

CHARLES M. SHARPLESS

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Personal Born: July 1, 1967. Princeton, NJ, USA.

Status: Married with two children

Education

Ph.D. Chemistry (Analytical), Duke University, Durham, NC. December, 1999
Dissertation Title: *Studies of the Relationship Between Humic Acid Fluorescence, Physical Properties, and the Effects of Metal Complexation.*

Advisor: Linda B. McGown

B.A. Natural Sciences, The Johns Hopkins University, Baltimore, MD. May, 1989

Professional Experience

2009-present Associate Professor. Department of Chemistry, Mary Washington College of Arts and Sciences, University of Mary Washington, Fredericksburg, VA.

2004-2009 Assistant Professor. Department of Chemistry, Mary Washington College of Arts and Sciences, University of Mary Washington, Fredericksburg, VA.

Summer 2006 Guest Investigator. Department of Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution, Falmouth, MA.

2002-2004 Assistant Research Professor. Department of Civil and Environmental Engineering, Duke University, Durham, NC.

2000-2002 Postdoctoral Research Associate. Department of Civil and Environmental Engineering, Duke University, Durham, NC.

1990-1992 Research Assistant. Department of Respiratory Biology, Harvard School of Public Health, Boston, MA.

Consulting Experience

2001-present Consulting scientist for Ondeo-Degremont. Measurements and oversight of aging tests for mercury lamps used in UV water treatment reactors.

Instructional Experience

Fall 2004-present Instructor. General Chemistry with Lab (Chem111-112); Analytical Chemistry (Chem252); Chemical Analysis II (Chem254); Environmental Chemistry (Chem331); Environmental Chemistry Lab (Chem332); Instrumental Analysis (Chem392). University of Mary Washington.

Spring 2004 Instructor. Environmental Chemistry and Toxicology (ENV160). Nicholas School of the Environment and Earth Sciences, Duke University

2001-2003 Instructor. Environmental Aquatic Chemistry (ENV242/CE242). Nicholas School of the Environment and Earth Sciences, Duke University.

2001-2003 Assistant Lecturer. Chemistry and Microbiology for Environmental Engineers (CE120L). Department of Civil and Environmental Engineering, Duke University.

- 2001-2003 Assistant Lecturer. Physical and Chemical Treatment Processes (CE241). Department of Civil and Environmental Engineering, Duke University.
- 1996-1999 Recitation Instructor. General Chemistry (CHEM11L/12L). Duke University, Department of Chemistry.
- 1992-1993 Graduate Teaching Assistant. Organic Chemistry Laboratory (151L/152L). Duke University, Department of Chemistry.

Academic and Research Interests

Primary research interests are photochemistry in natural and engineered systems, chemistry of humic substances, fate and remediation of anthropogenic pollutants, and environmental analysis. Teaching interests include general chemistry, analytical chemistry, environmental chemistry, instrumental methods, and spectroscopy.

Honors and Awards

- (2006) Faculty Achievement Award. University of Mary Washington.
- (2006) UMW Division of Teaching and Learning Technologies Fellowship. Awarded to assist in design and implementation of projects to enhance teaching and learning in the general chemistry laboratory by using information technologies.
- (2005) Professor's Honorary Award. Awarded for extraordinary contributions and dedication to the students by the University of Mary Washington Academic Affairs Council on advice from the chemistry majors.
- (2003) Award of Excellence for 2003 ACS National Meeting Presentation. Division of Environmental Chemistry, American Chemical Society.
- (2002) Preparing Future Faculty Fellowship. Preparing Future Faculty National Program, Washington, D.C. and the Center for Teaching, Learning, and Writing at Duke University. August 2002-May 2003.
- (1993) Elected to Alpha Pi Chapter of Phi Lambda Upsilon, National Honorary Chemical Society. August, 1993.
- (1992) NIEHS Toxicology Fellowship, Integrated Toxicology Program. Duke University, Durham, NC. September 1992-August 1995.

Professional Affiliations and Activities

- Member:* American Chemical Society (analytical, education, environmental divisions), Virginia Academy of Sciences, Council on Undergraduate Research.
- Reviewer:* Environmental Science and Technology, Photochemistry and Photobiology, Analytica Chimica Acta, Chemosphere, ASCE Journal of Environmental Engineering, Water Research.
- Volunteer:* Committee on the Environment, Virginia Academy of Science, 2007-present
Session chair, Virginia Academy of Science Annual Meeting, 2006
Project Advisory Committee Member. American Water Works Association Research Foundation, 2001-2003

Peer Reviewed Publications (* denotes undergraduate researchers)

1. Carfagno, A.K.*; Sharpless, C.M., "Correlations between dissolved organic matter optical properties and quantum yields of $^1\text{O}_2$ and H_2O_2 ," *manuscript in preparation*.
2. Plata, D; Sharpless, C.M.; Reddy, C.M, "Photochemical degradation of polycyclic aromatic hydrocarbons in oil films," *Environ. Sci. Technol.*, **2008**, *42*, 2432-2438.

3. Shemer, H.; Sharpless, C.M.; Elovitz, M.S.; Linden, K.G., "Relative rate constants of contaminant candidate list pesticides with hydroxyl radicals," *Environ. Sci. Technol.*, **2006**, *40*, pp. 4460-4466.
4. Chen, W.-R., Sharpless, C.M., Linden, K.G., Suffet, I. H. (Mel), "Treatment of volatile organic chemicals (VOCs) on the EPA contaminant candidate list using ozonation and O₃/H₂O₂ advanced oxidation process," *Environ. Sci. Technol.*, **2006**, *40*, pp. 2734-2739.
5. Shemer, H.; Sharpless, C.M.; Linden, K.G., "Photodegradation of 3,5,6-trichloro-2-pyridinol in aqueous solution," *Water, Air, Soil Poll.*, **2005**, *168*, pp. 145-155.
6. Sharpless, C.M.; Linden, K.G., "Interpreting collimated beam UV oxidation rate data in terms of electrical efficiency of treatment," *J. Environ. Eng. Sci.*, **2005**, *4*(S1), pp. S19-S26.
7. Sharpless, C.M.; Seibold, D.A.*; Linden, K.G., "Nitrate photosensitized degradation of atrazine during UV water treatment," *Aquat. Sci.*, **2003**, *65*, pp. 359-366.
8. Sharpless, C.M.; Page, M.A.*; Linden, K.G., "Impact of hydrogen peroxide on nitrite formation during UV disinfection," *Water Res.*, **2003**, *37*, pp. 4730-4736.
9. Sharpless, C.M.; Linden, K.G., "Experimental and model comparisons of low- and medium-pressure Hg lamps for the direct and H₂O₂ assisted UV photodegradation of N-nitrosodimethylamine in drinking water," *Environ. Sci. Technol.*, **2003**, *37*, pp. 1933-1940.
10. Liu, W; Andrews, S.A.; ; Bolton, J.R.; Linden, K.G; Sharpless, C.M.; Stefan, M.I., "Comparison of disinfection byproduct (DBP) formation from different UV technologies at the bench-scale," *Water Sci. Technol.: Water Supp.*, **2002**, *2*(5/6), pp. 515-521.
11. Magnuson, M.L.; Kelty, C.A.; Sharpless, C.M.; Linden, K.G.; Fromme, W.; Metz, D.; Kashinkunti, R., "Effect of UV irradiation on Ohio River natural organic matter studied through the use of electrospray mass spectrometry," *Environ. Sci. Technol.*, **2002**, *36*, pp. 5252-5260.
12. Sharpless, C.M.; Linden, K.G., "UV photolysis of nitrate: effects of natural organic matter and dissolved inorganic carbon and implications for UV water disinfection," *Environ. Sci. Technol.*, **2001**, *35*, pp. 2949-2955.
13. Sharpless, C.M.; McGown, L.B., "Effects of aluminum induced aggregation on the fluorescence of humic substances," *Environ. Sci. Technol.*, **1999**, *33*, pp. 3264-3270.
14. Rosen, D.L.; Sharpless, C.M.; McGown, L.B., "Bacterial spore detection and determination by use of terbium dipicolinate photoluminescence," *Anal. Chem.*, **1997**, *69*, pp. 1082-1085.

Articles

1. Sharpless, C.M., "Weighted Fluence-Based Parameters for Assessing UV and UV/H₂O₂ Performance and Transferring Bench-Scale Results to Full-Scale Water Treatment Reactor Models," *International Ultraviolet Association News*, **2005**, *7*(3), 13-19.

Conference Proceedings and Reports (* denotes undergraduate researchers)

- (2008) Plata, D.; Sharpless, C.M.; Reddy, C.M. "Photochemical degradation of polycyclic aromatic hydrocarbons in oil films," Abstracts of papers of the American Chemical Society, 236: ENVR-102.
- (2008) Carfagno, A.*; Sharpless, C.M. "Predicting NOM Photosensitized Reaction Rates Using Spectroscopic Correlations," Abstracts of papers of the American Chemical Society, 236: ENVR-75.
- (2007) Dalrymple, R.*; Carfagno, A.*; Sharpless, C.M. "Spectroscopic Correlations Involving Humic Substance Photochemical Reaction Rates," Abstracts of papers of the American Chemical Society, 234: ENVR-164.

- (2006) Ijpelaar, G.; Harmsen, D.; Sharpless, C.M.; Linden, K.G.; Kruithof, J.C. "Fluence Monitoring in UV Disinfection Systems: Development of a Fluence Meter," Final Report, AwwaRF Project #2949; American Water Works Association Research Foundation, Denver, CO.
- (2005) Shemer, Hilla; Sharpless, Charles M.; Suffet, I. H.; Elovitz, Michael S.; Linden, Karl G. "Relative reactivity of contaminant candidate list pesticides to OH radical oxidation," Proceedings, Water Quality Technology Conference and Exposition, American Water Works Association, Québec City, Québec, Canada.
- (2005) Sharpless, C.M.; Cho, K.-D.; Linden, K.G.; Ijpelaar, G.; Harmsen, D. "Development of an Online Dosimeter," Proceedings, Water Quality and Technology Conference, American Water Works Association, Québec City, Québec, Canada.
- (2005) Schaefer, R.; Grapperhaus, M.; Linden, K.; Sharpless, C.M. "Innovative Disinfection and Contaminant Degradation in Water Using Sparker Technology," Proceedings American Water Works Association Annual Meeting, San Francisco.
- (2004) Chen, W.R.; Sharpless, C.M.; Linden, K.G.; Suffet, I.H. "Kinetic studies of volatile organic chemicals on the EPA contaminant candidate list by advanced oxidation processes," Abstracts of papers of the American Chemical Society, 228: ENVR-055.
- (2003) Linden, K.G.; Sharpless, C.M.; Andrews, S.A.; Atasi, K.Z.; Koratgere, V.; Stefan, M.I.; Suffet, I.H. (Mel) "Innovative UV Technologies to Oxidize Organic and Organoleptic Chemicals," Final Report, AwwaRF Project #2599; American Water Works Association Research Foundation, Denver, CO.
- (2003) Sharpless, C.M.; Linden, K.G.; Siddqi, M.; Atasi, K. "UV Treatment of Atrazine: Effect of Water Quality," Proceedings, Water Quality and Technology Conference, American Water Works Association, Philadelphia, PA.
- (2003) Chen, W.R.; Sharpless C.; Linden, K.G.; Suffet, I. H. (Mel) "Treatment of Volatile Organic Chemicals (VOCs) on the EPA Contaminant Candidate List Using Ozonation," Proceedings, 16th World Congress of the International Ozone Association, Las Vegas, NV.
- (2003) Chen, W.R.; Sharpless C.; Linden, K.G.; Suffet, I. H. (Mel) "Treatment of Organophosphate Pesticides on the EPA Contaminant Candidate List Using Ozonation," Proceedings, 16th World Congress of the International Ozone Association, Las Vegas, NV.
- (2003) Sharpless, C.M.; Seibold, D.A.*; Linden, K.G. "Nitrate Photosensitized Degradation of Atrazine During UV Water Treatment," Abstracts of papers of the American Chemical Society, 225: ENVR-008.
- (2003) Sharpless, C.M.; Linden, K.G.; Neofotistos, P. "Spectral Distribution of UV Light During Aging of Medium Pressure UV Lamps," Proceedings International Ultraviolet Association, 2nd Annual Congress, Vienna, Austria.
- (2002) Liu, W; Andrews, S.A.; Sharpless, C.M.; Stefan, M.I.; Linden, K.G.; Bolton, J.R. "Bench-Scale Investigations into Comparative Evaluation of DBP Formation from Different UV/H₂O₂ Technologies," Proceedings Water Quality and Technology Conference, American Water Works Association, Seattle, WA.
- (2001) Sharpless, C.M.; Chou, C.I.; Mofidi, A.A.; Linden, K.G. "N-Nitrosodimethylamine Removal From Drinking Water By UV-Treatment: A Direct Comparison of Different UV Technologies," Proceedings Water Quality and Technology Conference, American Water Works Association, Nashville, TN.
- (2001) Stefan, M.I.; Sharpless, C.; Linden, K.G.; Bolton, J.R. "Degradation of Atrazine in a Bench-scale Collimated Beam Apparatus using Low- and Medium-Pressure UV Lamps,"

Proceedings Water Quality and Technology Conference, American Water Works Association, Nashville, TN.

- (2001) Sharpless, C.M.; Bastow, T.L.*; Linden, K.G. "Nitrite Production During Polychromatic UV Disinfection Of Drinking Water: Effect of pH And Natural Organic Matter," Proceedings American Water Works Association Annual Meeting, Washington, DC.
- (2001) Sharpless, C.M.; Linden, K.G. "A Comparison Of Monochromatic Versus Polychromatic Hg Lamps For Direct Photolysis and H₂O₂ Assisted UV Degradation Of N-Nitrosodimethylamine," Proceedings International Ultraviolet Association, 1st Annual Congress, Washington, DC.
- (1998) Christman, R.F; Shi, J.; Wagoner, D.; Sharpless, C.; Fischer, E.; Schubach, J., "A New Method For Characterizing Aquatic Organic Matter," Report No. 319 (November 1998) North Carolina Water Resources Research Institute.

Invited Presentations

- (2008) "Photochemical Processing of Environmental Pollutants: Predicting Rates in Aqueous and Non-aqueous Systems," Seminar Series, Department of Chemistry, University of Maryland, College Park.
- (2005) "Experimental and Modeling Approaches to Assess UV based AOPs for Water Treatment," Plenary presentation, 3rd Annual International Ultraviolet Association Congress, Whistler, Canada.
- (2003) "Kinetic Screening of Candidate Contaminant List (CCL) Chemicals for Treatment by Advanced Oxidation Processes," Water Quality and Technology Conference, American Water Works Association, Philadelphia, PA.
- (2002) "UV-Based Oxidation of Water Contaminants" Plenary Lecture, First Asia Regional Conference on Ultraviolet Technologies for Water, Wastewater & Environmental Applications, Singapore.
- (2002) "UV Driven Processes for Destroying Water Contaminants" North Carolina Drinking Water Research Center Symposium, University of North Carolina at Chapel Hill.
- (1997) "Fluorescence Spectroscopy of Humic Substances" School of Public Health, University of North Carolina at Chapel Hill.

Other Presentations and Posters (* denotes undergraduate researchers)

- (2009) Williams, J.S.* and Sharpless, C.M. "Exploring direct photolysis mechanisms of PAHs in nonpolar solvents," Poster (CHED-195), 238th Annual Meeting of the American Chemical Society, Washington, DC, August, 2009.
- (2009) Kamptner, E.*; Whipkey, C.; Sharpless, C. "Soils at bridges and roadways as possible sources of polychlorinated biphenyls (PCBs) to Lake Anna waters and sediments," Poster presented at the of the Geological Society of America, Northeastern Section, Portland, Maine, March 22-24, 2009.
- (2008) Carfagno, A.K.* and Sharpless, C.M. "Investigating the basis of natural organic matter photochemistry," Annual meeting of the Virginia Academy of Science, Newport, VA, May 27-29, 2008.
- (2008) Carfagno, A.K.* and Sharpless, C.M. "Investigating the basis of natural organic matter photochemistry," Poster presented at the Virginia Section of the American Chemical Society meeting, University of Virginia, Charlottesville, April 18th, 2008.
- (2008) Pinney, J.*; Shapiro, R.*; Sharpless, C.; Kisila, B.O. "The effect of land use on the nutrients and organic contaminants in the water and sediment of the Rappahannock River," Poster presented at the 57th annual meeting of the Geological Society of America, Southeastern Section, Charlotte, NC, April 10-11, 2008.

- (2007) Dalrymple, R.M.* and Sharpless, C.M. "Relating the Photochemistry of Humic Substances to Their Spectroscopic and Electrochemical Properties" Annual meeting of the Virginia Academy of Science, Harrisonburg, VA, May 24-26, 2007.
- (2006) Studer, K.E.* and Sharpless, C.M. "Direct UV Photolysis and Advanced Oxidation of Estrone with Byproduct Formation" Annual meeting of the Virginia Academy of Science, Blacksburg, VA, May 24-26, 2006.
- (2006) Dalrymple, R.M.* and Sharpless, C.M. "Predicting the Singlet Oxygen Quantum Yield of Humic Substances from Spectroscopic Properties" Annual meeting of the Virginia Academy of Science, Blacksburg, VA, May 24-26, 2006.
- (2006) McKay, J.M.* and Sharpless, C.M. "Synthesis and Characterization of Peroxynitrite Preparations for Photochemical Studies" Poster presented at the annual meeting of the Virginia Academy of Science. Blacksburg, VA, May 24-26, 2006.
- (2005) Walsh, P.* and Sharpless, C.M. "Photochemistry of Humic Substances: Singlet Oxygen Quantum Yield" Poster presented at the Virginia Section of the American Chemical Society meeting, University of Virginia, Charlottesville, April 21st, 2005.
- (2000) Linda B. McGown, Charles M. Sharpless, Joseph D. Hewitt "Fluorescence Spectral Characterization of Humic Substances and the Effects of Metal Cations," 46th International Conference on Analytical Sciences and Spectroscopy (ICASS) Meeting, Winnipeg, Canada.
- (1999) "Relationship of Humic Acid Physical Properties to Their Fluorescence Spectra: Implications for the Study of Metal Complexation by Natural Organic Ligands," Duke University Integrated Toxicology Program Seminar Series.
- (1995) Sharpless, C.M.; McGown, L.B., "Effects of Metal Induced Aggregation on Fluorescence Analysis of Metal Binding by Humic Materials," Poster, International Humic Substances Society Meeting, Georgia Tech., Atlanta, GA.
- (1995) Sharpless, C.M.; McGown, L.B., "Metal Induced Aggregation and Changes In Fluorescence Properties of a Commercial Humic Acid: How Are They Related?," Pittsburgh Conference on Analytical Chemistry, New Orleans, LA.
- (1994) Sharpless, C.M.; McGown, L.B., "Total Fluorescence Spectral and Lifetime Characterization of Aluminum Binding by a Commercial Humic Acid," Rocky Mountain Conference on Analytical Chemistry, Denver, CO.

Honors Thesis and Dissertation Committee Service

- Zachary Detweiler, Honors Thesis in Chemistry (UMW), anticipated 2010.
- Erika Kamptner, Honors Thesis in Earth & Environmental Science (UMW), 2009.
- Paul Walsh, Honors Thesis in Chemistry (UMW), 2007.
- Hadas Mamane-Gravetz, Ph.D. in Environmental Engineering (Duke University), 2005.
- Erik Rosenfeldt, M.S. in Environmental Engineering (Duke University), 2003.

University and Departmental Service

- 2006-present Faculty Senator for the chemistry department, University of Mary Washington
- 2005-present Outcomes Assessment Coordinator, Chemistry Dept., University of Mary Washington
- 2005-present Assistant Webmaster, Chemistry Dept., University of Mary Washington
- 2007-2009 First-Year Advisor, University of Mary Washington
- 2006-2009 Faculty Budget Committee (secretary, '07-'09), University of Mary Washington
- 2005-2006 Secretary, Bachelor of Liberal Studies Committee, University of Mary Washington

Community Service

- 2009 Outreach, Colonial Forge High School Environmental Club biodiesel project
2006-present Youth Soccer Coach, Fredericksburg Parks & Recreation
Fall 2001 Volunteer fundraiser, Durham Rape Crisis Center
1995-1997 Homebrewing section manager, Durham Food Co-Op

External Research Funding

Probing the Mechanism of Singlet Oxygen Production by Natural Organic Matter (*Virginia Academy of Science Gwathmey Chemistry Award*); Budget: \$9,810 (5/09-12/10).

Probing the Origins of Natural Organic Matter Photochemistry Using Spectroscopic and Electrochemical Approaches (*Research Corporation*); Budget: \$25,460 (5/07-12/09).

Photochemistry of Natural Organic Matter in the Rappahannock River (*Virginia Academy of Science Small Project Research Funds*); Budget: \$1,000 (10/06-12/07).

UV Water Treatment with Surface Discharge UV Lamps (*NSF, SBI*); Budget: \$81,000 (6/03-5/04); R. Schaefer (PI), K.G. Linden and C.M. Sharpless (Co-PIs).

Development of an On-Line Fluencemeter (*Kiwa Research and Consultancy & AWWA Research Foundation*); Budget: \$80,000 (5/03-5/04); K.G. Linden (PI), C.M. Sharpless (Co-PI).

Advanced Oxidation Processes for the Treatment of Candidate Contaminant List (CCL) Chemicals (*US EPA*); Budget: \$300,000 (10/01 - 10/04); K.G. Linden (PI), C.M. Sharpless and I.H. Suffet (Co-PIs).

Internal Research Funding: UMW Undergraduate Research Awards (total, \$19,450).

- 2009 *Comparative analysis of capsaicin in chili peppers using HPLC*, E. Lynch (sophomore).
- 2008 *Soils at bridges and roadways as possible sources of polychlorinated biphenyls (PCBs) to Lake Anna waters and sediments*, E. Kamptner (senior).
Examining the role of oxygen during photolysis of polycyclic aromatic hydrocarbons in nonpolar solvents, J. Williams (sophomore).
The effect of land use on the nutrients and organic contaminants in the water and sediment of the Rappahannock River, J. Pinney (junior) and R. Shapiro (sophomore).
- 2006 *Relating the photochemistry of humic substances to their spectroscopic and electrochemical properties*, R. Dalrymple (senior).
Examining the environmental photochemistry of biodiesel, D. Hilton (sophomore).
Water and sediment quality testing for the Rappahannock River basin, J. Brown (junior), K. Brown (senior), C. Funkey (senior), M. Slattery (junior).
- 2005 *Mineral-catalyzed degradation of hydroxynaphthoic acids: effect of natural organic matter*, R. Caylor (senior).
UV photolysis and advanced oxidation of estrone: reaction kinetics and byproduct formation, K. Studer (senior).
Predicting singlet oxygen quantum yields of humic substances from spectroscopic properties, R. Dalrymple (junior).
- 2004 *Relating humic substance photochemistry and structure*, P. Walsh (sophomore).
Photochemical alterations of mineral adsorbed humic substances, J. Leckey (junior).
Synthesis and photochemistry of peroxyxynitrite, J. McKay (junior).