

Mitchel J. Doktycz

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Education

University of Illinois	Biology and Chemistry	B.S., 1985
University of Illinois	Chemistry	M.S., 1987
University of Illinois	Chemistry	Ph.D., 1991

Professional Experience

2011 – Present	Inaugural Faculty, UT-ORNL Center for Interdisciplinary Research and Graduate Education
2006 – Present	R&D Staff, Center for Nanophase Materials Sciences, ORNL
2005 – Present	Distinguished Scientist and Leader, Biological and Nanoscale Systems Group
2002 – 2005	Research Staff, Condensed Matter Sciences Division, ORNL
2001 – 2005	Program Leader, Biomedical & Biophysics Programs, ORNL
1995 – Present	Adjunct Assistant Professor, Graduate Program in Genome Science and Technology, University of Tennessee–Knoxville.
1994 – Present	Research Staff, Biosciences Division, ORNL
1991 – 1994	Postdoctoral Fellow, Biology Division, ORNL

Professional and Synergistic Activities

1992 – Present	Member: American Association for the Advancement of Science and American Chemical Society
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Honors and Awards:

2008	Fellow of the American Institute for Medical and Biological Engineering 1987 Merit Award for Outstanding Teaching in Chemistry, University of Illinois
2004	Life Sciences Division Award for Scientific Achievement
2003	National Federal Laboratory Consortium Award for Excellence in Technology Transfer
2002	R&D 100 Award
2001	SE Region Federal Laboratory Consortium Award for Excellence in Technology Transfer
1997	Lockheed Martin Energy Research Publication Award
1990	Bernard Babler Award for Excellence in Teaching, University of Illinois

Publications

Full publication list follows CV.

Research Synopsis

M. J. Doktycz's research interests focus at the intersection of biological and nanoscale systems. His laboratory is involved in the development of analytical technologies for post-genomics studies with specific emphases on molecular and cellular imaging techniques and the use of nanomaterials to study and mimic biological systems.

1. *Cell Mimics* – Biological systems present the ideal paradigm for technologies that require the integration of multiple functions. In these efforts, advances in micro- and nanoscale fabrication are being exploited to build functional mimics of biological cells. These mimics replicate the volume and controlled material exchange that are characteristic of natural cells. Synthetic gene networks are encapsulated within these structures with the ultimate goal of realizing practical devices for industrial and biomedical applications.
2. *Biomineralization* – Biological systems are remarkable in their ability to produce inorganic materials with desired physical properties. Efforts are focused on understanding biological routes to mineralization as well as on the development of bioinspired approaches to nanomaterial fabrication. Micro- and nanoscale chemical patterning techniques are used to control the chemical and physical characteristics of mineralization interfaces. Objectives of these efforts are to gain insights into natural routes to mineralization and to realize practical applications of biomineralization technologies.
3. *Molecular and Cellular Imaging* – Advanced imaging techniques are being combined with surface modifications, microfluidics control, and electronic interfaces to create effective platforms for studying living systems. One key focus is the development of scanning probe microscopy based techniques to gain information about biological cells at the molecular and cellular levels.
4. *Genomics Science* – The advent of whole genome sequencing is revolutionizing our understanding of biological systems. A specific focus of our genomics science efforts is to characterize and interpret the dynamic interface that exists between plants, microbes, and their environment and to relate these functional events to genetic characteristics.

Graduate and Postdoctoral Advisors:

Graduate Advisor: A. S. Benight, Portland State University
Postdoctoral Advisor: K. B. Jacobson, ORNL (Retired)

Thesis Advisor and Postgraduate-Scholar Sponsor:

Current Students: S. Iyer, P. Siuti

Current Postdoctoral: A. Kumar

Publications

Mitchel J. Doktycz, Ph. D.

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Publications:

1. Siuti, P., Green, C., Edwards, A. N., Doktycz, M. J., Alexandre, G. (2011) "Nitrogen availability modulates surface attachment of *Azospirillum brasilense* while changes in adhesive cell surface properties regulated by the chemotaxis-like pathway Che1 have an indirect role", FEMS Microbiology Letters, in press.
2. Siuti, P., Retterer, S. T., Doktycz, M. J. (2011) "Continuous protein production in nanoporous, picoliter volume containers", Lab on a Chip, in press.
3. Suresh, A. K., Doktycz, M. J., Wang, W., Moon, J.-W., Gu, B., Meyer III, H. M., Hensley, D. K., Allison, D. P., Phelps, T. J., Pelletier, D. A. (2011) "Monodispersed Biocompatible Silver Sulfide Nanoparticles: Facile Extracellular Biofabrication using the γ -proteobacterium, *Shewanella oneidensis*", ActaBiomaterialia, in press.
4. Gittel, N.R., Castro, H. F., Kerley, M, Yang, Z., Pelletier, D. A., Podar, M., Karpinets, T., Uberbacher, E., Tuskan, G. A., Vilgalys, R., Doktycz, M. J., Schadt, C. W. (2011) "Populus deltoides roots harbor distinct microbial communities within the endosphere and rhizosphere across contrasting soil types", Applied and Environmental Microbiology, in press.
5. Kumar, A., Mortensen, N. P., Mukherjee, P., Retterer, S. T. and Doktycz, M. J. (2011) "Electric field induced bacterial flocculation of Enterococci Escherichia coli 042", Applied Physics Letters, 98, 253701.
6. Mortensen, N. P., Fowlkes, J. D., Maggert, M., Treviño-Dopatka, S., Boisen, N., Doktycz, M. J., Nataro, J. P., Allison, D. P. (2011) "Effects of sub-minimum inhibitory concentrations of ciprofloxacin on enterococci Escherichia coli and the role of the surface protein dispersin", International Journal of Antimicrobial Agents, 38(1), 27-34.
7. Karig, D. K., Siuti, P., Dar, R. D., Retterer, S. T., Doktycz, M. J., Simpson, M. L., (2011) "Model for biological communication in a nanofabricated cell-mimic driven by stochastic resonance" Nano Communication Networks, 2, 39–49.
8. Allison, D.P., Sullivan, C.J., Mortensen, N.P., Retterer, S. T., Doktycz, M.J. (2011) "Bacterial Immobilization for Imaging by Atomic Force Microscopy" JOVE, in press 12/24/10
9. Suresh, A. K., Pelletier, D. A., Wang, W., Broich, M. L., Moon, J.-W., Gu, B., Allison, D. P., Joy, D. C., Phelps, T. J., and Doktycz, M. J. (2011) "Biofabrication of discrete spherical gold nanoparticles using the metal-reducing bacterium, *Shewanella oneidensis*" ActaBiomaterialia, 7(5), 2148-2152.
10. Edwards, A. N., Siuti, P., Bible, A. N., Alexandre, G., Retterer, S. T., Doktycz, M. J., Morrell-Falvey, J. L. (2011) "Characterization of cell surface and EPS remodeling of *Azospirillum*

- brasile* chemotaxis-like 1 signal transduction pathway mutants by atomic force microscopy”, FEMS Microbiology Letters, 314 (2), 131-139.
11. Srijanto, B., Retterer, S., Fowlkes, J. D., Doktycz, M.J. (2010) “Nanostructured silicon membranes for control of molecular transport” J. Vac. Sci. Technol. B, 28 (6), C6P48-C6P52.
 12. Pelletier, D. P., Suresh, A. K., Holton, G. A., McKeown, C., Wang, W., Gu, B., Mortensen, N. P., Allison, D. P., Joy, D. C., Allison, M. R., Brown, S. D., Phelps, T. J., Doktycz, M. J. (2010) “Engineered cerium oxide nanoparticles: Effects on bacterial growth and viability” Applied and Environmental Microbiology, 76(24), 7981-7989.
 13. Allison, D. P., Mortensen, N. P., Sullivan, C. J., Doktycz M. J. (2010) “Atomic Force Microscopy of Biological Samples” Wiley Interdisciplinary Reviews: Nanomedicine and Nanobiotechnology, 2(6), 618-634.
 14. Wang, W., Howe, J. Y., Li, Y., Qui, X., Joy, D. C., Paranthaman, M. P., Doktycz, M. J., Gu, B. (2010) “A Surfactant and Template-Free Route for Synthesizing Ceria Nanocrystals with Tunable Morphologies” J. Mater. Chem., 20(36), 7776-7781.
 15. Choi, C.K., Fowlkes, J.D., Retterer, S.T., Siuti, P., Iyer, S., Doktycz, M.J. (2010) “Surface Charge- and Space-Dependent Transport of Proteins in Crowded Environments of Nanotailored Posts”, ACS Nano, 4(6), 3345–3355.
 16. Suresh, A. K., Pelletier, D. A., Wang, W. Moon, J.-W., Gu, B., Mortensen, N. P., Allison, D. P., Joy, D. C., Phelps, T. J., Doktycz M. J. (2010) “Silver nanocrystallites: Biofabrication using *Shewanella oneidensis*, and an evaluation of their comparative toxicity on Gram-negative and Gram-positive bacteria” Environmental Science and Technology, 44, 5210–5215.
 17. Fowlkes, J. D., Doktycz, M. J., Rack, P. D. (2010) “An Optimized Nanoparticle Separator Enabled by Electron Beam Induced Deposition” Nanotechnology, 21, 165303.
 18. Retterer, S.T., Siuti, P., Choi, C.-K., Doktycz, M.J. (2010) “Development and Fabrication of Nanoporous Silicon Bioreactors within a Microfluidic Chip” Lab on a Chip, 10(9) 1174 - 1181.
 19. Edwards, A.N., Fowlkes, J.D., Standaert, R.F., Pelletier, D.A., Doktycz, M.J., and Morrell-Falvey, J.L. (2009) “An in vivo imaging-based protein interaction assay with high sensitivity for high-throughput applications” Analytical Biochemistry, 395, 166–177.
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 21. Siuti, P., Retterer, S. T., Choi, C. K., Fowlkes, J. D., Doktycz, M. J. (2009) “Cell Free Translation in Engineered Picoliter Volume Containers” IEEE Proceedings of the First Annual ORNL Biomedical Science and Engineering Conference, IEEE Proceedings Biomedical Science & Engineering Conference, 2009. BSEC 2009. First Annual ORNL 18-19 March 2009 Page(s):1 - 4.
 22. Fletcher, B.L., Fern, J.T., Rhodes, K., McKnight, T. E., Fowlkes, J.D., Retterer, S.T., Keffer, D.J., Simpson, M.L., Doktycz, M. J. (2009) “Effects of ultramicroelectrode dimensions on the

- electropolymerization of polypyrrole” *Journal of Applied Physics*, 105(12) Article Number: 124312.
23. Pollas Mortensen, N. Fowlkes, J. D., Sullivan, C. J. Allison, D. P., Larsen, N. B. Molin, S. Doktycz, M. J. (2009) “The effects of the antimicrobial peptide colistin on surface ultrastructure and nanomechanics of *Pseudomonas aeruginosa* cells” *Langmuir*, 25(6) 3728-3733.
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 27. Lee CW, Kim MJ, Standaert R, Kim S, Owens E, Yan J, Choa YH, Doktycz M, Lee JS (2008) “Application of nanoparticles for materials recognition using peptide phage display technique - Part II: Magnetic bio-panning using Fe₃O₄ nanoparticles” *Journal of the Korean Institute of Metals and Materials*, 46(3) 131-134.
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35. Doktycz, M. J. and M. L. Simpson (2007) "Nano-enabled synthetic biology" *Molecular Systems Biology*, 3:125.
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