

**JOSEPH J. BOZELL**  
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PRESENT POSITION Associate Professor - Biomass Chemistry, University of Tennessee - Knoxville

QUALIFICATIONS *The organic chemistry of renewable feedstocks:* Over 15 years experience in the conversion of renewable materials into chemicals; broad experience in organic chemistry and synthesis, and the use of transition metal organometallic complexes in organic synthesis.

RESEARCH INTERESTS

*Renewable carbon as a source of chemicals:* new synthetic methods for conversion of renewables; transition metal catalysis for biomass conversion; interaction of organometallics with carbohydrates; novel transformations of biorenewable feedstocks; organometallic chemistry in synthesis.

JOB HISTORY

Associate Professor – Biomass Chemistry – University of Tennessee Knoxville, 2006 to present  
Principal Scientist - Chemist, National Renewable Energy Laboratory, 2000 to 2006.  
Research Associate Professor, University of Denver, 1991 to 2006  
Senior Chemist, National Renewable Energy Laboratory, 1989 to 2000  
Adjunct Associate Professor of Chemistry, University of Missouri, St. Louis, 1988 to 1989.  
Adjunct Assistant Professor of Chemistry, University of Missouri, St. Louis, 1984 to 1988.  
Research Specialist, Monsanto Company, 1985 to 1989.  
Senior Research Scientist, Monsanto Company, 1982 to 1985.

EDUCATION

Postdoctoral Research Associate, Princeton University, 1980 to 1982.  
Ph.D., Organic/Organometallic Chemistry, Colorado State University, 1980.  
B.S., Professional Chemistry, South Dakota State University, 1975.

ACTIVITIES

Member, American Chemical Society  
Member, ACS Organic and Carbohydrate Divisions  
Member, ACS CELL Division Program committee  
Member, Phi Kappa Phi (Chemical Honorary)  
Chair, Organic Chemistry Chapter, Technical Community of Monsanto (1984-1987).  
Associate Editor CLEAN – Air, Soil, Water (Wiley-VCH journal)  
Member, International Advisory Board, 2006 Renewable Resources and Biorefineries Conference

AWARDS

2005 Federal Laboratory Consortium Notable Technology Award

2005 Clean Fractionation License Award

2004 NREL Director's Award

1999 Presidential Green Chemistry Award

1998 NREL Director's Award

1996 NREL Outstanding Achievement Award

## PUBLICATIONS

### Peer-Reviewed Publications

29. "Chemical Catalysis for Biomass Deconstruction", Joseph J. Bozell, *Riegel's Handbook of Biocatalysts for Biomass Conversion*, in press.
28. "Feedstocks for the Future: Using Technology Development as a Guide to Product Identification", Joseph J. Bozell, *ACS Symposium Series*, **2006**, 921, 1 (JJB also edited the rest of the book)
27. "Feedstocks for the Future: Renewables for the Production of Chemicals and Materials", Joseph J. Bozell and Martin K. Patel, eds., *ACS Symposium Series*, **2006**, 921.
26. "Alternative Feedstocks for Bioprocessing" Dekker Encyclopedia of Plant and Crop Science, R. M. Goodman, ed, 2004.
25. "Pulping Catalysts from Lignin: The Diels-Alder Step", in *Advances in Chemical Modification, Properties and Usage of Lignin*, Donald R. Dimmel, Joseph J. Bozell, David G. von Oepen, and Michael C. Savidakis, Kluwer Academic/Plenum Publishers, 2002, p.199.
24. "Green Chemistry in Practice", Joseph J. Bozell in *Handbook of Green Chemistry and Technology*, J. Clark and D. Macquarrie, eds., 2002.
23. "Stereoselective and Regioselective Reaction of Cyclic Orthoesters with Phenols", Joseph J. Bozell, Darrin Miller, Bonnie R. Hames and Cheryl Loveless, *J. Org. Chem.*, **2001**, 66, 3084.
22. "Chemicals and Materials from Renewable Resources", J. J. Bozell, *ACS Symposium Series*, **2001**, 784, 1 (JJB also edited the rest of the book).
21. "Heteropolyacid Catalyzed Oxidation of Lignin and Lignin Models to Benzoquinones", Joseph J. Bozell, John O. Hoberg, and Donald R. Dimmel, *J. Wood Chem. Tech.*, **2000**, 20, 19.
20. "Production of Levulinic Acid and Use as a Platform Chemical for Derived Products", J. J. Bozell, L. Moens, D. C. Elliott, Y. Wang, G. G. Neuenschwander, S. W. Fitzpatrick, R. J. Bilski, and J. L. Jarnefeld, *Resources, Conservation and Recycling*, **2000**, 28, 227.
19. "New Quinone-Based Pulping Catalysts," Dimmel, D. R.; Althen, E.; Savidakis, M; Courchene, C; and Bozell, J. J., *Tappi J.*, **1999**, 82(12), 83.
18. "New Methodology for the Production of Chemicals from Renewable Feedstocks", J. J. Bozell, J. O. Hoberg, D. Claffey, B. R. Hames, and D. R. Dimmel, in *Green Chemistry: Frontiers in Benign Chemical Synthesis and Processing*, P. T. Anastas and T. C. Williamson, eds. Oxford University Press, Chapter 2 (1998).
17. "Catalytic Oxidation of Para-Substituted Phenols with Nitrogen Dioxide and Oxygen", Joseph J. Bozell, John O. Hoberg, and Donald R. Dimmel, *Tetrahedron Letters*, **1998**, 39, 2261.
16. "Pulping Catalysts from Lignin (8). Nitrogen Dioxide Oxidation of Lignins", D. R. Dimmel, K. Kuroda, X. Pan, and Joseph J. Bozell, *J. Wood Chem. Technol.*, **1997**, 17, 235.
15. "Cobalt-Schiff Base Complex Catalyzed Oxidation of Para-Substituted Phenolics. Molecular Orbital Calculations on Phenolic Substrates", Thomas Elder and Joseph J. Bozell, *Holzforschung*, **1996**, 50, 24.
14. "Pulping Catalysts from Lignin (7). Nitrogen Dioxide Oxidation of a Lignin Model Dimer", D. R. Dimmel, X. Pan, and Joseph J. Bozell, *J. Wood Chem. Technol.*, **1996**, 16, 205.
13. "Pulping Catalysts from Lignin (6). Nitrogen Dioxide Oxidation of 5-Substituted Guaiacyl Compounds", D. R. Dimmel, X. Pan, K. Kuroda, and Joseph J. Bozell, *J. Wood Chem. Technol.*, **1996**, 16, 191.

12. "Pulping Catalysts from Lignin (5). Nitrogen Dioxide Oxidation of Lignin Models to Benzoquinones", D. R. Dimmel, M. R. Karim, M. C. Savidakis, and Joseph J. Bozell, *J. Wood Chem. Technol.*, **1996**, 16, 169.
11. "Cyclopropanation and Ring Expansion of Unsaturated Sugars", John O. Hoberg and Joseph J. Bozell, *Tetrahedron Letters*, **1995**, 36, 6831.
10. "Cobalt-Schiff Base Complex Catalyzed Oxidation of Para-Substituted Phenolics. Preparation of Benzoquinones", Joseph J. Bozell, Bonnie R. Hames, and Donald R. Dimmel, *J. Org. Chem.*, **1995**, 60, 2398.
9. "Pulping Catalysts from Lignin", Joseph J. Bozell, Donald R. Dimmel, and Arthur J. Power, *Ind. Uses Agricultural Mat. Situation Outlook Report*, **1994**, 27.
8. "Pulping Catalysts from Lignin", Donald R. Dimmel and Joseph J. Bozell, *Tappi J.*, **1991**, 74(5), 239.
7. "Transition Metal Assisted Asymmetric Synthesis of Amino Acid Analogues. A New Synthesis of Optically Pure D- and L-Pyridylalanines", Joseph J. Bozell, C. E. Vogt, and J. Gozum, *J. Org. Chem.*, **1991**, 56, 2584.
6. "Bimetallic Catalysis. A New Method for the Activation of Chloroarenes toward Palladium Catalyzed Coupling with Olefins", Joseph J. Bozell and Charles E. Vogt, *J. Am. Chem. Soc.*, **1988**, 110, 2655.
5. "Quinone Synthesis with Organometallic Reagents", M. F. Semmelhack, T. Sato, Joseph J. Bozell, L. Keller, W. Wulff, A. Zask, and E. Spiess, in *Current Trends in Organic Synthesis*, **1983**, 303.
4. "Synthesis of Nanaomycin A and Deoxyfrenolicin by Alkyne Cycloaddition to Chromium Carbene Complexes", M. F. Semmelhack, Joseph J. Bozell, T. Sato, W. Wulff, E. Spiess, and A. Zask, *J. Am. Chem. Soc.*, **1982**, 104, 5850.
3. "Naphthoquinones from Alkynes and Chromium-Carbene Complexes. Control of Regioselectivity through Intramolecular Reaction", M. F. Semmelhack and Joseph J. Bozell, *Tetrahedron Lett.*, **1982**, 23, 2931.
2. "Palladium Assisted Functionalization of Olefins. A New Amination of Electron-Deficient Olefins", Joseph J. Bozell and L. S. Hegedus, *J. Org. Chem.*, **1981**, 46, 2561.
1. "Palladium Assisted Intramolecular Amination of Olefins. Synthesis of Nitrogen Heterocycles", Louis S. Hegedus, Gary F. Allen, Joseph J. Bozell, and Edward L. Waterman, *J. Am. Chem. Soc.*, **1978**, 100, 5800.

#### Invited Lectures

23. "Oleochemicals in the Biorefinery: Products and Opportunities, presented at the 2006 Growing the Bioeconomy Conference, Iowa State University, August, 2006.
22. "Technology Concepts for the Forest Biorefinery", presented at North Carolina State University, June 2006.
21. "Methodology for the Conversion of Renewable Feedstocks into Chemicals", presented at Mississippi State University, April, 2005.
20. "Methodology for the Conversion of Renewable Feedstocks into Chemicals", presented at Iowa State University, February, 2005.
19. "Oleochemicals as Renewable Feedstocks: New Products and Opportunities", presented at the meeting of the Biorenewables Vegetable Oil Workshop, Plant Sciences Institute, Iowa State University, August, 2004.

18. "The Use of Renewable Feedstocks for the Production of Chemicals and Materials", presented at BOC Gases, July, 2004.
17. "Methodology for the Conversion of Renewable Feedstocks into Chemicals", presented at the University of Montana, Missoula, MT, April, 2004.
16. "New Chemicals and Polymers from Biomass", presented at the Iowa State University Chemical Engineering Department, Ames, IA, September, 2002.
15. "A Brief Overview of Technical Challenges and Opportunities Within the Biobased Products Industry", presented at the Iowa Industries of the Future Symposium, Ames, IA, September, 2002.
14. "New Chemicals and Polymers from Renewable Feedstocks" presented at the spring meeting of the American Chemical Society, Orlando, FL, April, 2002.
13. "New Chemicals and Polymers from Biomass", presented at the University of Denver, February, 2002
12. "New Chemicals and Polymers from Renewable Feedstocks" presented at DuPont Company, November, 2001.
11. "New Chemicals and Polymers from Biomass", presented at the USDA Western Regional Research Laboratory, September, 2001.
10. "Chemicals from Renewable Feedstocks. An Opportunity for Small Business?", presented at the national meeting of the American Chemical Society, Chicago, IL, August, 2001.
9. "New Methods for the Conversion of Renewable Feedstocks to Chemicals: Research at the National Renewable Energy Laboratory", Joseph J. Bozell, presented at Monsanto Company, June, 1998
8. "Separation of C5 Sugars from Corn Fiber", Joseph J. Bozell, Stuart K. Black, and Debbie Cahill, presented at the 1998 Corn Utilization and Technology Conference, St. Louis, MO, June, 1998.
7. "New Technology for the Conversion of Renewables to Chemicals: Research at the National Renewable Energy Laboratory", Joseph J. Bozell, presented at the Fraunhofer Institut Systemtechnik und Innovationsforschung, Karlsruhe, Germany, May, 1998.
6. "New Approaches for the Conversion of Renewables to Chemicals, presented at Regis University, November, 1997.
5. "Use of Biomass for the Production of Chemicals", presented at Regis University, April, 1995
4. "Metal Mediated Reactions of Renewable Materials", presented at Denver University, February, 1993.
3. "Synthesis of Anthraquinone Wood Pulping Catalysts", presented at Denver University, November, 1989.
2. "Transition Metal Assisted Asymmetric Synthesis of Nitrogen Heterocycles", presented at G. D. Searle and Company, Skokie, IL, November, 1988.
1. "Bimetallic Activation of Aryl Chlorides", presented at the National Science Foundation Organometallic Workshop, Potosi, MO, May, 1988.

### Proceedings Publications

9. "Production of Levulinic Acid and Use as a Platform Chemical for Derived Products" by Elliott, Fitzpatrick, Bozell, Jarnefeld, Bilski, Moens, Frye, Wang and Neuenschwander, In: Biomass - A Growth Opportunity in Green Energy and Value-Added Products - Proceedings of the 4th Biomass Conference of the Americas, Volume 1, eds. R.P. Overend and E. Chornet, pp. 595-600; Pergamon: Kidlington, Oxford, UK, 1999.

8. "Production of Levulinic Acid and Use as a Platform Chemical for Derived Products", J. J. Bozell, L. Moens, D. C. Elliott, Y. Wang, G. G. Neuenschwander, S. W. Fitzpatrick, R. J. Bilski, and J. L. Jarnefeld, presented at the 1999 ACEEE meeting, Saratoga Springs, NY, June, 1999.
7. "Separation of C5 Sugars from Corn Fiber", Joseph J. Bozell, Stuart K. Black, and Debbie Cahill, presented at the 1998 Corn Utilization and Technology Conference, St. Louis, MO, June, 1998.
6. "Clean Fractionation of Lignocellulosics - Process Scaleup, Optimization, and Characterization of Process Streams", Joseph J. Bozell, Mark Davis, Stuart K. Black, David K. Johnson and Debbie Cahill, presented at the 9th International Symposium on Wood and Pulping Chemistry, Montreal, Quebec, June, 1997.
5. "Clean Fractionation Of Lignocellulosics - A New Process For Preparation Of Alternative Feedstocks For The Chemical Industry", Joseph J. Bozell, Stuart K. Black, and Michele Myers, presented at the 8th International Symposium on Wood and Pulping Chemistry, Helsinki, Finland, June, 1995.
4. "Pulping Catalysts From Lignin. Progress And Barriers To An Economic Synthesis.", Donald R. Dimmel, Xiaoqi Pan, and Joseph J. Bozell, presented at the 8th International Symposium on Wood and Pulping Chemistry, Helsinki, Finland, June, 1995.
3. "Metal Mediated Transformations of Lignin. Preparation of Benzoquinones as Chemical Intermediates", Joseph J. Bozell and Bonnie R. Hames, presented at the First Biomass Conference of the Americas, Burlington, VT, August, 1993.
2. "Degradation of Lignin to Oxidized Monomers", Donald R. Dimmel, K.-i. Kuroda and Joseph J. Bozell presented at the Cellulose 91 conference, New Orleans, LA, December, 1991.
1. "Pulping Catalysts from Lignin: Process Optimization via NO<sub>2</sub> Oxidation and Aqueous Diels-Alder Reactions", Donald R. Dimmel, Mohammad R. Karim, Patrick J. Van Vreede, and Joseph J. Bozell, presented at the International Symposium on Wood and Paper Chemistry, April, 1991, Melbourne, Australia.

### Meeting Presentations

28. "Biobased Nanostructural Materials: Syntheses and Interaction with Natural Polymers" J. J. Bozell, S. Park, N. Labbé, T. Elder, S. Vidal, J. Bullock, D. Thompson, presented at the 2006 Southeast Regional American Chemical Society Meeting (SERMACS), Augusta, GA, November 2<sup>nd</sup>, 2006.
27. "Use Of Lignin in the Biorefinery", D. K. Johnson, J. Bozell, J. E. Holladay, J. F. White, presented at the 7th International Forum of the International Lignin Institute, Barcelona, Spain, April 27-28<sup>th</sup>, 2005 (presented by DKJ).
26. "New Transformations of Renewable Carbohydrates: Organometallic Processes and Formation of Nanostructural Materials", presented at the national meeting of the American Chemical Society, Anaheim, CA, March, 2004.
25. "New Chemicals and Polymers from Biomass", presented at the 10<sup>th</sup> Annual Meeting of the BioEnvironmental Polymer Society, Albuquerque, NM, September, 2002.
24. "Chemical Building Blocks from Renewable Feedstocks. Organic Synthesis at the National Renewable Energy Laboratory", Joseph J. Bozell, presented at the CU-Roche symposium on Organic Synthesis, June, 2002.
23. "New Chemicals and Polymers from Renewable Feedstocks" presented at the 24<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals, Gatlinburg, TN, April, 2002.

22. "New Chemicals and Polymers from Renewable Feedstocks" presented at the spring national meeting of the American Chemical Society, Orlando, FL, April, 2002.
21. "Effect of Compounds Derived from *Allium* Species on the Activity of Cholesterol Esterase and Paraoxonase", Joseph J. Bozell and Andrey Sosnov, presented at the CU-Array Biopharma Symposium on Medicinal and Synthetic Organic Chemistry, June 6th, 2001.
20. "Pulping Catalysts From Lignin", Donald R. Dimmel and Joseph J. Bozell, presented at the December 2000 meeting of the American Chemical Society.
19. "Production of Levulinic Acid and Use as a Platform Chemical for Derived Products", J. J. Bozell, L. Moens, D. C. Elliott, Y. Wang, G. G. Neuenschwander, S. W. Fitzpatrick, R. J. Bilski, and J. L. Jarnefeld, presented at the 4th Biomass Conference of the Americas, Oakland, CA, August, 1999.
18. "New Quinone-based Pulping Catalysts", Donald R. Dimmel, Elizabeth Althen, Michael Savidakis, Charles Courchene, and Joseph J. Bozell, presented at the TAPPI Pulping Conference, Fall, 1998
17. "Stereoselective Arylation of Cyclic Orthoesters", Joseph J. Bozell and Darrin Miller, presented at the CU/Roche Colorado Symposium in Synthetic Chemistry, May, 1998.
16. "Chemicals Derived from Biomass", Joseph J. Bozell, presented at the Workshop on Future Directions in Biomass Refining, University of Minnesota, September, 1996.
15. "New Methodology for the Use of Renewable Materials as Chemical Feedstocks", Joseph J. Bozell, John O. Hoberg, David Claffey, Bonnie R. Hames, presented at the Gordon Conference on Green Chemistry, July, 1996
14. "Clean Fractionation of Lignocellulosics - A New Solvent Based Approach for the Preparation of Renewable Chemical Feedstocks", Joseph J. Bozell, Stuart K. Black, Michele Myers, Debbie Cahill, and Joanna Ossinger; presented at the national meeting of the American Chemical Society, New Orleans, March, 1996.
13. "Clean Fractionation of Lignocellulosics. A New Process for the Separation of Biomass", Joseph J. Bozell, Stuart R. Black, and Michele Myers, presented at the national meeting of the American Chemical Society, April, 1994.
12. "Selective Oxidation of Lignin Models Using Transition Metal Catalysis", Joseph J. Bozell and Bonnie R. Hames, presented at the national meeting of the American Chemical Society, March, 1993.
11. "Organometallic Carbohydrate Chemistry. The Reaction of Transition Metal Nucleophiles with Carbohydrate Derivatives", Joseph J. Bozell and John O. Hoberg, presented at the national meeting of the American Chemical Society, March, 1993.
10. "Pulping Catalysts from Lignin - A Technoeconomic Appraisal", Arthur J. Power, Joseph J. Bozell, and Helena L. Chum, presented at the national meeting of the American Chemical Society, August, 1992.
9. "Chemicals from Renewable Feedstocks", Helena L. Chum, Joseph J. Bozell, Douglas Elliott, and Arthur J. Power, presented at the national meeting of the American Chemical Society, August, 1992.
8. "Metal Catalyzed Oxidation of Para-Substituted Phenolics. Approaches to Benzoquinones", Joseph J. Bozell and Bonnie R. Hames, presented at the Rocky Mountain and Northwest Regional meetings of the American Chemical Society, June, 1992.
7. "Metal Catalyzed Oxidation of Para-Substituted Phenolics. Approaches to Benzoquinones", Joseph J. Bozell, Bonnie R. Hames, and Helena L. Chum, presented at the national meeting of the American Chemical Society, Atlanta, GA, April, 1991.

6. "Metal Catalyzed Oxidation of Lignin Models. Effect of Catalyst Structure", Joseph J. Bozell, Bonnie R. Hames, and Helena L. Chum, presented at the national meeting of the American Chemical Society, Atlanta, GA, April, 1991.
5. "Synthesis of Anthraquinone Pulping Catalysts from Lignin", Joseph J. Bozell, Helena L. Chum, Donald R. Dimmel, Mohammad R. Karim, and Patrick J. Van Vreede, presented at the fall meeting of the American Institute of Chemical Engineers, Chicago, IL, November, 1990.
4. "Metal Catalyzed Oxidation of Lignin Models. Effect of Catalyst Structure", Joseph J. Bozell, Bonnie R. Hames, and Helena L. Chum, presented at the Gordon Conference on Organometallic Chemistry, Newport, RI, June, 1990.
3. "Alkali Metal Reduction of Levoglucosan in Liquid Ammonia Solution", Joseph J. Bozell, Luc Moens, H. Chum, Z. Pawlak, and N. Owen, presented at the May, 1990 meeting of the Electrochemical Society (presented by HLC).
2. "Bimetallic Catalysis. A New Method for the Activation of Chloroarenes Toward Palladium Catalyzed Coupling with Olefins", Joseph J. Bozell and Charles E. Vogt, presented at the IUPAC meeting of Organometallics in Organic Synthesis, Vancouver, British Columbia, July, 1987
1. "Palladium Assisted Amination of Olefins", Louis S. Hegedus and Joseph J. Bozell, presented at the Rocky Mountain Regional ACS meeting, June, 1977.

#### Patent

1. "Process for the Preparation of Substituted Olefins from Unsaturated Organic Chlorides and Olefins", U. S. Patent No. 4,814, 489, issued March 21, 1989.