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EDUCATION

Ph.D. Chemistry, University of Virginia, 1989

B.S. Chemistry, College of Charleston, Charleston, South Carolina, 1981

EXPERIENCE

Associate Professor, Environmental Engineering and Earth Sciences and Clemson Institute of Environmental Toxicology, 2005 to present

Assistant Professor, School of the Environment, Faculty of Environmental Engineering and Science, and Clemson Institute of Environmental Toxicology, Clemson University, 2003-2005

Assistant Professor, Department of Environmental Toxicology, Clemson University, 1999-2003

Assistant Professor, Department of Civil Engineering, Environmental and Water Resources Engineering, Texas A&M University, 1994-1999

Postdoctoral Research Fellow, Department of Civil and Environmental Engineering, University of Michigan, 1992-1994, Directors: Walter J. Weber, Jr. and Peter Adriaens

Postdoctoral Research Fellow, Department of Environmental Engineering Science, California Institute of Technology, 1990-1992, Director: Michael R. Hoffmann

Visiting Assistant Professor, Department of Chemistry, Dickinson College, 1989-1990

PUBLICATIONS

Song, H., and Carraway, E. R.: Catalytic hydrodechlorination of chlorinated ethenes by nanoscale zero-valent iron, *Appl. Catal. B-Environ.*, 78, 53-60, 2008.

Lee, J. H., Carraway, E. R., Hur, J., Yim, S., and Schlautman, M. A.: Pyrene fluorescence in the presence of nonquenching and dynamic quenching salting-out agents, *J. Photochem. Photobiol. A-Chem.*, 185, 57-61, 2007.

Song, H., and Carraway, E. R.: Reduction of chlorinated methanes by nano-sized zero-valent iron. Kinetics, pathways, and effect of reaction conditions, *Environ. Eng. Sci.*, 23, 272-284, 2006.

Lee, J. H., Je, J., Tartaglia, A., Hur, J., Schlautman, M. A., and Carraway, E. R.: Quantification of Cu²⁺ using 1,1'-oxalyldiimidazole chemiluminescence, *J. Photochem. Photobiol. A-Chem.*, 182, 28-32, 2006.

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Zhu, D. Q., Herbert, B. E., Schlautman, M. A., Carraway, E. R., and Hur, J.: Cation- π bonding: A new perspective on the sorption of polycyclic aromatic hydrocarbons to mineral surfaces, *J. Environ. Qual.*, 33, 1322-1330, 2004.

- Zhu, D. Q., Herbert, B. E., Schlautman, M. A., and Carraway, E. R.: Characterization of cation- π interactions in aqueous solution using deuterium nuclear magnetic resonance spectroscopy, *J. Environ. Qual.*, 33, 276-284, 2004.
- Schlautman, M. A., Yim, S. B., Carraway, E. R., Lee, J. H., and Herbert, B. E.: Testing a surface tension-based model to predict the salting out of polycyclic aromatic hydrocarbons in model environmental solutions, *Water Res.*, 38, 3331-3339, 2004.
- Lee, J. H., Schlautman, M. A., Carraway, E. R., Yim, S., and Herbert, B. E.: Quantifying ground-state complexation between Ag^+ and polycyclic aromatic hydrocarbons in dilute aqueous solution via fluorescence quenching, *J. Photochem. Photobiol. A-Chem.*, 163, 165-170, 2004.
- Lee, J. H., Carraway, E. R., Schlautman, M. A., Yim, S., and Herbert, B. E.: Characterizing pyrene- Ag^+ exciplex formation in aqueous and ethanolic solutions, *J. Photochem. Photobiol. A-Chem.*, 167, 141-148, 2004.
- Scott, D. T., Runkel, R. L., McKnight, D. M., Voelker, B. M., Kimball, B. A., and Carraway, E. R.: Transport and cycling of iron and hydrogen peroxide in a freshwater stream: Influence of organic acids, *Water Resour. Res.*, 39, 14, 2003.
- Lee, J. H., Je, J. T., Schlautman, M. A., and Carraway, E. R.: Fast peroxyoxalate chemiluminescence for minimized analytical separation systems, *Chem. Commun.*, 270-271, 2003.
- Lee, J. H., Je, J., Hur, J., Schlautman, M. A., and Carraway, E. R.: Solvent and pH effects on fast and ultrasensitive 1,1'-oxalyldi(4-methyl)imidazole chemiluminescence, *Analyst*, 128, 1257-1261, 2003.
- Kim, Y. H., and Carraway, E. R.: Reductive dechlorination of TCE by zero valent bimetals, *Environ. Technol.*, 24, 69-75, 2003.
- Kim, Y. H., and Carraway, E. R.: Dechlorination of chlorinated ethenes and acetylenes by palladized iron, *Environ. Technol.*, 24, 809-819, 2003.
- Kim, Y. H., and Carraway, E. R.: Dechlorination of chlorinated phenols by zero valent zinc, *Environ. Technol.*, 24, 1455-1463, 2003.
- Lee, J. H., Rock, J. C., Schlautman, M. A., and Carraway, E. R.: Characteristics of key intermediates generated in uncatalyzed bis(2,4-dinitrophenyl) oxalate (DNPO) chemiluminescence reactions, *J. Chem. Soc.-Perkin Trans. 2*, 1653-1657, 2002.
- Lee, J. H., Rock, J. C., Park, S. B., Schlautman, M. A., and Carraway, E. R.: Study of the characteristics of three high-energy intermediates generated in peroxyoxalate chemiluminescence (PO-CL) reactions, *J. Chem. Soc.-Perkin Trans. 2*, 802-809, 2002.
- Kim, Y. H., and Carraway, E. R.: Reductive dechlorination of PCE and TCE by vitamin B-12 and ZVMs, *Environ. Technol.*, 23, 1135-1145, 2002.
- An, Y. J., Carraway, E. R., and Schlautman, M. A.: Solubilization of polycyclic aromatic hydrocarbons by perfluorinated surfactant micelles, *Water Res.*, 36, 300-308, 2002.
- An, Y. J., and Carraway, E. R.: PAH degradation by UV/ H_2O_2 in perfluorinated surfactant solutions, *Water Res.*, 36, 309-314, 2002.
- An, Y. J., Jeong, S. W., and Carraway, E. R.: Micellar effect on the photolysis of hydrogen peroxide, *Water Res.*, 35, 3276-3279, 2001.

- Ko, S. O., Schlautman, M. A., and Carraway, E. R.: Cyclodextrin-enhanced electrokinetic removal of phenanthrene from a model clay soil, *Environ. Sci. Technol.*, 34, 1535-1541, 2000.
- Kim, Y. H., and Carraway, E. R.: Dechlorination of pentachlorophenol by zero valent iron and modified zero valent irons, *Environ. Sci. Technol.*, 34, 2014-2017, 2000.
- Ko, S. O., Schlautman, M. A., and Carraway, E. R.: Partitioning of hydrophobic organic compounds to hydroxypropyl-beta-cyclodextrin: Experimental studies and model predictions for surfactant-enhanced remediation applications, *Environ. Sci. Technol.*, 33, 2765-2770, 1999.
- Ko, S. O., Schlautman, M. A., and Carraway, E. R.: Partitioning of hydrophobic organic compounds to sorbed surfactants. 1. Experimental studies, *Environ. Sci. Technol.*, 32, 2769-2775, 1998.
- Ko, S. O., Schlautman, M. A., and Carraway, E. R.: Effects of solution chemistry on the partitioning of phenanthrene to sorbed surfactants, *Environ. Sci. Technol.*, 32, 3542-3548, 1998.
- Hoffman, A. J., Carraway, E. R., and Hoffmann, M. R.: Photocatalytic production of H₂O₂ and organic peroxides on quantum-sized semiconductor colloids, *Environ. Sci. Technol.*, 28, 776-785, 1994.
- Carraway, E. R., Hoffman, A. J., and Hoffmann, M. R.: Photocatalytic Oxidation of Organic-Acids on Quantum-Sized Semiconductor Colloids, *Environ. Sci. Technol.*, 28, 786-793, 1994.
- Carraway, E. R., Demas, J. N., Degraff, B. A., and Bacon, J. R.: Photophysics and photochemistry of oxygen sensors based on luminescent transition-metal complexes, *Anal. Chem.*, 63, 337-342, 1991.
- Carraway, E. R., Demas, J. N., and Degraff, B. A.: Luminescence Quenching Mechanism for Microheterogeneous Systems, *Anal. Chem.*, 63, 332-336, 1991.
- Carraway, E. R., Demas, J. N., and Degraff, B. A.: Photophysics and oxygen quenching of transition-metal complexes on fumed silica, *Langmuir*, 7, 2991-2998, 1991.
- Carraway, E. R., Hauenstein, B. L., Demas, J. N., and Degraff, B. A.: Luminescence lifetime measurements - elimination of phototube time shifts with the phase plane method, *Anal. Chem.*, 57, 2304-2308, 1985.

SELECTED RECENT PRESENTATIONS

- Schlautman, M. A., Carraway, E. R., Estes, S. L. and Zhang, R., Optimizing metalloporphyrin-catalyzed reduction reactions for in situ remediation of DOE contaminants, Department of Energy Environmental Remediation Science Program 3rd annual Principal Investigator meeting, National Conference Center, Lansdowne, VA, April 7-10, 2008.
- Jones, A. J., and Carraway, E. R., A statewide sediment and water quality approach to characterize pollution in wadeable streams of South Carolina, SETAC North America 28th Annual Meeting, Milwaukee, WI, USA, 11-17 November 2007.
- Xu, X. and Carraway, E.R., Effect of synthesis methods on metal oxide nanoparticles properties, SETAC North America 28th Annual Meeting, Milwaukee, WI, USA, 11-17 November 2007.
- Xu, X. and Carraway, E. R., β -HgS nanoparticles: Synthesis and characterization, SERMACS (Southeastern Regional Meeting of the ACS), Greenville, SC, October 24-27, 2007.

- Wagner, J. R., Bixler, R. D., Carraway, E. R., Moysey, S. M., Murdoch, L. R., Schlautman, M. A., and Warner, R. D., The creative inquiry approach to early undergraduate research experiences at Clemson University, Geol. Soc. America, October 2007.
- Jones, A. J., Carraway, E. R., Klaine, S. J., and Scott, M. C., A statewide sediment and water quality approach to characterize pollution in wadeable streams of South Carolina, Water Forum sponsored by Clemson University's Restoration Institute, April 2007 AND Carolinas and Southeastern Regional Chapters of SETAC meeting, Athens, GA, April 2007.
- Xu, X. and Carraway, E. R., Synthesis of metal oxide nanoparticles – Reducing agglomeration for toxicity tests, Carolinas and Southeastern Regional Chapters of SETAC meeting, Athens, GA, April 2007.
- Estes, S. L. and Carraway, E. R., Evaporative light scattering (ELS) detection coupled with high performance size-exclusion chromatography (HPSEC) for the determination of molecular weight distributions of aquatic humic substances, Carolinas and Southeastern Regional Chapters of SETAC meeting, Athens, GA, April 2007.
- Jones, A. J. and Carraway, E. R., Reproductive toxicity of cadmium, copper, mercury and zinc to *Ceriodaphnia dubia*, SETAC North America 27th Annual Meeting, Montreal, Quebec, Canada, November 2006.
- Nesbitt, J., Kim, Y-T., Tartaglia, A. L., Lee, J. H., Schlautman, M. A., and Carraway, E. R., The effects of surfactants on the determination of porphyrins by flow injection analysis using 1,1'-oxalyldi-4-methylimidazole (OD4MI) chemiluminescence (CL) systems, Focus on Creative Inquiry (FoCI) Symposium, Clemson University, Clemson, SC, April 17, 2006 AND the Fourth SC Life Colloquium of Undergraduate Research, Clemson, SC, April 7-8, 2006.
- Nielson, D., Tartaglia, A. L., Carraway, E. R., Lee, J. H., and Schlautman, M. A., Complexation of iron with uroporphyrin III and coproporphyrin III at room temperature, Focus on Creative Inquiry (FoCI) Symposium, Clemson University, Clemson, SC, April 17, 2006 AND the Fourth SC Life Colloquium of Undergraduate Research, Clemson, SC, April 7-8, 2006.
- Smith, A., Nesbitt, J., Cryns, A., and Carraway, E., Developing Clemson University's Solar Decathlon Team, Focus on Creative Inquiry (FoCI) Symposium, Clemson University, Clemson, SC, April 17, 2006.
- Jones, A. J., Pac, C. R., and Carraway, E. R., Alkalinity effects on metal speciation and toxicity to *ceriodaphnia dubia* in waters of varying hardness, Annual Carolinas Regional Meeting of the SETAC, Clemson, SC, April 6-8, 2006.
- Pac, C. R., Jones, A. J. & Carraway, E. R., Metal toxicity to *Ceriodaphnia dubia* as a probe of the kinetic lability of metal complexes. SETAC North America 26th Annual Meeting, Baltimore, MD, November 13-17, 2005.
- Jones, A. J., Pac, C. R. & Carraway, E. R., Alkalinity effects on metal speciation and toxicity to *ceriodaphnia dubia* in waters of varying hardness, SETAC North America 26th Annual Meeting, Baltimore, MD, November 13-17, 2005.
- Lee, J. H., Tartaglia, A. L., Nesbitt, J. N., Hong, S-H., Schlautman, M. A., and Carraway, E. R., Factorial analyses to quantify biosynthesized porphyrins using ultra-fast 1,1'-oxalyldiimidazole chemiluminescence reactions, Division of Analytical Chemistry at the 230th American Chemical Society National Meeting, Washington, DC, August 28 to September 1, 2005.

- Lee, J. H., Tartaglia, A. L., Collins, G. E., Schlautman, M. A., and Carraway, E. R., Microfluidic liquid core waveguide device with 1,1'-oxalyldiimidazole chemiluminescence detection capable of sensing multiple chemical warfare agents, Division of Analytical Chemistry at the 230th American Chemical Society National Meeting, Washington, DC, August 28 to September 1, 2005.
- Carraway, E. R., Team-Based Learning (TBL) for introductory environmental science, Association of Environmental Engineering and Science Professors (AEESP), Potsdam, NY (July 2005).
- Lee, J. H., Tartaglia, A. L., Schlautman, M. A., and Carraway, E. R., Fabrication of microfluidic cells with liquid core waveguide and 1,1'-oxalyldiimidazole chemiluminescence detection, NSTI Nanotechnology Conference and Trade Show, Anaheim, California, May 8-12, 2005.
- Lee, J. H., Tartaglia, A. L., Schlautman, M. A., and Carraway, E. R., Development and applications of a nanovolume flow injection analysis system with 1,1'-oxalyldiimidazole chemiluminescence detection manufactured based on the liquid core waveguide principle, Working Together: R&D Partnerships in Homeland Security, Department of Homeland Security Science and Technology Research & Development Conference, Boston, Massachusetts, April 27-28, 2005.
- Jones, A. J., Pac, C. R., and Carraway, E. R., Alkalinity effects on the speciation and toxicity of metals to ceriodaphnia dubia in waters of varying hardness. Annual Carolinas Regional Meeting of the Society of Environmental Toxicology and Chemistry, Raleigh, NC, March 31-April 2, 2005.
- Environmental Factors Promoting Induced Porphyrin Diseases, by Joelyn N. Nesbitt, Elizabeth R. Carraway, Mark A. Schlautman, and Ji Hoon Lee. Presented at the 2005 Annual Carolinas Regional Meeting of the Society of Environmental Toxicology and Chemistry, Raleigh, NC, March 31 to April 2, 2005.
- Nesbitt, J. N., Schlautman, M. A., Carraway, E. R., and Lee, J. H., Environmental Factors Promoting Induced Porphyrin Diseases, 77th Annual Meeting of the South Carolina Academy of Science, Rock Hill, South Carolina, March 16, 2005.