

Keith Brian Rodenhausen, Jr., Ph.D.

Curriculum Vitae

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Objective: To work on challenging projects in the field of surface science and grow in competency while providing my own skill set to benefit the organization.

Technical Skills

- Expertise of combinatorial spectroscopic ellipsometry (SE) and quartz crystal microbalance with dissipation (QCM-D) techniques for solid-liquid interfacial chemistry applications
- Worked on novel, label-free chemical sensing principle that takes advantage of anisotropic three-dimensional (3D) surfaces to detect non-specifically attached adsorbate
- Developed data acquisition and data analysis algorithms for surface science instrumentation
- Currently studying adsorption, porosity, and structure of organic ultra-thin (< 10 nm) films on flat and 3D nanostructured surfaces
- Scientific instrumentation: SE, GE, QCM-D, GeSIM Nanoplotter, Contact Angle, SEM, TEM, UV-Vis, AFM
- Computer programs: CompleteEASE, WVASE, QSoft, QTools, Mathcad, Origin, Aspen

Soft Skills

- Consulted for instrumentation manufacturers regarding technical questions and a customer visit/demonstration
- Strong background of interdisciplinary teamwork with colleagues including physicists, electrical engineers, civil engineers, biological systems engineers, and chemists
- Comfortable giving technical presentations to small or large groups
- Coordinated student's research plan with international research groups and industry to develop microfluidic devices
- Mentored interdisciplinary graduate and undergraduate students how to use instrumentation and interpret results for their own projects
- Worked on international collaboration to combine surface fabrication and characterization knowledge with polymer expertise for stimuli-responsive nanohybrid materials, resulting in numerous publications

Awards and Honors

- Milton E. Mohr Fellow, University of Nebraska-Lincoln, 2012-2013
- First Place Student Prize, SE Focus Topic Session, 2011 Fall AVS Meeting, November 2011
- Outstanding Presentation Award, UNL E-Week Research Symposium, April 2011
- Publication, "Combined optical and acoustical method for determination of thickness and porosity of transparent organic layers below the ultra-thin film limit," selected for the November 1, 2011 issue of Virtual Journal of Biological Physics Research and the November 14, 2011 issue of Virtual Journal of Nanoscale Science & Technology.

Personal Background

Ph.D. in Engineering
Cumulative GPA: 3.87 (4.00 scale)

University of Nebraska-Lincoln (UNL), Dec. 2013

M.S. in Chemical Engineering
(Minor in Electrical Engineering)

University of Nebraska-Lincoln, May 2012

B.S. in Chemical Engineering
Cumulative GPA: 3.85 (4.00 scale)

University of Nebraska-Lincoln, May 2009
Regents Scholar
Dean's List (Eight Semesters)
College of Eng. and Tech. Scholarship

Research Experience

Aug. 2014 – Present

Research Group of P. Uhlmann
Leibniz Institute of Polymer Research-Dresden (IPF)
Attachment of nanoparticles onto responsive polymeric brushes
Nanoparticle synthesis
Nanochromatography

June 2009 – Present

Research Group of M. Schubert
Electrical Engineering, UNL
Surface-enhanced birefringence sensing
Porosity and structure of organic thin films
Chemical and biomarker detection
Fabrication of nanohybrid functional materials
Trained graduate students
Supervised undergraduate researchers

Jan. 2009 – May 2009

Research Group of N. Ianno
Electrical Engineering, UNL
Chemical bath deposition of CdS

Aug. 2007 – Sep. 2008

Research Group of R. Saraf
Chemical and Biomolecular Engineering, UNL
Electrical properties of Au nanoparticle arrays

Apr. 2007 – Apr. 2008

**Goodyear Engineered Products –
Veyance Technologies**
Lincoln, Nebraska
Industrial research setting
Worked with rubber at every stage of process
Tested new formulations and factory stocks

Research Interests

- Combinatorial SE/QCM-D
- Surface chemistry and characterization
- Solid-liquid interface
- Functional organic layers
- Nanostructured surfaces
- Nanohybrid functional materials

International Activities

- Spent seven months at IPF (Germany) as part of long-term collaboration with groups of P. Uhlmann and K.-J. Eichhorn (2010, 2014-2015)
- Attended week-long surface science workshop, Physical Chemistry of Biointerfaces II, at San Sebastian, Spain (July 9-14, 2012)

Book Chapters

1. "Detection of organic attachment onto highly ordered three-dimensional nanostructure thin films by generalized ellipsometry and quartz crystal microbalance techniques," **K.B. Rodenhausen**, D. Schmidt, C. Rice, T. Hofmann, E. Schubert, M. Schubert, in *Ellipsometry of Functional Organic Surfaces and Films* by K. Hinrichs and K.-J. Eichhorn (Eds.), Springer (2013).
2. "Coupling spectroscopic ellipsometry and quartz crystal microbalance to study organic films at the solid-liquid interface," R.P. Richter, **K.B. Rodenhausen**, N. Eisele, M. Schubert, in *Ellipsometry of Functional Organic Surfaces and Films* by K. Hinrichs and K.-J. Eichhorn (Eds.), Springer (2013).

Journal Articles

1. "The retention of liquid by columnar nanostructured surfaces during quartz crystal microbalance measurements and the effects of adsorption thereon," **K.B. Rodenhausen**, R.S. Davis, D. Sekora, D. Liang, A. Mock, R. Neupane, D. Schmidt, E. Schubert, T. Hofmann, and M. Schubert. *J. Colloid Interf. Sci.*, 455 (2015) 226-235.
2. "Use of precisely sculptured thin film (STF) substrates with generalized ellipsometry to determine spatial distribution of adsorbed fibronectin to nanostructured columnar topographies and effect on cell adhesion," T. Kasputis, A. Pieper, **K.B. Rodenhausen**, D. Schmidt, D. Sekora, C. Rice, E. Schubert, M. Schubert, and A.K. Pannier. *Acta Biomater.*, 18 (2015) 88-99.
3. "Combined QCM-D/GE as a tool to characterize stimuli-responsive swelling of and protein adsorption on polymer brushes grafted onto 3D-nanostructures. M. Koenig, T. Kasputis, D. Schmidt, **K.B. Rodenhausen**, K.-J. Eichhorn, A.K. Pannier, M. Schubert, M. Stamm, and P. Uhlmann. *Anal. Bioanal. Chem.* 406 (2014) 7233-7242.
4. "In-situ-synthesis of palladium nanoparticles in polymer brushes followed by QCM-D coupled with spectroscopic ellipsometry," M. Koenig, **K.B. Rodenhausen**, D. Schmidt, K.-J. Eichhorn, M. Schubert, M. Stamm, and P. Uhlmann. *Part. Part. Syst. Char.*, 30 (2014) 931-935.
5. "Slanted columnar thin films prepared by glancing angle deposition functionalized with polyacrylic acid Gueiselin polymer brushes," T. Kasputis, M. Koenig, D. Schmidt, D. Sekora, **K.B. Rodenhausen**, K.-J. Eichhorn, P. Uhlmann, E. Schubert, A.K. Pannier, M. Schubert, and M. Stamm. *J. Phys. Chem. C*, 117 (2013) 13971-13980.
6. "Generalized ellipsometry *in-situ* quantification of organic adsorbate attachment within slanted columnar thin films," **K.B. Rodenhausen**, D. Schmidt, T. Kasputis, A.K. Pannier, E. Schubert, and M. Schubert. *Opt. Express*, 20 (2012) 5419-5428.

7. "Combined optical and acoustical method for determination of thickness and porosity of transparent organic layers below the ultra-thin film limit," **K.B. Rodenhausen**, T. Kasputis, A.K. Pannier, J.Y. Gerasimov, R.Y. Lai, M. Solinsky, T.E. Tiwald, H. Wang, A. Sarkar, T. Hofmann, N. Ianno, and M. Schubert. *Rev. Sci. Instrum.*, 82 (2011) 103111.
8. "*In-situ* monitoring of alkanethiol self-assembled monolayer chemisorption with combined spectroscopic ellipsometry and quartz crystal microbalance techniques," **K.B. Rodenhausen**, B.A. Duensing, T. Kasputis, A.K. Pannier, T. Hofmann, M. Schubert, T.E. Tiwald, M. Solinsky, and M. Wagner. *Thin Solid Films*, 519 (2011) 2817–2820.
9. "Micelle-assisted bilayer formation of cetyltrimethylammonium bromide thin films studied with combinatorial spectroscopic ellipsometry and quartz crystal microbalance techniques," **K.B. Rodenhausen**, M. Guericke, A. Sarkar, T. Hofmann, N. Ianno, M. Schubert, T.E. Tiwald, M. Solinsky, and M. Wagner. *Thin Solid Films*, 519 (2011) 2821–2824.
10. "Virtual separation approach to study porous ultra-thin films by combined spectroscopic ellipsometry and quartz crystal microbalance methods," **K.B. Rodenhausen** and M. Schubert. *Thin Solid Films*, 519 (2011) 2772–2776.
11. "Protein adsorption on and swelling of polyelectrolyte brushes: a simultaneous ellipsometry-quartz crystal microbalance study," E. Bittrich, **K.B. Rodenhausen**, K.-J. Eichhorn, T. Hofmann, M. Schubert, M. Stamm, and P. Uhlmann. *Biointerphases*, 5 (4) (2010) 1–9.

Oral Presentations

1. "Combinatorial quartz crystal microbalance with dissipation and spectroscopic ellipsometry techniques to characterize organic layers at the solid-liquid interface," IPF (Dresden, Germany) Apr. 15, 2015.
2. "Combinatorial quartz crystal microbalance with dissipation and spectroscopic ellipsometry techniques to characterize organic layers at the solid-liquid interface," WSE9 (Twente, Netherlands) Feb. 23, 2015.
3. "Quantification of adsorption on three-dimensional spatially coherent thin films at the solid-liquid interface," J.A. Woollam Company (Lincoln, NE) Jan. 22, 2014.
4. "Detection of organic adsorption onto three-dimensional nanostructure layers with generalized ellipsometry," ICSE-VI (Kyoto, Japan) May 30, 2013.
5. "Generalized ellipsometry *in-situ* monitoring of fibronectin protein infiltration of sculptured thin films," WSE7 (Leipzig, Germany) March 7, 2012.
6. "Real-time spectroscopic ellipsometry and quartz crystal microbalance with dissipation characterization of biomolecule adsorption within sculptured thin films," AVS (Nashville, TN) Nov. 3, 2011.
7. "Hybrid *in-situ* spectroscopic ellipsometry and quartz crystal microbalance to study rigid, organic, ultra-thin films," UNL E-Week Research Symposium (Lincoln, NE) Apr. 22, 2011.
8. "Monitoring protein deposition on self-assembled monolayers of alkanethiols on gold, *in-situ*, with combined quartz crystal microbalance and spectroscopic ellipsometry," AVS (Albuquerque, NM) Oct. 21, 2010.
9. "Agent-free biochemical sensing with sculptured thin films," ISSSR (Springfield, MO) June 23, 2010.
10. "Development of combinatorial, *in-situ* spectroscopic ellipsometry and quartz crystal microbalance with dissipation," ICSE-V (Albany, NY) May 28, 2010.
11. "Monitoring protein deposition on self-assembled monolayers of alkanethiols on gold *in situ* with combined quartz crystal microbalance and spectroscopic ellipsometry," ICMCTF (San Diego, CA) Apr. 28, 2010.
12. "Monitoring organic thin film growth *in-situ* with combined quartz crystal microbalance with dissipation and spectroscopic ellipsometry," Mini-Symposium: *In-situ* quartz crystal

microbalance and spectroscopic ellipsometry characterization of biological materials (Lincoln, NE) Nov. 17, 2009.

13. "Monitoring organic thin film growth *in-situ* with combined quartz crystal microbalance with dissipation and spectroscopic ellipsometry," QCM-D Scientific Meeting USA (New York City Metro Area, NJ) Nov. 5, 2009.
14. "Mathcad tutorial," Student group event (Lincoln, NE) Given multiple times.

Conference Posters (First Author)

1. "Capture of macromolecules by polymeric brushes anchored on three-dimensional spatially coherent thin films," 8th ECNP International Conference on Nanostructured Polymers and Nanocomposites (Dresden, Germany) Sep. 16-19, 2014.
2. "Generalized ellipsometry *in-situ* monitoring of fibronectin protein infiltration of sculptured thin films," Physical Chemistry of Biointerfaces II (San Sebastian, Spain) July 9-14, 2012.
3. "Generalized ellipsometry *in-situ* monitoring of fibronectin protein infiltration of sculptured thin films," WSE7 (Leipzig, Germany) March 5-7, 2012.
4. "Combinatorial spectroscopic ellipsometry and quartz crystal microbalance with dissipation to study organic ultra-thin film evolution," WSE6 (Berlin, Germany) Feb. 21-24, 2010.
5. "Monitoring protein deposition on self-assembled monolayers of alkanethiols on gold *in-situ* with combined quartz crystal microbalance and spectroscopic ellipsometry," ICSE-V (Albany, NY) May 23-28, 2010.
6. "Micelle-assisted bilayer formation of CTAB thin films studied with combined spectroscopic ellipsometry and quartz crystal microbalance techniques" ICSE-V (Albany, NY) May 23-28, 2010.
7. "Monitoring organic thin film growth *in-situ* with combined quartz crystal microbalance and spectroscopic ellipsometry" AVS (San Jose, CA) Nov. 8-13, 2009.

Ad-hoc Reviewing (Journals)

- Langmuir
- Sensors
- Thin Solid Films

References Available upon Request