

Lucas B. Thompson

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Education

University of Illinois at Urbana Champaign Urbana, IL
Ph.D., Materials Chemistry (in progress) August 2003 - Current

- Teaching Assistant, August 2003 - December 2004
- List of Teachers Rated as Excellent, Spring 2004
- Full Time Graduate Researcher, January 2004 - Current

The College of Wooster Wooster, OH
B.A., Chemistry August 1999 - May 2003

- Herrick L. Johnston Prize in Chemistry, August 1999
- Independent Study Thesis "*The computational modeling of the reconstruction of O, S, and Se adlayers upon coadsorption of CO*"

Research Experience

University of Illinois at Urbana Champaign Urbana, IL
Research Assistant, Laboratory of Ralph G. Nuzzo January 2004 - Current

- Assay based binding experiments benefit from the ability to have an inert background to improve signal to noise by reducing nonspecific adsorption. A polyacrylamide backbone has been functionalized via n-hydroxysuccinimide couplings with 3-methylthiopropylamine and nitrilotriacetic acid. These hydrophilic thin films spontaneously self-assemble and have been engineered to specifically bind histidine tagged proteins (6His), while simultaneously remaining inherently resistant to non-specific adsorption.
- We have developed a nanostructured plasmonic crystal (PC) fabricated by soft lithographic methods that is extremely sensitive to refractive index changes near the metal-dielectric interface. Utilizing a responsive hydrogel coupled to the surface of a PC, we are able to optically detect small changes in pH of a buffered solution in the absence of bulk refractive index changes. The introduction of gold nanoparticles into the hydrogel leads to an enhancement of the response due to coupling between the plasmonic modes of the fabricated plasmonic crystal and plasmons supported on the gold nanoparticles. Our work has shown that the observed enhancement can be modified by changing the size of the nanoparticles as well as the concentration of the nanoparticles in the hydrogel matrix.
- Microfluidic devices are well suited for manipulating and measuring mass limited samples; here we adapt a microfluidic device containing functionalized surfaces to chemically stimulate a small number of neurons (down to a single neuron), collect the release of neuropeptides and characterize them using mass spectrometry. Rather than using an on-line approach, off-line analysis is used; after collection of the peptides onto a surface, mass spectrometric imaging interrogates that surface to determine the peptides released from the cell. The overall utility of this scheme is demonstrated using several device formats with measurement of neuropeptides released from *Aplysia californica* bag cell neurons.

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The College of Wooster

Wooster, OH

Senior Independent Study, Laboratory of Wingfield V. Glassey August 2002 - May 2003

The main focus of this work was to expand the utility of the extended Huckel method to other atoms besides CO as well as to understand the reconstruction of group 16 elements (O, S, and Se) that is induced by the coadsorption of CO. Our investigations probed how the charge transfer determined the ability for the surface to reorganize upon CO coadsorption.

University of Pittsburgh

Pittsburgh, PA

Undergraduate Research Assistant, Laboratory of John T. Yates, Jr. Summer 2002

A gas dosing system for the quantitative deposition of low vapor pressure compounds onto surfaces in an ultrahigh vacuum system is reported. The dosing system is maintained at elevated temperature to achieve sufficiently high gas pressure for rapid transfer to the surface. Dosing is achieved through a heated calibrated leak valve, which connects the high temperature source system to an internal tubular doser. The leak valve and the internal doser head are heated to a higher temperature than the source system to prevent condensation of the compound. The quantitative behavior of this doser is demonstrated for two low vapor pressure compounds.

Instrumentation/Skills

Photolithography, soft lithography, metal deposition (e-beam, sputter coating), optical and fluorescence microscopy, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Focused Ion Beam (FIB), X-ray Photoelectron Spectroscopy (XPS), profilometry, ellipsometry, Matrix Assisted Laser Desorption Ionization – Time Of Flight/Mass Spectrometry (MALDI-TOF/MS), Surface Plasmon Resonance (SPR), Reflection Absorption Infrared Spectroscopy (RAIRS), UV-Vis/NIR

Computer Skills: MS Office, Freehand, MatLab, ImagePro, Adobe CS, Dreamweaver (maintained group webpage), Blender 3D

Other: Member of the Student Selected Speaker Committee for Inorganic/Materials Chemistry division (2007-present); Staff Member/Volunteer at The Bike Project Co-Op of Urbana Champaign, which promotes cycling and affordable bicycle sales and repairs for the community (August 2006-present); chief organizer for the first annual Champaign Cranksgiving, a charity bike race, scavenger hunt, and food drive to benefit the Eastern Illinois Food Bank

Professional Memberships

American Chemical Society

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Teaching Experience

University of Illinois at Urbana Champaign

Urbana, IL

- Teaching Assistant- Chemistry 103 Lab-Fall 2004 General Chemistry Lab (two sections of ~35 students)
- Teaching Assistant- Chemistry 110 Lab-Spring 2004 Advanced General Chemistry Lab (two sections of ~20 students)
- Teaching Assistant- Chemistry 101Z-Fall 2003 General chemistry discussion sections (two sections of ~25 students)

Presentations, Meetings, Awards

PITTCON 2009, Chicago March 2009, Oral Presentation, “Enhancing the Sensitivity of Plasmonic Crystals using Gold Nanoparticles” Presider of Sensors in Nanotechnology session

University of Illinois at Urbana-Champaign

List of Teachers Rated as Excellent

Spring 2004

College of Wooster

Herrick L. Johnston Prize in Chemistry

1999

Publications

“Enhancing the Optical Transduction of Chemical Forces using Gold Nanoparticles”

Lucas B. Thompson, Jay Wm. Wackerly, Philip A. Janowicz, Jeffrey S. Moore and Ralph G. Nuzzo *In preparation*

“Bifunctional Polyacrylamide Based Polymers for the Specific Binding of Hexahistidine Tagged Proteins” **Lucas B. Thompson**, Nathan H. Mack, and Ralph G. Nuzzo *In Preparation*

Stewart, Matthew E.; Anderton, Christopher R.; **Thompson, Lucas B.**; Maria, Joana; Gray, Stephen K.; Rogers, John A.; Nuzzo, Ralph G. “Nanostructured plasmonic sensors”. *Chemical Reviews* 2008, 108(2), 494-521.

Stewart, M. N.; Motala, M. A.; Yao, J.; **Thompson, L.B.**; Nuzzo, R.G. “Unconventional Methods for Forming Nanopatterns”. *Journal of Nanoengineering Nanosystems* 2007, 220, 81-138

Jo, Kyubong; Heien, Michael L.; **Thompson, Lucas B.**; Zhong, Ming; Nuzzo, Ralph G.; Sweedler, Jonathan V. “Mass spectrometric imaging of peptide release from neuronal cells within microfluidic devices”. *Lab on a Chip* 2007, 7(11), 1454-1460.

Thompson, L.; Lee, J-G.; Maksymovych, P; Ahner, J.; Yates, J.T. Jr. "Construction and performance of an UHV-compatible high temperature vapor dosing system for low vapor pressure compounds". *Journal of Vacuum Science and Technology A* 2003, 21, 491-494

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References

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