

Alan W. Szmodis

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OBJECTIVE A post-doctoral position working in a collaborative and cross-disciplinary environment to investigate novel scientific phenomena while further developing and expanding my research expertise.

EDUCATION **PhD, Biophysics** University of California, Davis, CA 2003 - Present
Dissertation: Imposing Topographical & Compositional Inhomogeneities In Lipid Membranes
Advisor: Atul N. Parikh, PhD, Department of Applied Science

Designated Emphases in Biotechnology and Biophotonics

Biotechnology Advisor: Judith A. Kjelstrom, PhD Biophotonics Advisor: Yin Yeh, PhD

BS, Physics, Minor in Math Pennsylvania State University, State College, PA 1997-2001

INTERESTS Biophysics, surface and colloidal physics, organic/inorganic interfaces, biological/chemical sensing

RESEARCH EXPERIENCE **Graduate Research**

University of California at Davis, Davis, CA Sept 2003 - Present

Advised by Prof. Atul Parikh, Department of Applied Science

- Investigated mechanisms controlling phase separation in synthetic membrane systems.
- Measured the kinetics and thermodynamics of domain formation and effects of curvature using real-time, label-free, imaging ellipsometry, fluorescence microscopy, atomic force microscopy (AFM), and differential scanning calorimetry (DSC).
- Explored the role of engineered substrates as mimics of biological systems having various curvatures, hydrophobicity and charge distributions.
- Developed novel platforms for biomolecular studies utilizing soft lithography on supported biomembrane architectures.
- Designed hydrophilic/hydrophobic and charge templated surfaces, microfluidic devices, membrane and membrane-protein preservation/dessication, and novel membrane probing techniques.
- Active lead in lab management, mentored graduate and undergraduate students, responsible for large equipment procurement and operation.
- Written successful proposals for personal funding and assisted in lab-wide proposal writing. (Eight publications/manuscripts [1-8] have resulted from this research)

Interim Research

Lawrence Livermore National Lab, Livermore, CA Jan 2002 - Sept 2003

Supervised by Dr. C.A. Orme, Biosciences and Biotechnology Division

- Examined oxidative effects and novel porous oxide formation on metal alloys using electrochemical modification and AFM.
- Studied Alloy 22, a nickel based alloy candidate for spent nuclear waste containment, and its ability to form a passivating oxide layer in extreme salt and pH conditions.
- Studied titanium and how oxide formation protects implants against corrosion in biologically relevant chemical and frictional conditions.
- Gained extensive experience with AFM both in air and solution. (Two publications [9, 10] have resulted from this research)

Undergraduate Research

Penn State Physics Department, University Park, PA June 2001 - Dec 2001

Supervised by Prof. R.D. Diehl, Physics Department

- Developed a technique to study 1D and 2D quasicrystalline lattice structures.
- Analyzed data from Low Energy Electron Diffraction studies on quasicrystals (Two publications [11, 12] have resulted from this research)

RESEARCH EXPERIENCE CONTINUED **Penn State Physics Department**, University Park, PA Jan 2001 - June 2001
Supervised by Prof. Y. Liu, Physics Department
· Tested and assisted in the production of novel superconducting materials.

Lawrence Livermore National Lab, Livermore, CA May-Aug 1998, 1999
Supervised by Dr. J.J. DeYoreo and Dr. C.A. Orme, Chemistry and Material Science
· Examined the effects of amino acid incorporation and chirality on calcite and brushite crystal growth using AFM
· Studied KDP (Potassium Dihydrogen Phosphate) crystal growth and properties.

RELATED SKILLS **General:** Comprehensive experience in interfacial physics and chemistry, biomaterial interactions at surfaces, and novel thin film platform development for arrayed studies and sensing.

Thin Films: Extensive work with controlled biological molecule deposition and contact printing, self-assembled monolayer and bilayer deposition, templated physical/chemical substrate modification for thin film studies, standard and soft lithography of (in)organic and biological films, templated curved/topographic substrates using elastopolymers (PDMS). Experience with micro-fluidic device development, Langmuir-Blodgett lipid surfactant films, spin-coating, and low-energy plasma etching.

Characterization: Proficient with optical/fluorescence microscopy, imaging ellipsometry and Atomic Force Microscopy (AFM) in and out of fluid with hard and soft/bio films. Experience with neutron and x-ray scattering on thin films, differential scanning calorimetry (DSC), confocal microscopy, scanning electron (SEM) and transmission electron microscopy (TEM).

Computer: Experience with LaTeX, Matlab, Mathematica

Directed and trained undergraduate and graduate students in various lab techniques, instrumentation, and data analysis.

Wrote successful proposals for personal funding and assisted in lab-wide proposal writing.

FELLOWSHIPS & HONORS · Lawrence Livermore Natl Lab University Education Partnerships Fellow (\$150K) 2005-08
· Winner of "People's Choice" and 2nd in Big Bang Business Plan Competition (\$8K) 2008
· Winner of Little Bang Business Competition for Medical & Biotech Innovations (\$3K) 2008
· UC Davis Office of Graduate Studies Professors for the Future Fellowship 2006-07
· Recipient of NSF Center for Adaptive Optics award for Inquiry Based Learning 2005
· Recipient of NIH Biotechnology Fellowship (T32-GM08799) 2004-05
· Recipient of NIH Biomolecular Technology Fellowship (1st Year, T32-GM08799) 2003-04

PROFESSIONAL SOCIETIES Participate as an active member attending meetings of several professional associations since 2004: Biophysical Society, Materials Research Society (MRS), American Chemical Society (ACS).

OTHER SKILLS & SERVICES **Entrepreneurial experience** transitioning technology from bench-top to market. Competed and placed in UC Davis Little Bang and Big Bang business competition for a business plan developed around a breath-based glucose sensor for diabetics and a proposed company, Arcus. Moved on to compete in DFJ Venture Capital entire west coast competition (bigbang.gsm.ucdavis.edu).

Organized and held workshops for hands-on and inquiry-based teaching methods and have written proposals and received funding to support these endeavors.

Participated in community outreach related to the sciences, recruitment of underrepresented individuals in the sciences, facilitator of public forums on science and society, and have assisted with grade school robotics competitions.

REFERENCES References Available Upon Request

PUBLICATIONS

1. Argov, N., Barboza, M., Froehlich, J., Bricarello, D.A., **Szmodis, A.W.**, Zivkovic, A., Lemay, D., Freeman, S., Smilovitz, J., Lebrilla, C., Parikh, A.N., and German, B., Milk as a Constituent Resource for HDL. Manuscript in Preparation.
2. El-khoury, R., **Szmodis, A.W.**, Frey, S.L., Lee, K.C., and Parikh, A.N., PEG8S Effects on DPPC Domain Formation and Stability. Manuscript in Preparation.
3. Smith, H., Howland, M.C., **Szmodis, A.W.**, Parikh, A.N., and Majewski, J., Early stages of oxidative stress-induced membrane permeabilization: a neutron reflectometry study. Manuscript Submitted, *JACS*.
4. **Szmodis, A.W.**, Blanchette, C.D., Longo, M.L., Orme, C.A., and Parikh, A.N., Thermally Induced Phase Separation In Supported Bilayers of Glycosphingolipid and Phospholipid Mixtures. Manuscript in Preparation.
5. Sanii, B., **Szmodis, A.W.**, Bricarello, D.A., and Parikh, A.N., Nucleating Interdigitated Domains in Supported f-DPPC Lipid Bilayers. Manuscript in Preparation.
6. **Szmodis, A.W.**, Blanchette, C.D., Levchenko, A., Navrotsky, A., Longo, M.L., Orme, C.A., and Parikh, A.N., Direct Visualization of Thermally-Induced Phase Separation in Supported Phospholipid Bilayers Using Imaging Ellipsometry. *Soft Matter Communication* 2008, 4, (6), 1161.
7. Howland, M.C., **Szmodis, A.W.**, and Sanii, B. and Parikh, A.N. (*First two authors contributed equally.*) Characterization of Physical Properties of Supported Phospholipid Membranes Using Imaging Ellipsometry at Optical Wavelengths. *Biophysical Journal* 2007, 92, (4), 1306.
8. Dixit, S.S., **Szmodis, A.W.**, and Parikh, A.N. (*First two authors contributed equally.*) Glass bead probes of local structural and mechanical properties of fluid, supported membranes. *ChemPhysChem* 2006, 7, 1678-1681.
9. Hayes, J.R., Gray, J., **Szmodis, A.W.**, and Orme, C.A., Influence of Chromium and Molybdenum on the Corrosion of Nickel Based Alloys. *Journal of the Electrochemical Society* 2005, 153, 5.
10. Orme, C.A., Anderson, K.L., Hayes, J.R., **Szmodis, A.W.**, and Bearinger, J.P., Morphological changes in metal/metal-oxide systems. *NACE Corrosion Research in Progress* 2004.
11. Ferralis, N., **Szmodis, A.W.**, and Diehl, R.D., Diffraction from one and two-dimensional quasicrystalline gratings. *American Journal of Physics* 2004, 72, 1241.
12. Diehl, R.D., Ledieu, J., Ferralis, N., **Szmodis, A.W.**, and McGrath, R. Low-energy electron diffraction from quasicrystal surfaces. *J. Phys.: Condens. Matter* 2003, 15, R63-R81.

INVITED TALKS

1. "Membrane Dynamics at the solid-liquid interface: Spreading, Interdigitation and Domain Gellation", **Szmodis, A.W.**, Sanii, B. and Parikh, A.N., Forschungszentrum Karlsruhe Institute for Nanotechnology, Eggenstein-Leopoldshafen, Germany, September 2007.

APPLICATION
NOTE (INVITED)

1. "Supported phospholipid bilayer membranes - Part 1" Howland, M.C., **Szmodis, A.W.** and Parikh, A.N., *Nanopticum* 2006, 6-7.

1. **Szmodis, A.W.**, Howland, M.C., Blanchette, C.D., Longo, M.L., Orme, C.A., and Parikh, A.N., Label-free Characterization of Biomembranes and Phase Separation Processes Using Imaging Ellipsometry. *Biomembrane Frontiers Meeting* March 2008.
2. **Szmodis, A.W.**, Blanchette, C.D., Levchenko, A., Navrotsky, A., Longo, M.L., Orme, C.A., and Parikh, A.N., Direct Visualization on Thermally-Induced Phase Separation in Supported Bilayers Using Imaging Ellipsometry. *Biophysical Society Meeting* Feb. 2008.
3. Smith, H., Majewski, J., **Szmodis, A.W.**, Howland, M.C. and Parikh, A.N. Understanding the process of membrane photolithography. *Biophysical Society Meeting* Feb. 2008.
4. **Szmodis, A.W.**, Blanchette, C.D., Levchenko, A., Navrotsky, A., Longo, M.L., Orme, C.A., and Parikh, A.N., Direct Visualization on Thermally-Induced Phase Separation in Supported Bilayers Using Imaging Ellipsometry. *Novel Model Systems for Bimolecular Lipid Membranes*, Schloss Ringberg, Germany, Sept. 2007.
5. **Szmodis, A.W.**, Blanchette, C.D., Levchenko, A., Navrotsky, A., Longo, M.L., Orme, C.A., and Parikh, A.N., Direct Visualization on Thermally-Induced Phase Separation in Supported Bilayers Using Imaging Ellipsometry. *Biophysical Society Meeting* Mar. 2007.
6. **Szmodis, A.W.**, Sanii, B., Howland, M.C. and Parikh A.N., Direct Visualization on Thermally-Induced Phase Separation in Supported Bilayers Using Imaging Ellipsometry. *American Chemical Society Meeting* Sept. 2006.
7. **Szmodis, A.W.**, Dixit, S. and Parikh A.N., Glass Bead Probes of Morphology and Mechanical Properties in Fluid, Supported Membranes. *Biophysical Society Meeting* Feb. 2006.
8. **Szmodis, A.W.**, Dixit, S. and Parikh A.N., Colloidal Interactions with Lipid Bilayers. *Material Research Society Meeting* Mar. 2005.
9. **Szmodis, A.W.**, Dixit, S. and Parikh A.N., Bowlingballs on bilayers: Amplification of patterns in lipid bilayers through colloidal adhesion. *Biophysical Journal* 88 (1): 413A Part 2 Suppl. S, Jan. 2005.
10. Brozell, A.M., Muha, M., **Szmodis A.W.**, et al., Design and characterization of supported phospholipid membranes on colloidal layers. *Biophysical Journal* 88 (1): 413A-414A Part 2 Suppl. S, Jan. 2005.
11. Yee, C.K., Butti, A.R.S., **Szmodis, A.W.**, et al., Non-ideal mixing and dynamics of phase separation in fluid lipid bilayers. *Abstracts of Papers of the American Chemical Society* 230: U1240-U1240 417-COLL, Aug. 2005.
12. Dixit, S., **Szmodis, A.W.**, and Parikh A.N., Functional Membrane Consequences of Membrane Fluidity: Bead Adhesion. *California Institute for Quantitative Biosciences Meeting* May 2005.
13. **Szmodis, A.W.**, Anderson, K.L., Farmer, J.C., Lian, T., Orme, C.A., Environmental Influence on Passive Films Formed on Alloy 22 (UNSNO6022). Proceedings National Association of Corrosion Engineers - San Diego, CA March 2003.
14. **Szmodis, A.W.**, Anderson, K.L., Farmer, J.C., Lian, T., Orme, C.A. Characteristics of the oxides films formed on Alloy C-22. 26th Symposium on the Scientific Basis for Nuclear Waste Management, MRS Fall Meeting; Boston, MA; USA; 2-5 Dec. 2002. pp.757-764. 2003.