

**Brandon M. Vogel**

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**EDUCATION:**

Assistant Professor July 2008-Present  
Bucknell University, Department of Chemical Engineering

Visiting Assistant Professor August 2007  
Bucknell University, Department of Chemical Engineering

Staff Member August 2007  
National Institute of Standards and Technology, Polymers Division

NRC Postdoctoral Fellow November 2006  
National Institute of Standards and Technology, Polymers Division

Ph.D. Chemical Engineering December 2004  
Iowa State University, Ames, IA  
*Thesis Topic:* High-throughput Synthesis and Characterization of Polyanhydrides  
*Thesis Advisor:* Surya K. Mallapragada and Balaji Narasimhan

M.S. Chemical Engineering August 2003  
Iowa State University, Ames, IA  
*Thesis Topic:* Synthesis of Novel Polyanhydrides for Controlled Release  
*Thesis Advisor:* Surya K. Mallapragada

B.S. Chemical Engineering May 1999  
University of Minnesota, Twin Cities, MN

B.S. Chemistry May 1999  
University of Minnesota, Twin Cities, MN

**AWARDS/ HONORS:**

- ◆ The Jane W. Griffith Faculty Fellowship, Bucknell University, September 2008
- ◆ National Institute of Standards and Technology/National Research Council Postdoctoral Fellowship, November 2004
- ◆ Iowa State University Chemical Engineering Department Fellowship, September 1999 - August 2001

- ◆ National Science Foundation Lando Fellowship, Summer 1996, Summer 1997
- ◆ Awarded a UROP Grant (Undergraduate Research Opportunity Program), September 1996

### RESEARCH EXPERIENCE:

Principle Investigator and Jane W. Griffith Faculty Fellow  
Bucknell University

July 2008-Present

My group is synthesizing new biomaterials to detect, target and treat disease. With this focus, we are interested in new methods to make materials and improve on reactions with microwave energy. To develop new materials, we aim to establish the structure-property relationships of these materials to enable the rational design of the next generation of biomaterials. We view materials synthesis as a tool for chemical diversity to uncover the influence of the materials structure and morphology on performance.

Staff Member

August 2007

National Institute of Standards and Technology, Polymers Division

In collaboration with the Nanotechnology Characterization Laboratory (NCL), National Cancer Institute (NCI) and the Food and Drug Administration (FDA) we are developing a nanoparticle reference material for use to calibrate instruments and provide a reference material for biologist and others in related fields who deal with nanoparticles. We are precisely measuring the size, shape, and concentration of these reference nanoparticles with small angle x-ray scattering. Future work will correlate nanoparticle physical properties (size, shape, and chemical composition) to cellular uptake and transport properties.

NRC Postdoctoral Fellow

November 2006

National Institute of Standards and Technology, Polymers Division

Our objective was to correlate material/structure-property relationships to electrical performance with metrics such as the field effect mobility and threshold voltage in organic field effect transistors. We used self-assembled monolayer chemistry to control the surface energy and chemical functionality at the organic semiconductor-dielectric interface to investigate these factors on polymer morphology, microstructure and electrical performance. This provided insight into the mechanism controlling the self-assembly and orientation of conjugated semiconducting polymers.

Ph.D. Thesis

December 2004

Iowa State University, Ames, IA

I developed high-throughput methods to synthesize and characterize polyanhydride copolymer libraries. As part of my training, I spent a year working in the Biomaterials group within the Polymers Division at the National Institute of Standards and Technology in Gaithersburg, Maryland.

- ◆ Used rapid prototyping to generate glass multi-well substrates for polymer science applications
- ◆ Able to synthesize the first polyanhydride copolymer library in a parallel fashion (100 polymers)
- ◆ Created a multi-well platform to monitor dissolution kinetics of polyanhydride libraries
- ◆ Generated a polyanhydride ternary blend library on a multi-well substrate to map phase behavior in parallel

M.S. Thesis

August 2003

## Iowa State University, Ames, IA

I synthesized polyanhydrides for controlled drug delivery applications, including methods to create block copolymers and bulk eroding polyanhydrides. In addition, I developed a microwave polymerization method to prepare polyanhydrides for high-throughput screening.

- ◆ Obtained knowledge of condensation and ring opening polymerization techniques such as drying of solvents and working air free
- ◆ Used organic chemistry to rationally design polymeric controlled release systems
- ◆ Responsible for mentoring and managing undergraduate students working in the laboratory

Before switching to my thesis topic, I conducted experiments to regenerate mammary tissue on biodegradable polymer scaffolds. Spinner flasks containing woven PLLA or PLGA scaffolds seeded with Murine HC11 Epithelial cells and 3T3 Fibroblasts cells provided the context to test the relationship between seeding density, hormone type and concentration, and growth factors to extracellular matrix formation and differentiation of the cells.

- ◆ Learned aseptic technique and maintained tissue culture facility
- ◆ Gained experience culturing a large number of cells and techniques required to count and characterize cells

## Undergraduate Research

University of Minnesota, Twin Cities, MN

*Advisor:* Wayland E. Noland

October 1997 - May 1999

I synthesized novel tetrahydrocarbazoles as therapeutics for the treatment of HIV. The characterization of the compounds included infrared spectroscopy, gas chromatography/mass spectroscopy, melting point, nuclear magnetic spectroscopy and elemental analysis.

- ◆ Gained experience in organic synthesis and related techniques such as compound purification
- ◆ Developed critical thinking skills in analyzing and applying research results to produce more therapeutically active compounds

TEACHING EXPERIENCE:

Assistant Professor

Fall 2008

My fall semester course is Bioprocess Engineering, a senior level/graduate elective course in chemical engineering that satisfies an undergraduate biology requirement for chemical engineering students. This course is a survey of biochemistry, cell biology, microbiology and application of kinetics, reactor design and material and energy balances to problems in bioprocess engineering.

Teaching Fellow Biomaterials Lab

Fall 2002

My teaching responsibilities revolved around instructing an innovative biomaterials laboratory that required students to design and build a reactor to produce skin for surgical replacement. The lab functions as a tool for the students to glean knowledge through open-ended problem based learning. The specific duties were to meet with the lab groups and advise them on their research and design progress, while helping to teach the students the necessary concepts to accomplish their project goals.

Teaching Assistant Unit Operations Laboratory

Fall 2001

The Unit Operations Lab is an undergraduate instructional course that enables the students to have hands on experience with equipment they may encounter in an industrial setting. As a teaching

assistant, I was responsible for answering questions about the labs and equipment, grading lab reports and making sure the students were prepared for the day's lab activities.

Undergraduate Tutor in Math and Sciences

1995-1996

My responsibilities included working through problems in the fields of Mathematics, Physics, Chemistry and Biology and giving insight into areas that needed clarification for the students.

#### JOURNAL ARTICLES:

1. S. Broderick, C. Suh, J. Nowers, B.M. Vogel, S. Mallapragada, B. Narasimhan and K. Rajan "Informatics for combinatorial materials science", JOM Journal of the Minerals, Metals and Materials Society, 60, 3, 56-59 (2008).
2. B. M. Vogel, D. M. DeLongchamp, C. M. Mahoney, L. A. Lucas, D. A. Fischer and E. K. Lin "Interfacial modification of silica surfaces through  $\gamma$ -isocyanatopropyl triethoxy silane-amine coupling reactions", Applied Surface Science, 254, 6, 1789-1796 (2008).
3. L.A. Lucas, D.M. DeLongchamp, B.M. Vogel, E.K. Lin, M.J. Fasolka, D.A. Fischer, I. McCulloch, M. Heeney, and G.E. Jabbour "Combinatorial screening of the effect of temperature on the microstructure and mobility of a high performance polythiophene semiconductor", Applied Physics Letters, 90, 1, No. 012112 (2007).
4. M.C. Gurau, D.M. DeLongchamp, B.M. Vogel, E.K. Lin, D.A. Fischer, S. Sambasivan, and L.J. Richter, "Measuring molecular order in poly(3-alkylthiophene) thin films with polarizing spectroscopies", Langmuir, 23, 834-842 (2007).
5. E.L. Jablonski, B.M. Vogel, D.P. Cavanagh and K.L. Beers, "Microfluidics in the Undergraduate Laboratory: Device Fabrication to Study Transport and Gas Embolisms in Model Blood Flow", submitted to the Journal of Chemical Education.
6. Maria del Pilar Torres, B.M. Vogel, S.K. Mallapragada and B. Narasimhan, "Erosion Mechanism of Polyanhydrides Containing Oligomeric Ethylene Glycol", The Journal of Biomedical Research Part A, 102-110 (2006).
7. D. M. DeLongchamp, B. M. Vogel, Y. Jung, M. C. Gurau, C. A. Richter, O. Kirillov, J. Obrzut, D. A. Fischer, S. Sambasivan, L. J. Richter, E. K. Lin, "Variations in Semiconducting Polymer Microstructure and Hole Mobility with Spin-Coating Speed", Chemistry of Materials, 17, 5610-5612 (2005).
8. B.M. Vogel, J.T. Cabral, N. Eidelman, S.K. Mallapragada and B. Narasimhan, "Parallel Synthesis and Dissolution Testing of Polyanhydride Random Copolymers", Journal of Combinatorial Chemistry, 7, 921-928 (2005).
9. B.M. Vogel and S.K. Mallapragada, "Synthesis of Novel Biodegradable Polyanhydrides Containing Aromatic and Glycol Functionality for Tailoring of Hydrophilicity in Controlled Drug Delivery Devices", Biomaterials, 26, 721-728 (2004).
10. S. Lin-Gibson, S. Bencherif, J.A. Cooper, J.M. Antonucci, B.M. Vogel and N.R. Washburn, "Synthesis and Characterization of PEG Dimethacrylates and their Hydrogels", Biomacromolecules, 5, 1280-1287 (2004).
11. B.M. Vogel, S.K. Mallapragada, and B. Narasimhan, "Rapid Synthesis of Polyanhydrides By Microwave Polymerization", Macromolecular Rapid Communications 25, 330-333 (2004).

#### PATENTS:

1. B.M. Vogel, S.K. Mallapragada, and B. Narasimhan, U.S. Patent Application Serial Number: 11/275,184, Biodegradable Polyanhydrides Containing Glycol Functionality, Pending.
2. B.M. Vogel, S.K. Mallapragada, and B. Narasimhan, U.S. Patent Application Serial Number: 11/275,168, Synthesis of Anhydride Containing Polymers by Microwave Radiation, Pending.

BOOK CHAPTERS:

1. B.M. Vogel and S.K. Mallapragada, "The Synthesis of Polyanhydrides", in Handbook of Biodegradable Materials and their Applications, edited by S.K. Mallapragada and Balaji Narasimhan, ASP Publishers, Vol. 1, 329-347 (2005).
2. K.L. Beers and B.M. Vogel, "The Synthesis, Characterization and Applications of Polymeric Discrete Libraries", in Combinatorial Materials Science, edited by S.K. Mallapragada and Balaji Narasimhan, John Wiley & Sons, 51-79 (2007).
3. C. Suh, K. Rajan, B. M. Vogel, B. Narasimhan and S. K. Mallapragada, "Informatics Methods for Combinatorial Materials Science", in Combinatorial Materials Science, edited by S.K. Mallapragada and Balaji Narasimhan, John Wiley & Sons, 109-119 (2007).

REFERENCE MATERIALS:

1. National Institute of Standards and Technology Report of Investigation, Gold Nanoparticles, 10 nm Diameter, "Reference Material 8011", December, 13 (2007).
2. National Institute of Standards and Technology Report of Investigation, Gold Nanoparticles, 30 nm Diameter, "Reference Material 8012", December, 13 (2007).
3. National Institute of Standards and Technology Report of Investigation, Gold Nanoparticles, 60 nm Diameter, "Reference Material 8013", December, 13 (2007).

CONFERENCE PROCEEDINGS:

1. Z.D. Schultz, M. Gurau, D.M. DeLongchamp, B.M. Vogel, R.J. Kline, Y. Jung, E.K. Lin, L.J. Richter, "Nonlinear spectroscopic characterization of polymer thin films" in Abstracts of Papers of the American Chemical Society 231:324 POLY March 26, (2006).
2. D.M. DeLongchamp, D.A. Fischer, B.M. Vogel, R.J. Kline, Y. Jung, M. Gurau, L.J. Richter, E.K. Lin, "Near-edge X-ray absorption fine structure spectroscopy as a characterization tool for organic semiconductors" in Abstracts of Papers of the American Chemical Society 231:323 POLY March, 26 (2006).
3. S.K. Mallapragada, B.M. Vogel and B. Narasimhan, "Combinatorial Methods for Synthesis and Characterization of Polyanhydride Copolymers", PMSE Proceeding, 93, 818-819 (2005).

SESSION CHAIR:

1. B. M. Vogel, Biological Polymers (Session Chair), American Institute of Chemical Engineers (Annual Meeting), Salt Lake City, UT, November 5, 2007.
2. B. M. Vogel, Polymer Thin Films and Interfaces II (Session Chair), American Institute of Chemical Engineers (Annual Meeting), Salt Lake City, UT, November 5, 2007.
3. B. M. Vogel, Polymer Thermodynamics I (Session Co-Chair), American Institute of Chemical Engineers (Annual Meeting), San Francisco, CA, November 4, 2006.

PRESENTATIONS:

1. B. M. Vogel, “High throughput methods to make and evaluate degradable polymers for controlled drug delivery”, (Invited Talk), Department of Chemical Engineering, Bucknell University, February 19, 2008.
2. Dean M. DeLongchamp, R. Joseph Kline, B. M. Vogel, Leah A. Lucas, Daniel Fischer, Lee J. Richter, Martin Heeney, Iain McCulloch, and Eric K. Lin, “The Microstructure Foundation of High Carrier Mobility in Semiconducting Polymers”, (Talk), American Institute of Chemical Engineers (Annual Meeting), San Francisco, CA, November 16, 2006.
3. B. M. Vogel, Dean M. DeLongchamp, Daniel Fischer, and Eric K. Lin, “Surface Chemical Modification to Systematically Vary the Dielectric Interface in Semiconducting Polymer Field Effect Transistors”, (Talk), American Institute of Chemical Engineers (Annual Meeting), San Francisco, CA, November 15, 2006.
4. B. M. Vogel, Dean M. DeLongchamp, Youngsuk Jung, Daniel A. Fischer, Sharadha Sambasivan, Lee J. Richter, Eric K. Lin “Surface Modification of Dielectric Interfaces to Control Semiconducting Polymer Chain Orientation”, (Talk), American Institute of Chemical Engineers (Annual Meeting), Cincinnati, OH, November 4, 2005.
5. B.M. Vogel, “Combinatorial Approaches to Materials: Biomaterials and Electronic Materials”, (Session Chair), ACS National Meeting & Exposition, Washington, DC, September 1, 2005
6. S. K. Mallapragada, B.M. Vogel, N. Eidelman, and B. Narasimhan, “Combinatorial Synthesis and Dissolution Testing of Polyanhydride Copolymers”, (Talk), ACS National Meeting & Exposition, Washington, DC, September 1, (2005).
7. B.M. Vogel, N. Eidelman, S.K. Mallapragada and B. Narasimhan, “High-Throughput Synthesis and Parallel Dissolution of Polyanhydrides”, (Invited Talk), NIST Combinatorial Methods Center Workshop 7, Gaithersburg, MD, May 2, 2005.
8. B.M. Vogel, N. Eidelman, S.K. Mallapragada and B. Narasimhan, “High-Throughput Synthesis and Parallel Dissolution of Polyanhydrides”, (Invited Talk), NSF-CoSMIC-IMI-NIST Workshop, Gaithersburg, MD, January 24, 2005.
9. B.M. Vogel, N. Eidelman, S.K. Mallapragada and B. Narasimhan, “High-Throughput Synthesis and Parallel Dissolution Evaluation of Polyanhydrides”, (Talk), American Institute of Chemical Engineers (Annual Meeting), Austin, TX, November 12, 2004.
10. B.M. Vogel and S.K. Mallapragada, “The Synthesis of Novel Biodegradable Polyanhydrides Containing Aromatic and Glycol Functionality for Improved Tailoring of Hydrophilicity in Controlled Drug Delivery”, (Talk), American Institute of Chemical Engineers (Annual Meeting), San Francisco, CA, November 21, 2003.
11. B.M. Vogel and S.K. Mallapragada, “Synthesis of Polyanhydride Block Copolymers”, (Talk), American Institute of Chemical Engineers (Annual Meeting), Indianapolis, IN, November 5, 2002.
12. B.M. Vogel and W. Noland, “Synthesis of Novel Tetrahydrocarbazoles for the Treatment of HIV”, (Poster), American Chemical Society (Annual Meeting), Dallas, TX, March 29, 1998.

RESEARCH INTERESTS:

Biomaterials, controlled release, drug delivery, hydrogels, quantum dots, organic electronics, nanoparticles polymer synthesis, and high-throughput synthesis and characterization.

REFERENCES:

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