle Works, Belle, WV	
<b>Process Development Engineer</b>	1978-1980
DuPont Agricultural Chemicals, Experimental Station, Wilmington, DE	
<b>Plants Technical Engineer</b>	1976-1978
Manufacturing, DuPont Petrochemicals, Cape Fear Plant, Wilmington, NC	
<b>Chemical Engineer</b>	1973-1976
Particle Technology, DuPont Engineering, Louviers, Wilmington, DE	

## **AWARDS AND HONORS**

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DuPont Corporate Engineering Excellence Award: In-House Insecticide Manufacture	2005
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American Chemical Society Hero of Chemistry	1997
DuPont Corporate Safety, Health and Environmental Excellence Award: New Catalyst to Reduce Emissions, Reduce Costs, and Avoid Abatement Investment	1996
DuPont Corporate Engineering Excellence Award: New Catalyst to Reduce Emissions, Reduce Costs, and Avoid Abatement Investment	1996
DuPont Engineering Excellence Award: Development of Thermodynamics Computer Tools for Non-aqueous Inorganic Systems	1993
DuPont Engineering Excellence Award: Reactor Redesign to Support TiO <sub>2</sub> Business Needs	1993
DuPont Engineering Silver Award For Excellence in Reactor Design	1990
Outstanding Chemical Engineering Student Lehigh University, by Lehigh Valley Section, AIChE	1973
Tau Beta Pi, Pennsylvania Alpha Chapter, Lehigh University	1972
Phi Eta Sigma, Lehigh University Chapter	1970
National Merit Scholar, Lehigh University	1969
High School Mathematics and Physics Prizes	1969

## **PROFESSIONAL ORGANIZATIONS**

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American Institute of Chemical Engineers (AIChE)

American Chemical Society (ACS)

Delaware Association of Professional Engineers (DAPE)

## U. S. PATENTS

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1. Subramanian, Narayanan Sankara, Diemer, Jr., Russell, Bertrum, Gai, Pratibha Laxman, *Process for Treating Inorganic Particles via Sintering of Sinterable Material*, **United States Patent 7,799,124**, September 10, 2010.
2. Diemer, Jr., Russell Bertrum, Eaton, Alan Roger, Subramanian, Narayanan Sankara, Taylor, Stephen William, Schurr, George A., Zimmerman, David A., *Titanium Dioxide Finishing Process*, **United States Patent 7,247,200**, July 24, 2007.
3. Subramanian, Narayan Sankara, Diemer, Jr., Russell Bertrum, Gai, Pratibha Laxman, *A Process for Making Durable Rutile Titanium Dioxide Pigment by Vapor Phase Deposition of Surface Treatments*, **United States Patent 7,029,648**, April 18, 2006.
4. Subramanian, Narayan Sankara, Diemer, Jr., Russell Bertrum, Gai, Pratibha Laxman, *A Process for Making Durable Rutile Titanium Dioxide Pigment by Vapor Phase Deposition of Surface Treatments*, **United States Patent 6,852,306**, February 8, 2005.
5. Bergmann, Oswald, Robert, Blank, Howard M., Diemer, Jr., Russell Bertrum, Jain, David, Messing, Thomas A., and Simmons, Walter John, *Modified Electrolyte for Fused Salt Electrolysis*, **United States Patent 6,117,303**, September 12, 2000.
6. Bergmann, Oswald, Robert, Blank, Howard M., Diemer, Jr., Russell Bertrum, Jain, David, Messing, Thomas A., and Simmons, Walter John, *Modified Electrolyte and Diaphragm for Fused Salt Electrolysis*, **United States Patent 6,063,247**, May 16, 2000.
7. Subramanian, Narayan Sankara, Gai, Pratibha Laxman, Diemer, Jr., Russell Bertrum, Allen, Alvin, and Gergely, John Steven, *Process for Producing Coated TiO<sub>2</sub> Pigment Using Cooxidation to Provide Hydrous Oxide Coatings*, **United States Patent 5,922,120**, July 13, 1999.
8. Diemer, Jr., Russell Bertrum, Subramanian, Narayanan Sankara, and Zimmerman, David A., *Granular Scrubs for Use in Manufacturing Titanium Dioxide Pigment*, **United States Patent 5,759,511**, June 2, 1998.
9. Blenk, Michael H., Diemer, Jr., Russell B., and Hager, John P., *Iron as a Co-Additive in Refining Crude Lead Bullion*, **United States Patent 5,223,021**, June 29, 1993.
10. Blenk, Michael H., Diemer, Jr., Russell B., and Hager, John P., *Iron and a Copper Speiss as Co-Additives in Refining Crude Lead Bullion*, **United States Patent 5,183,497**, February 2, 1993.
11. Blenk, Michael H., Diemer, Jr., Russell B., and Hager, John P., *A Copper Speiss Co-Additive in Refining Crude Lead Bullion*, **United States Patent 5,183,496**, February 2, 1993.

12. Diemer, Jr., R. Bertrum, and Dunson, Jr., James B., *Method for Separating Immiscible Fluids of Different Density*, **United States Patent 4,057,404**, November 8, 1977.
13. Diemer, Jr., R. Bertrum, and Dunson, Jr., James B., *Method for Separating Immiscible Fluids of Different Density*, **United States Patent 4,056,371**, November 1, 1977.

## PUBLICATIONS

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1. Diemer, R. Bertrum, and Luyben, William L., "Design and Control of a Methyl Acetate Process Using Carbonylation of Dimethyl Ether", *Ind. Eng. Chem. Res.*, **49** (23), pp 12224–12241, [doi:10.1021/ie101583j](https://doi.org/10.1021/ie101583j), October 2010.
2. Diemer, R. Bertrum, Jr., and Rensi, Terence A., "PBM-Based Analysis of a Developmental Crystallization Process", Proceedings of 3<sup>rd</sup> International Conference on Population Balance Modeling, Quebec City, Quebec, September, 2007.
3. Ehrman, S. H., Castellanos, P., Dwivedi, V., and Diemer, R. B., "Introduction of a population balance based design problem in a particle science and technology course for chemical engineers", *Chem. Eng. Ed.*, **41** (2), 88-92 (Spring 2007).
4. Diemer, R. B., Jr., and J. H. Olson, "Analysis of a Moment-Based Inverse Problem Solution Technique for Breakage Kernel Identification", Paper 458a, Proceedings of AIChE 2006 Annual Meeting, San Francisco, November 2006.
5. Diemer, R. B., Jr., and Olson, J. H., "Criterion for employing bivariate formulations in collision-coalescence problems", *J. Aerosol Sci.*, **37** (12), 1883-1887 (December 2006), [doi:10.1016/j.jaerosci.2006.07.005](https://doi.org/10.1016/j.jaerosci.2006.07.005).
6. Diemer, R. B., Jr., Spahr, D. E., Olson, J. H., Magan, R. V., and Litster, S. J., "Interpretation of breakage data via moment models", Paper 167a, Proceedings of 5<sup>th</sup> World Congress of Particle Technology, Orlando, Florida, April 2006.
7. Diemer, R. B., Jr., and Olson, J. H., "Bivariate Moment Methods for Simultaneous Coagulation, Coalescence and Breakup", *J. Aerosol Sci.*, **37** (3), 363-385 (March 2006), [doi:10.1016/j.jaerosci.2005.07.005](https://doi.org/10.1016/j.jaerosci.2005.07.005).
8. Li, R., McCoy, B. J., and Diemer, R. B., "Cluster Aggregation and Fragmentation Kinetics Model for Gelation", *J. Coll. Int. Sci.*, **291** (2), 375-387 (December 2005), [doi:10.1016/j.jcis.2005.05.038](https://doi.org/10.1016/j.jcis.2005.05.038).
9. Diemer, R. B., Jr., Spahr, D. E., Olson, J. H. and Magan, R. V., "Interpretation of Size Reduction Data via Moment Models", *Powder Tech.*, **156** (2-3), 83-94 (August 2005), [doi:10.1016/j.powtec.2005.04.015](https://doi.org/10.1016/j.powtec.2005.04.015).

10. Diemer, R. B., Jr., and Ehrman, S. H., "Pipeline Agglomerator Design as a Model Test Case", *Powder Tech.*, **156** (2-3), 129-145 (August 2005), [doi:10.1016/j.powtec.2005.04.016](https://doi.org/10.1016/j.powtec.2005.04.016).
11. Diemer, R. B., Jr., and Olson, J. H., "Multicomponent Coagulation – Similarity Solutions and Moment Models", Proceedings of 7<sup>th</sup> World Congress of Chemical Engineering, Glasgow, Scotland, July 10-14, 2005.
12. Subramanian, N. S., Gai, P. L., and Diemer, R. B., Jr., "In Situ Aerosol Powder Coating via Multicomponent Coagulation", Proceedings of 7<sup>th</sup> World Congress of Chemical Engineering, Glasgow, Scotland, July 10-14, 2005.
13. Diemer, R. B., Jr., and Olson, J. H., "Similarity Solution Existence Maps for Binary Growth", Proceedings of 7<sup>th</sup> World Congress of Chemical Engineering, Glasgow, Scotland, July 10-14, 2005.
14. Diemer, R. B., Jr., and Olson, J. H., "Bivariate Moment Methods for Simultaneous Coagulation, Coalescence and Breakup", Paper 547e, Proceedings of AIChE 2004 Annual Meeting, November 7-12, 2004, Austin, TX, American Institute of Chemical Engineers, New York, NY, 2004.
15. Diemer, R. B., Jr., Spahr, D. E., and Olson, J. H., "Interpretation of Size Reduction Data via Moment Models", Paper 54g, Proceedings of AIChE 2003 Annual Meeting, November 16-21, 2003, San Francisco, American Institute of Chemical Engineers, New York, NY, 2003.
16. Diemer, R. B., Jr., and Ehrman, S. H., "Pipeline Agglomerator Design as a Model Validation Test Case", Paper 45f, Proceedings of AIChE 2003 Annual Meeting, November 16-21, 2003, San Francisco, American Institute of Chemical Engineers, New York, NY, 2003.
17. Sommer, M., Stenger, F., Peukert, W., Wagner, N. J., and Diemer, R. B., "Modeling the Superposition of Grinding and Agglomeration in Stirred Ball Mills by Population Balance Models", Paper 30e, Proceedings of AIChE 2003 Annual Meeting, November 16-21, 2003, San Francisco, American Institute of Chemical Engineers, New York, NY, 2003.
18. Diemer, R. B., and Olson, J. H., "A Moment Methodology for Coagulation and Breakage Problems: Part III – Generalized Daughter Distribution Functions", *Chem. Eng. Sci.*, **57** (19), 4187-4198 (October 2002), [doi:10.1016/S0009-2509\(02\)00366-4](https://doi.org/10.1016/S0009-2509(02)00366-4).
19. Diemer, R. B., and Olson, J. H., "A Moment Methodology for Coagulation and Breakage Problems: Part II – Moment Models and Distribution Reconstruction", *Chem. Eng. Sci.*, **57** (12), 2211-2228 (June 2002), [doi:10.1016/S0009-2509\(02\)00112-4](https://doi.org/10.1016/S0009-2509(02)00112-4).
20. Diemer, R. B., and Olson, J. H., "A Moment Methodology for Coagulation and Breakage Problems: Part I – Analytical Solution of the Steady-State Population Balance", *Chem. Eng. Sci.*, **57** (12), 2193-2209 (June 2002), [doi:10.1016/S0009-2509\(02\)00111-2](https://doi.org/10.1016/S0009-2509(02)00111-2).

21. Diemer, R. B., Jr., and Olson, J. H., "Modeling Distribution Evolution in Mechanical Milling", Paper 141f, Proceedings of AIChE 2002 Annual Meeting, November 3-7, 2002, Indianapolis, American Institute of Chemical Engineers, New York, NY, 2002.
22. Diemer, R. B., Jr., "Aerosol Reaction Engineering for Powder Manufacture", Paper 143f, Proceedings of AIChE 2002 Annual Meeting, November 3-7, 2002, Indianapolis, American Institute of Chemical Engineers, New York, NY, 2002.
23. Diemer, R. B., and Olson, J. H., "Moment Methods for Population Balance Modeling", Proceedings of 6<sup>th</sup> World Congress of Chemical Engineering, Process Simulation Session 2316, September 23-27, 2001, Melbourne Australia, Institution of Chemical Engineers in Australia.
24. Diemer, R. Bertrum, Jr., and Andrew W. DeGraff, "Reducing CCl<sub>4</sub> Emissions at the Source", AIChE 2000 Spring National Meeting, March 5-9, 2000, Atlanta, American Institute of Chemical Engineers, New York, NY, 2000.
25. Diemer, R. Bertrum, and Olson, J. H., "Moment Methods for Bivariate Population Balances", AIChE 1999 Annual Meeting, October 31-November 5, 1999, Dallas, American Institute of Chemical Engineers, New York, NY, 1999.
26. Diemer, R. Bertrum, Jr., *Moment Methods for Coagulation, Breakage and Coalescence Problems*, **Doctoral Dissertation**, University of Delaware, May, 1999.
27. Diemer, R. B., Jr., and Olson, J. H., *Basis Functions for Inversion of Moment Problems*, **Advanced Technologies for Particle Production**, Vol. 1, Proceedings of AIChE 1998 Annual Meeting, November 15-20, 1998, Miami Beach, American Institute of Chemical Engineers, New York, NY, 1998, pp. 99-104.
28. Diemer, R. B., Jr., Ellis, T. D., Silcox, G. D., Lighty, J. S., and Pershing, D. W., *Hazardous Waste Incineration*, **Encyclopedia of Environmental Analysis and Remediation**, John Wiley, 1998, pp. 2056-2072.
29. Diemer, R. B., Jr., and Olson, J. H., *Generalized Area Moment Equations for Agglomerated Particle Formation and Growth*, **Technologies Critical to a Changing World**, Vol. 6, Proceedings of 5<sup>th</sup> World Congress of Chemical Engineering, July 14-18, 1996, San Diego, American Institute of Chemical Engineers, New York, NY, 1996, pp. 52-57.
30. Diemer, R. B., Ellis, T. D., Silcox, G. D., Lighty, J. S., and Pershing, D. W., *Incinerators*, **Kirk-Othmer Encyclopedia of Chemical Technology**, 4<sup>th</sup> Edition, Vol. 14, John Wiley, 1995, pp. 86-122.
31. Diemer, R. B., Ellis, T. D., Vevai, J. E., Scrivner, N. C., and Brunner, C. R., *Hazardous Waste Incineration*, **Encyclopedia of Physical Science and Technology**, 2<sup>nd</sup> Edition, Vol. 7, Academic Press, 1992, pp. 623-637.

32. Blenk, M. H., Diemer, R. B., and Hager, J. P., *A Process for Separating Impurities from Crude Lead Bullion via Sodium Metal Injection*, **Injection in Process Metallurgy**, Proceedings of Symposium, 1991 Annual TMS Meeting, New Orleans, February, 1991, pp. 299-323.
33. Diemer, R. B., Jr., *Sticking Coefficients in Solid Aerosol Collisions*, **Aerosols: Science, Industry, Health and Environment**, Proceedings of 3<sup>rd</sup> International Aerosol Conference, September 24-27, 1990, Kyoto, Japan, Pergamon Press, New York, 1990, pp. 160-163.
34. Sanders, S. J., Rafal, M., Clark, D. M., Young, R. D., Scrivner, N. C., Pease, R. A., Grise, S. L., and Diemer, R. B., "Modeling the Separation of Amino Acids by Ion-Exchange Chromatography", *Chemical Engineering Progress*, August, 1988, pp. 47-54.
35. Diemer, R. B., Ellis, T. D., Vevai, J. E., Scrivner, N. C., and Brunner, C. R., *Hazardous Waste Incineration*, **Encyclopedia of Physical Science and Technology**, Vol. 6, Academic Press, 1987, pp. 436-450.
36. Bickford, D. F., and Diemer, R. B., Jr., "Redox Control of Electric Melters with Complex Feed Compositions: I. Analytical Methods and Models", *J. Non-Crystalline Solids*, **84**, 276-284 (1986).
37. Bickford, D. F., Diemer, R. B., Jr., and Iverson, D. C., "Redox Control of Electric Melters with Complex Feed Compositions: II. Preliminary Limits for Radioactive Waste Melters", *J. Non-Crystalline Solids*, **84**, 285-291 (1986).
38. Diemer, R. B., Jr., Dooley, K. M., Gates, B. C., and Albright, R. L., "Sulfonated Poly(Styrene-Divinylbenzene) Catalysts: III. The Influence of Polymer Physical Properties on the Kinetics of Methanol Dehydration", *J. Catalysis*, **74**, 373-381 (1982).
39. Diemer, R. Bertrum, Jr., *The Effects of Catalyst Structure on Methanol Dehydration Catalyzed by Sulfonic Acid Resins*, **Masters Thesis**, University of Delaware, May, 1980.

## PROFESSIONAL ACTIVITIES

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### Journal Reviewer:

*Powder Technology*

*Canadian Metallurgical Quarterly*

*Chemical Engineering Science*

*American Institute of Chemical Engineers Journal*

*Aerosol Science & Technology*

*Industrial & Engineering Chemistry Research*



*Journal of Colloid and Interface Science*

*Journal of Aerosol Science*

**Proposal Reviewer and/or Review Panelist:**

NSF

Research Council of Canada

Norwegian Research Council

**Chair/Vice-Chair, Technical Sessions on:**

Annual AIChE Meeting, San Francisco, CA <i>Aerosol Reaction Engineering</i>	1989
EF Conference, Santa Barbara, CA <i>Polymer Reactor Design and Modeling</i>	1991
UEF Conference, Kona, HI <i>Population Balance Modeling and Simulation</i>	2000
UEF Conference, Barga, Italy <i>Electronic Devices from Vapor-Synthesized Nanoparticles</i>	2002
Annual AIChE Meeting, San Francisco, CA <i>Wet and Dry Comminution Processes</i>	2003
Spring National AIChE Meeting, New Orleans, LA <i>Nanotechnology Plenary Sessions</i>	2004
Spring National AIChE Meeting, Atlanta, GA <i>Nanotechnology Plenary Sessions</i>	2005
Spring National AIChE Meeting, Orlando, FL (& 5 <sup>th</sup> World Congress on Particle Technology) <i>Modeling of Comminution Processes</i>	2006
Annual AIChE Meeting, Salt Lake City, UT <i>Comminution: Theory, Experiment &amp; Modeling</i>	2007
Annual AIChE Meeting, Philadelphia, PA <i>Comminution: Theory, Experiment &amp; Modeling</i>	2008
Annual AIChE Meeting, Philadelphia, PA <i>History &amp; Future of Particle Production</i>	2008

## INVITED PRESENTATIONS AND LECTURES

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AIChE – Particle Technology Forum, Oak Brook, IL <i>Invited Speaker</i> , Frontiers of Particle Science & Technology	2014
New Jersey Institute of Technology, <i>Guest Lecturer</i>	2011
Arthur D. Pelton Symposium, Houston, TX <i>Invited Speaker</i> , Materials Science & Technology Conference 2010	2010
Iowa State University, <i>Guest Lecturer</i>	2009
University of Utah, <i>Guest Lecturer</i>	2007
University of Missouri-Rolla, <i>Guest Lecturer</i>	2005
FLUENT Users Group Meeting, Dearborn, MI, <i>Invited Speaker</i>	2004
NSF-ASME Workshop, College Park, MD <i>Invited Speaker</i> , <i>Product Realization based on Nanoscale Particles, Tubes, Fibers, Rods &amp; Ribbons</i> ,	2004
Louisiana State University, <i>Guest Lecturer</i>	2004
12 <sup>th</sup> Larson Workshop, Groton, CT <i>Invited Speaker</i> , Association for Crystallization Technology	2003
Pennsylvania State University, <i>Guest Lecturer</i>	2000
Yale University, <i>Guest Lecturer</i>	1990, 1999
NSF Workshop, Washington, DC <i>Invited Panelist</i> , <i>Priorities in Submicron Particle Research</i>	1990
University of Cincinnati, <i>Guest Lecturer</i>	1989
Argonne National Laboratory, <i>Guest Lecturer</i>	1988

## TEACHING EXPERIENCE

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University of Delaware	2014-present
CHEG 432 <i>Chemical Process Analysis</i>	
CHEG 670 <i>Rate Processes and Kinetics</i>	
CHEG 672 <i>Mathematics for Particulate Systems</i>	
CHEG 675 <i>Particle Product Engineering and Economics</i>	

<b>University of Delaware Adjunct Faculty</b> CHEG 432 <i>Chemical Process Analysis</i> CHEG 667 <i>Toward Zero-Emissions Processes</i> CHEG 835 <i>Applied Chemical Kinetics</i>	1997-2014
<b>AIChE, Continuing Education Course</b> <i>Industrial Hazardous Waste Incineration</i>	1985-1993
<b>DuPont Company, Continuing Education Course</b> <i>Chemical Engineering for Non-chemical Engineers</i>	1980s

## **COMMITTEES & BOARDS**

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AIChE Awards Committee & Chair of Search Committee Industrial Award Nominations	2013-present
AIChE Director of Membership Nanoscale Science and Engineering Forum	2006-2011
AIChE Liaison Officer Nanoscale Science and Engineering Forum	2005-2006
University of Minnesota IGERT Program Board Member Industrial Nanoparticle Science and Engineering	2002-2006
UEF Conference Organizing Committee Nanoparticles and Nanostructures through Vapor Phase Synthesis-Vapor Phase Synthesis of Materials IV, Barga, Italy	2002
EF Conference Organizing Committee Polymer Reaction Engineering, Santa Barbara, CA	1991