PROFESSOR MICHAEL JOSEPH SAILOR

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Education:

1988-90 Post-doctoral associate, Stanford University and The California Institute of Technology. Directed by Prof. Nathan S. Lewis. Investigated semiconductor/polymer interfaces.

1983-88 Ph.D. in Inorganic Chemistry, Northwestern University, Evanston, IL. Directed by Prof. Duward F. Shriver. Thesis: *"Characterization and Reactivity of the CCO Ligand in Trinuclear Ruthenium Carbonyl Clusters"*

1979-83 B.S. in Chemistry, Harvey Mudd College

Appointments:

1996-present Professor, Department of Chemistry and Biochemistry, University of California, San Diego

2012 Invited Professor, Associate Researcher, CNRS Institut Charles Gerhardt, Montpellier, France

2008-present Affiliate Professor, Department of Bioengineering, University of California, San Diego

2008-present Affiliate Professor, Department of Nanoengineering, University of California, San Diego

2006-present Member, Moores Cancer Center at the University of California, San Diego

1994-96 Associate Professor, Department of Chemistry and Biochemistry, University of California, San Diego

1990-94 Assistant Professor, Department of Chemistry and Biochemistry, University of California, San Diego

Advisory Boards:

Editorial Advisory Boards: *ACS Nano* (2011-present); *Advanced Healthcare Materials* (2011-present); *Advanced Materials* (1993-present); *JCS Chemical Communications* (2005-2012); *Analytical Chemistry* (2007-2009); *Nanotechnology Newsletter* (2002-2008)

Editorial Boards: *Molecular Cancer Therapeutics* (2013-present)

Executive Committees: Sensor Division, The Electrochemical Society, inc. (2004-present); Materials Science Ph.D. program, the University of California, San Diego (1994-present)

External Advisory Committees: Program of Excellence in Nanotechnology, Mount Sinai School of Medicine (2010-present); Michigan Nanotechnology Institute for Medicine and Biological Sciences, MNIMBS (2006-2013), Doris A. Howell Foundation (2013-present)

Scientific Advisory Boards: United States Air Force (2006-2010); *Earth and Sky* (2004-present); NanoTechNexus (2009-present); Protein Discovery, inc. (2003-2007); NanoBioNexus (2003-2009); Iatroquest, inc. (2004-2005); Qgenics, inc. (2002-2003); Spinnaker Biosciences, inc. (2010-present); Illumina, inc. (1998-2000); TruTags, inc. (2011-present); Silicium Energy, inc. (2012-present); Pacific Integrated Energy, inc. (2012-present).

Service and Activities:

2014 Visiting Committee, Review of the UCSB Materials Science Department

2010-present CT2 Moores Cancer Center External Advisory Committee

2008-present	Member, San Diego Science Festival "Nifty Fifty" Science Educators Series
2006-present	Conference Co-Chair, Porous Semiconductors Science and Technology (PSST) international conference.
2005-2009	Executive Committee, University of California Toxic Substances Research and Teaching Program
1998-present	International Advisory Board, Porous Semiconductors Science and Technology (PSST) international conference
2002	Organizing committee, "Challenges for the Chemical Sciences in the 21st Century: Homeland Defense and National Security." Workshop Sponsored by the National Research Council.
2001	Member, Technical Advisory Panel, Chemical and Biological Agent Resistance Test (CBART) Working Group
2000	Organizer, Army Workshop on CBW Agent Water Monitors
2000	Participant, COSEPUP focus group on Department of Defense (DOD) adherence to the Government Performance and Results Act (GPRA)
1999-2000	Review panelist, DOD Technology Area Review and Assessment (TARA) on Chemical and Biological Warfare defense
1997-99	Defense Sciences Study Group Member (DSSG)

Awards and Honors:

2013	Chancellor's Award for Postdoctoral Scholar Mentoring, UC San Diego
2013	Outstanding Alumnus Award, Harvey Mudd College
2012	Elected Fellow, American Association for the Advancement of Science
2011	"Best of Green: Science and Technology" award from *Treehugger—A Discovery Company*.
2010	Meritorious Civilian Service Award, United States Air Force
2010	Leslie E. Orgel Scholar in Inorganic Chemistry, UCSD
2008	J. Clarence Karcher Medal, University of Oklahoma
2007	Best Scientific Advance of 2007, PETA "Proggy" Progress Award
2006	"Bronze Phantom Award" recipient from the Boeing Company, Phantom Works Division
2004	Outstanding Faculty Mentor in the Sciences and Engineering, UC San Diego Faculty Mentor Program
2004	Lipscomb Lecturer, University of South Carolina
2003	Grand Prize, National Inventors Hall of Fame Collegiate Inventors Competition (shared with graduate student Jamie R. Link)
2003	63rd Frontiers In Chemistry Distinguished Lecturer, Case Western Reserve University
2002	Max T. Rogers Distinguished Lecturer, Michigan State University
2002	"The Best of What's New" general technology award winner, Popular Science Magazine
1999	Annual Award for Architectural Research, Architecture® Magazine
1995	University of California Presidential Award for Excellence in Undergraduate Research
1994-95	Alfred P. Sloan Foundation Fellow
1994-95	Camille Dreyfus Foundation Teacher-Scholar Award
1993-98	National Science Foundation Young Investigator Award
1993-94	Arnold and Mabel Beckman Foundation Young Investigator Award
1983	ARCO Fellow, Northwestern University

Biographical Information--Michael J. Sailor, Ph.D.

Michael J. Sailor is a Professor of Chemistry and Biochemistry and the Leslie Orgel Scholar at the University of California, San Diego. He holds Affiliate appointments in the Department of Bioengineering, the Department of Nanoengineering, and the Materials Science and Engineering program at UCSD. Sailor received a B.S. degree in Chemistry from Harvey Mudd College (Claremont, CA), and M.S. and Ph.D. degrees in Chemistry from Northwestern University (Chicago). In 1990 he joined the faculty in the Department of Chemistry and Biochemistry at the University of California, San Diego, after post-doctoral studies at Stanford and the California Institute of Technology. He was promoted to Associate Professor in 1994, and to Full Professor in 1996. He has supervised more than 150 undergraduate, graduate, and post-doctoral students at UC San Diego. He is the author of more than 190 research publications, one book, and 27 patents. He has founded three companies and serves/has served on the scientific advisory boards of six others.

Research Interests

Professor Sailor's research focuses on nanotechnology, with emphasis on biomaterials, drug delivery, and environmental sensing applications. He is an expert in the chemistry, electrochemistry, and optical properties of nanomaterials, in particular porous silicon-based systems.

20 SELECTED LEADING PUBLICATIONS-ANNOTATED

1. Heinrich, J.L., Curtis, C.L., Credo, G.M., Kavanagh, K.L., and Sailor, M.J., "Luminescent colloidal Si suspensions from porous Si." *Science*, **1992**. 255: p. 66-8. *First report of micro-and nano-particles prepared from porous Si. The ultrasound method described here is still the leading means to prepare particles of electrochemically etched porous Si.*
2. Lauerhaas, J.M., Credo, G.M., Heinrich, J.L., and Sailor, M.J., "Reversible Luminescence Quenching of Porous Si by Solvents." J. Am. Chem. Soc., **1992**. 114: p. 1911-2. *First report of photoluminescence quenching of porous Si by molecular adsorbates.*
3. Curtis, C.L., Doan, V.V., Credo, G.M., and Sailor, M.J., "Observation of Optical Cavity Modes in Photoluminescent Porous Silicon Films." J. Electrochem. Soc., **1993**. 140(12): p. 3492-4. *First report showing the interference spectrum from a porous Si film as a means to detect chemicals.*
4. Green, W.H., Le, K.P., Grey, J., Au, T.T., and Sailor, M.J., "White Phosphors from a Silicate-Carboxylate Sol-Gel Precursor that Lack Metal Activator Ions." Science, **1997**. 276: p. 1826-8. *Reported the discovery of a non-aqueous sol-gel reaction that generates intrinsically luminescent Si oxide material.*
5. Lin, V.S.-Y., Motesharei, K., Dancil, K.S., Sailor, M.J., and Ghadiri, M.R., "A Porous Silicon-Based Optical Interferometric Biosensor." Science, **1997**. 278(5339): p. 840-3. *First porous Si biosensor paper. Showed the interference spectrum from a porous Si film can be used as a label-free biosensor. Licensed to Silicon Kinetics, inc., who has been marketing a porous Si-based biosensor since May, 2008.*
6. Sohn, H., Létant, S., Sailor, M.J., and Trogler, W.C., "Detection of fluorophosphonate chemical warfare agents by catalytic hydrolysis with a porous silicon interferometer." J.

Am. Chem. Soc., **2000**. 122: p. 5399-400. *Showed that catalytic reactions can be coupled to the optical response from porous Si to amplify detection of chemicals. First detection of a chemical warfare agent with porous Si.*

7. Colicos, M.A., Collins, B.E., Sailor, M.J., and Goda, Y., "Hippocampal synapse remodeling induced by photoconductive silicon stimulation." Cell, **2001**. 107(5): p. 605-16. *First example of photoelectrochemical stimulation of live cells using a photoconductive substrate (silicon) as a cellular host.*

8. Sohn, H., Calhoun, R.M., Sailor, M.J., and Trogler, W.C., "Detection of TNT and Picric Acid on Surfaces and in Seawater Using Photoluminescent Polysiloles." Angew. Chem. Int. Ed., **2001**. 40(11): p. 2104-5. *Discovery of the unexpected ability of photoluminescent silicon-based polymers to respond selectively to nitroaromatic molecules. Technology spawned the company RedXDefense.*

9. Cunin, F., Schmedake, T.A., Link, J.R., Li, Y.Y., Koh, J., Bhatia, S.N., and Sailor, M.J., "Biomolecular screening with encoded porous silicon photonic crystals." Nature Mater., **2002**. 1: p. 39-41. *First demonstration of the use of optical signatures etched into porous Si particles to act as encoding elements. Now referred to as "Spectral Barcodes." Technology licensed to TruTag, inc., marketed under the TruTag trademark (www.trutags.com) Technology also licensed to Minus9, inc. (www.minus9labs.com), marketed under the MINT trademark.*

10. Li, Y.Y., Cunin, F., Link, J.R., Gao, T., Betts, R.E., Reiver, S.H., Chin, V., Bhatia, S.N., and Sailor, M.J., "Polymer Replicas of Photonic Porous Silicon For Sensing and Drug Delivery Applications." *Science*, **2003**. *299* (5615), 2045-2047. *First demonstration of the use of porous Si as a template to generate nanostructured polymers. Technology licensed to Spinnaker Biosciences, inc.*

11. Link, J.R. and Sailor, M.J., "Smart Dust: Self-assembling, self-orienting photonic crystals of porous Si." Proc. Nat. Acad. Sci., **2003**. 100(19): p. 10607-10. *"Smart dust" paper illustrating the interplay of electrochemistry, chemistry, and optics to generate functional nanostructures.*

12. Pacholski, C., Sartor, M., Sailor, M.J., Cunin, F., and Miskelly, G.M., "Biosensing using porous silicon double-layer interferometers: reflective interferometric Fourier transform spectroscopy." J. Am. Chem. Soc., **2005**. 127(33): p. 11636-45. *Introduced the RIFTS technique as a nondestructive means of characterizing porous multilayers.*

13. Thomas, J. C.; Pacholski, C.; Sailor, M. J., Delivery of Nanogram Payloads Using Magnetic Porous Silicon Microcarriers. *Lab Chip* **2006**, *6*, (6), 782 - 787. *First paper incorporating magnetic nanoparticles and molecular payloads in a porous Si nanostructure.*

14. Park, J.-H.; Maltzahn, G. A. v.; Zhang, L.; Schwartz, M. P.; Bhatia, S. N.; Ruoslahti, E.; Sailor, M. J., "Magnetic Iron Oxide Nanoworms for Tumor Targeting and Imaging." *Adv. Mater.* **2008**, *20*, (9), 1630-1635. *Describes the first synthesis of worm-shaped iron oxide (magnetite) nanoparticles now known as "nanoworms". In a comparative study, shows that nanoworms display superior tumor targeting (both in vitro and in vivo) relative to the more well-known spherical iron oxide nanoparticles. Selected "Best work published in Advanced Materials in 2008" by the Editors.*

15. Park, J.-H.; Gu, L.; Maltzahn, G. v.; Ruoslahti, E.; Bhatia, S. N.; Sailor, M. J., "Biodegradable luminescent porous silicon nanoparticles for in vivo applications," *Nature Mater.* **2009**, *8*, 331-336. *First in-vivo use of intrinsically luminescent Si nanoparticles. Shows that 150 nm-scale porous Si nanoparticles overcome many of the disadvantages of smaller (< 6 nm) inorganic nanocrystals (CdSe, for example). This work is important for its low in vivo toxicity and its demonstration of in vivo imaging with an intrinsically luminescent Si nanocrystal. In 2012, it was selected by the editors of Nature Materials as one of the "landmark articles" published in the journal over the past ten years.*
16. Orosco, M. M.; Pacholski, C.; Sailor, M. J., "Real-time monitoring of enzyme activity in a mesoporous silicon double layer." *Nature Nanotech.* **2009**, *4*, 255 - 258. *Demonstrated immobilization of nanogram quantities of enzyme in a 5 nL volume, and showed that the optical response can be used to quantify enzyme kinetics. The importance of this work is it demonstrated a multifunctional nanostructure used to simultaneously separate and detect products of a biological reaction.*
17. Alvarez, S. D.; Li, C.-P.; Chiang, C. E.; Schuller, I. K.; Sailor, M. J., "A Label-Free Porous Alumina Interferometric Immunosensor." *ACS Nano* **2009,** *3* (10), 3301-3307. *First example of porous alumina used as a label-free optical biosensor.*
18. Andrew, J. S.; Anglin, E. J.; Wu, E. C.; Chen, M. Y.; Cheng, L.; Freeman, W. R.; Sailor, M. J., "Sustained Release of a Monoclonal Antibody from Electrochemically Prepared Mesoporous Silicon Oxide." *Adv. Funct. Mater.* **2010**, *20*, 4168–4174. *First demonstration of loading and controlled release of the antibody bevacizumab (Avastin) from a porous SiO_2 carrier. Bevacizumab is a common injectable therapeutic for cancer and for age related macular degeneration. Because of their large size and susceptibility to denaturation, antibodies have been difficult to formulate in most other controlled release drug delivery materials.*
19. Gu, L.; Ruff, L. E.; Qin, Z.; Corr, M.; Hedrick, S. M.; Sailor, M. J., "Multivalent Porous Silicon Nanoparticles Enhance the Immune Activation Potency of Agonistic CD40 Antibody." *Adv. Mater.* **2012**, *24*, 3981-3987. *First demonstration of immune system activation by porous Si nanoparticles. Showed the ability of porous Si nanoparticles to act as multivalent hosts to enhance the binding to, and activation of, immune b-cells.*
20. Gu, L.; Hall, D. J.; Qin, Z.; Anglin, E.; Joo, J.; Mooney, D. J.; Howell, S. B.; Sailor, M. J., "In vivo time-gated fluorescence imaging with biodegradable luminescent porous silicon nanoparticles." *Nature Comm*. **2013**, *4*, 2326. *First example of time-gated imaging of porous Si nanoparticles in-vivo. Demonstrates elimination of interfering light emission from organic chromophores and tissue autofluorescence*