Curriculum Vitae - Steven M. George

Professor, Dept. of Chemistry, University of Colorado, Boulder, CO. 80309

(303)-492-3398 Office; (303)-492-5894 FAX; Steven.George@Colorado.Edu Email
https://www.colorado.edu/lab/georgegroup/ Research Group Website

Education:

- University of California, Berkeley, Calif.; Ph.D. in Chemistry, March 1983; Thesis: "Picosecond Studies of Vibrational Linewidth Broadening in Liquids".
- Yale University, New Haven, Conn.; B.S. in Chemistry with highest honors, May 1977.
- Phillips Exeter Academy, Exeter N.H.; Graduated with high honors, June 1973.

Professional Experience:

- Professor, Dept. of Chemistry, Univ. of Colorado, Boulder, Colorado, July 2018- Present.
- Professor, Dept. of Mechanical Engineering, Univ. of Colorado, Boulder, Colorado, July 2013- August 2018.
- Professor, Dept. of Chemical and Biological Engineering, Univ. of Colorado, Boulder, Colorado, August 2001-June 2013.
- Professor, Dept. of Chemistry and Biochemistry, Univ. of Colorado, Boulder, Colorado, Sept. 1995- June 2018.
- Associate Professor, Dept. of Chemistry and Biochemistry, Univ. of Colorado, Boulder, Colorado, Jan. 1992- August 1995.
- Assistant Professor, Dept. of Chemistry, Stanford University, Stanford, Calif., Fall 1984 - Dec. 1991.
- Visiting Scientist: Exxon Corporate Research, Laboratories, Linden, N.J., Summer 1983 - Fall 1984.
- Bantrell Post-doctoral Research Fellow: Chemistry Dept., Calif. Inst. of Technology, Spring 1983 - Fall 1984.

Current and Past Professional Activities:

- Co-Chair, Workshop on Atomic Layer Etching (ALE2023) held in conjunction with ALD2023.
- Steering Committee, AVS Conference on Atomic Layer Deposition, 2002-Present.
- Steering Committee, AVS Workshop on Atomic Layer Etching, 2016-Present.
- Co-Chair, Workshop on Atomic Layer Etching (ALE2017) held in conjunction with ALD2017.
- Member, Plasma Science & Technology Division Program Committee of American Vacuum Society, October 2016-Present.
- Member, Conference Committee for American Vacuum Society Topical Conference on Atomic Layer Deposition 2002-present.
- Member, Thin Film Division Program Committee of American Vacuum Society, October 1999-Present.
- Past-President, American Vacuum Society, January 2015-December 2015.
- President, American Vacuum Society, January 2014-December 2014.

- President-Elect, American Vacuum Society, January 2013-December 2013.
- Chair, DARPA Workshop on "Future of Atomic Layer Deposition", April 20-21, 2013, Chicago, Illinois.
- Co-Chair, New Industrial Chemistry and Engineering (NIChE) Workshop on "Barrier Technologies", Council for Chemical Research, September 19-20, 2012, Arlington, Virginia.
- Board of Directors, American Vacuum Society, January 2010-December 2012.
- Chair of the Trustees, American Vacuum Society, January-December 2009.
- Trustee, American Vacuum Society, January 2007-December 2009.
- Member, Board of Editors, Surface Review and Letters, January 1998-December 2010.
- Member, Thin Film Division Executive Committee, American Vacuum Society, January 2007-December 2008.
- Chair, International Symposium of the American Vacuum Society, October 30-November 4, 2005, Boston, Massachusetts
- Co-Founder, ALD NanoSolutions, Fall 2001. Member of Scientific Advisory Board, 2002-Present.
- Chair, American Vacuum Society Topical Conference on Atomic Layer Deposition (ALD2001), May 14-15, 2001, Monterey, California.
- Chair, Thin Film Division of the American Vacuum Society, January - December 2002.
- Vice Chair, Thin Film Division of the American Vacuum Society, January - December 2001.
- Member, Board of Assessment of NIST Programs, Panel for Chemical Science and Technology, National Research Council, January 1993-December 1998.
- Co-Chair, Gordon Research Conference on Electronic Materials: Chemistry, Excitations and Processing, July 6-10, 1997 in New Hampshire.
- Member, Executive Committee of Electronic Materials and Processing Division, American Vacuum Society, January 1996-December 1997.
- Co-Chair, Symposium on Environmental Heterogeneous Processes, American Chemical Society National Meeting, New Orleans, LA, March 24-28, 1996.
- Guest Editor, Thematic Issue on Heterogeneous Catalysis, Chemical Reviews, May 1995.
- Chair, Microphysics of Surfaces: Nanoscale Processing, Topical Meeting of the Optical Society of America, Sante Fe, NM, Feb. 9-11, 1995.
- Associate Editor, Chemical Reviews, July 1992- Dec. 1994.
- Member, National Materials Advisory Board Committee on New Currency Design: Counterfeit Deterrent Features for the Next Generation, June 1992-May 1994.
- Alumni Member, Defense Science Study Group, Institute for Defense Analysis, Alexandria, Virginia, Fall 1991- Present.
- Member, Defense Science Study Group, Institute for Defense Analysis, Alexandria, Virginia, Spring 1989- Fall 1991.

Fellowships and Awards:

John A. Thornton Memorial Award from AVS, October 2017
ALD Innovation Award, AVS International Conference on Atomic Layer Deposition, July 2013
Faculty Research Award from College of Engineering and Applied Science, University of Colorado at Boulder, 2006
University of Colorado at Boulder Faculty Assembly Excellence in Research, Scholarly, and Creative Work Award, 2006

American Chemical Society Colorado Section Award, 2004
R&D 100 Award for *Particle-ALD*™ , 2004
Inventor of the Year, University of Colorado at Boulder, 2004
National Science Foundation Creativity Award, 2002-2004
Fellow, American Vacuum Society, 2000
Fellow, American Physical Society, 1997
Presidential Young Investigator Award, 1988-1993
Alfred P. Sloan Foundation Fellow, 1988
IBM Faculty Development Award, 1988
Dupont Young Faculty Awardee, 1988
Dreyfus Award for Newly Appointed Faculty in Chemistry, 1985
AT&T New Faculty Award, 1985
Bantrell Post-doctoral Research Fellow, Spring 1983-Fall 1984

Affiliations:
American Vacuum Society; American Chemical Society; American Physical Society; Electrochemical Society, Materials Research Society.

Brief Biographical Sketch

Prof. Steven M. George is Professor in the Dept. of Chemistry at the University of Colorado at Boulder. Dr. George received his B.S. in Chemistry from Yale University (1977) and his Ph.D. in Chemistry from the University of California at Berkeley (1983). Dr. George has more than 450 publications in the areas of thin film growth and etching, surface science, and physical chemistry. He has over 36,000 total citations and his H-index is 95 (February 2024). In addition, he currently has 28 issued U.S. or PCT patents and 3 U.S. patent applications undergoing review. Dr. George's research interests are in the areas of surface chemistry, thin film growth and etching and nanostructure engineering. He is directing a research effort focusing on atomic layer deposition (ALD), molecular layer deposition (MLD) and atomic layer etching (ALE). This research is examining new surface chemistry, measuring thin film growth and etching rates, characterizing the properties of films and developing new reactors for ALD, MLD and ALE. Dr. George chaired the first Topical Conference on Atomic Layer Deposition (ALD2001) in May 2001. He has been on the Conference Committees of all subsequent ALD meetings. He also co-chaired the Workshop on ALE (ALE2017) that was held in conjunction with ALD2017. He is currently co-chairing the Workshop on ALE (ALE2023) that will be held in conjunction with ALD2023. Dr. George also teaches one-day short courses on both ALD and ALE for the American Vacuum Society (AVS). Dr. George is very active in the AVS. He was a Trustee of the AVS (2007-2009) and Chair of the Trustees (2009). In addition, he was on the Board of Directors of the AVS (2010-2012). He also served as President-Elect of AVS (2013), President of AVS (2014) and Past-President of AVS (2015). Dr. George is a Fellow of the AVS (2000) and the APS (1997). Dr. George has received a number of awards including the *John A. Thornton Memorial Award* from the AVS (2017), *ALD Innovation Award* from the AVS International Conference on Atomic Layer Deposition (2013), an R&D 100 Award for *Particle-ALD*™ (2004), an NSF Creativity Award (2002-2004), an NSF Presidential Young Investigator Award (1988-1993), and an Alfred P. Sloan Foundation Fellowship (1988). He is also a co-founder of ALD NanoSolutions, Inc., a company that is working to commercialize ALD technology. ALD NanoSolutions merged with Forge Nano in February 2020.

PUBLICATIONS - Steven M. George

1. C.R. Dickson, S.M. George and R.N. Zare, "Determination of Absolute Photon Yields Under Single-Collision Conditions," *J. Chem. Phys*. **67**, 1024-1030 (1977).

2. S.D. Colson, S.M. George, T. Keyes and V. Vaida, "Singlet and Triplet Exciton Percolation in Benzene Isotopic Mixed Crystals," *J. Chem. Phys*. **67**, 4941-4947 (1977).

3. J.H. Richardson and S.M. George, "Comparison of Different Experimental Configurations in Pulsed Laser Induced Molecular Fluorescence," *Anal. Chem*. **50**, 616-620 (1978).

4. J.H. Richardson, S.M. George, J.E. Harrar and S.P. Perone, "Laser Induced Photoelectrochemistry. Dependence of Photoemission-Related Currents on Laser Characteristics," *J. Phys. Chem*. **82**, 1818-1827 (1978).

5. S.P. Perone, J.H. Richardson, B.S. Shepard, J. Rosenthal, J.E. Harrar and S.M. George, "Laser Applications in Photoelectrochemistry," in *New Applications of Lasers to Chemistry*, ed. by G.M. Hieftje. ACS Symposium Series Vol. 85 (American Chemical Society, Washington, D.C., 1978) p. 126-170.

6. J.H. Richardson, S.M. George and M.E. Ando, "Sub-Part-Per-Trillion Detection of Organics in Aqueous Solution by Laser Induced Molecular Fluorescence," in *Trace Organic Analysis: A New Frontier in Analytical Chemistry*, National Bureau of Standards Special Publication 519 (National Bureau of Standards, Washington, D.C., 1979) p. 691-696.

7. C.B. Harris, H. Auweter and S.M. George, "Critical Test of Vibrational Dephasing Theories in Liquids by Use of Selective, Coherent, Picosecond Stokes Scattering," *Phys. Rev. Lett*. **44**, 737-740 (1980).

8. C.B. Harris, H. Auweter and S.M. George, "The Dynamics and Structure of Liquids Revealed by the Homogeneous and Inhomogeneous Broadening of Liquid Vibrational Transitions," in *Picosecond Phenomena II*, Vol. 14, Springer Series Chem. Phys., ed. by R. Hochstrasser, W. Kaiser and C.V. Shank (Springer-Verlag, Berlin, 1980) p. 151-155.

9. S.M. George, H. Auweter and C.B. Harris, "Inhomogeneous Broadening of Vibrational Linewidths in Polyatomic Liquids," *J. Chem. Phys*. **73**, 5573-5583 (1980).

10. S.M. George and C.B. Harris, "Passively Mode-Locked Nd:Glass Laser Oscillator Optimized for TEM-00 Selectivity and Long Term Stability and Reliability," *Rev. Sci. Instrum*. **52**, 852-857 (1981).

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13. S.M. George, A.L. Harris, M. Berg and C.B. Harris, "The Temperature Dependence of Homogeneous and Inhomogeneous Vibrational Linewidth Broadening Studied Using Coherent Picosecond Stokes Scattering," in *Picosecond Phenomena III*, Vol. 23, Springer Series Chem. Phys. by K.B. Eisenthal, R.M. Hochstrasser, W. Kaiser and A. Laubereau (Springer-Verlag, Berlin, 1982) p. 196-200.

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15. D. Ben-Amotz, S.M. George and C.B. Harris, "Transient Stimulated Raman Scattering in High Laser Depletion and its Effects on Vibrational Dynamics Experiments," *Chem. Phys. Lett.* **97**, 533-537 (1983).

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20. J.L. Brand and S.M. George, "Effects of Laser Pulse Characteristics and Thermal Desorption Parameters on Laser Induced Thermal Desorption," *Surf. Sci*. **167**, 341-362 (1986).

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47. N.J. Tro, D.A. Arthur and S.M. George, "Infrared Resonant Desorption of Butane from Al_20_3(1120): Evidence for an Ordered Adlayer from Vibrational Mode Selectivity," *J. Chem. Phys*. **90**, 3389-3395 (1989).

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