

Michael J. Hankins, Ph.D.

Employment

Southern Illinois University-Edwardsville Edwardsville, IL 1/1/2017-6/30/2021

Instructor/Visiting Assistant Professor/Assistant Professor (Dept. of Chemistry)

- Instructor for Introductory Chemistry Course
- Lab Coordinator for Engineering Chemistry labs
- Electrochemistry research
- Physical Chemistry lecture and lab coordinator

Saint Louis University St. Louis, MO 7/1/2010- present

Assistant Professor Chemistry-NTT (7/1/2021-present)

- Instructor for lower and upper level chemistry courses
- Member of Majors Retention Research Committee
- Chair of Diversity, Equity, and Inclusion committee

Special Assistant to the VP for Recruitment in STEM (7/1/2021-present)

- Support programming for the Division of Diversity and Innovative Community Engagement
- Unify STEM recruitment efforts for the university
- Develop partnerships/pipelines for future students

Teaching Assistant (7/1/2010-12/31/2011)

- Facilitate general chemistry lab (2-3 sections per semester)
- Proctor examinations for general, organic, and nursing majors chemistry
- Grade both laboratory and lecture exams
- Create general chemistry lecture videos

Research Assistant (1/1/2012-7/5/2017)

- Non-linear dynamics in chemical systems
- Responsible for ordering equipment and materials for the lab group
- Train high school, undergraduate, and new graduate students to use lab equipment and software
- Assist with research progress of undergraduate/high school students

Food and Drug Administration (FDA) St. Louis, MO 6/1/2007- 5/31/2009

Science Aide/Intern

- Division of Pharmaceutical Analysis
- USP tablet assays
- HPLC
- IR Spectroscopy
- Raman Spectroscopy
- X-ray Spectroscopy

Education

Saint Louis University St. Louis, MO 8/22/2005-7/5/2017

PhD. in Integrated and Applied Sciences (July 2017)

- Chemistry track - Analysis and modeling of complex reaction networks
- Focuses on interdepartmental research between applied science fields

M.S. in Chemistry (May 2012)

- Coursework from all disciplines of chemistry
- Graduate Research in Electrochemistry
 - Enzymatic Fuel cells
 - Reciprocal rates of symmetrical chemical reactions

B.S. Chemistry (May 2009)

- Undergraduate research on optimal control of complex chemical reactions

Lab Techniques and Training

- Nonlinear digital signal processing techniques
- Scanning Electron Microscopy
- Operation of Rotating Ring Disc Electrode
- Use of MATLAB and LabVIEW softwares
- Modeling electrochemical reactions
- Chemical Vapor Deposition
- Electrochemistry, including potentiometry and cyclic voltammetry (CV)
- Preparation of Samples for High-Performance Liquid Chromatography
- Network topology/ connectomics analysis
- Corrosion analysis with charge transfer resistance measurements

Research

Networks of chemical reaction units

- Design optimal control of complex reaction by measuring system response
- Develop control-based techniques for solving nonlinear mathematical model equations
- Process data using analytical techniques (FFT, Hilbert, etc.)
- Fuel Cell Research
- Oscillatory and bi-stable systems
- Synchronization of periodic and chaotic oscillators

Publications

Gryniewicz, C. M., Spencer, J. A., Hankins, M., & Kauffman, J. F. (2007). Spectroscopic methods for rapid determination of diethylene glycol in glycerin. *American Pharmaceutical Review*, 10(7), 24.

Harada, T., Tanaka, H. A., Hankins, M. J., & Kiss, I. Z. (2010). Optimal waveform for the entrainment of a weakly forced oscillator. *Physical review letters*, 105(8), 088301.

Hankins, M. J., Nagy, T., & Kiss, I. Z. (2013). Methodology for a nullcline-based model from direct experiments: Applications to electrochemical reaction models" *Computers & Mathematics with Applications*, 65(10), 1633-1644.

Hankins, M. J., Yablonsky, G. S., & Kiss, I. Z. (2017). Dual kinetic curves in reversible electrochemical systems. *PloS one*, 12(3), e0173786.

Hankins, M. J., Gáspár, V., & Kiss, I. Z. (2019). Abrupt and gradual onset of synchronized oscillations due to dynamical

quorum sensing in the single-cathode multi-anode nickel electrodisolution system. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 29(3), 033114.

Conferences

- 2010 Midwest Regional ACS Conference – poster presentation
- 2011 Midwest Regional ACS Conference – poster presentation
- 2012 Gordon Research Conference (Dynamic Instabilities) – poster
- 2015 ECS conference – poster presentation
- 2016 ACS Spring National Conference – poster presentation
- 2017-2020 ILSAMP Spring Symposia – judge

Teaching Experience

- Teaching Assistant – General Chemistry Lab (2010-2011)
- Recording lectures for General Chemistry lecture course (2015)
- Large lecture experience (introductory chemistry approx. 160 students)
- Upper level lecture experience (physical chemistry)
- Lab coordinator experience (physical chemistry, engineering chemistry, and general chemistry)

Memberships/Affiliations

- American Chemical Society (ACS)
Co-Chair Elect – Committee for Minority Affairs
- The Electrochemical Society (ECS)
- National Society of Black Engineers (NSBE)

Service/Volunteer Work

- Department of Graduate Education at Saint Louis University
 - Graduate Student Orientation (registration and panel discussion)
 - Program G.R.A.D. (Team leader)
- African American Male Scholars (AAMS) Initiative – Mentor
- African American Studies Department at Saint Louis University
 - Help with hosting inner city schools on campus
 - Visiting youth at inner city schools
- Black Faculty and Staff Association – VP of faculty
- Chemistry Club advisor

Project summary

Methodology for a nullcline-based model from direct experiments: Applications to electrochemical reaction models

- Simulations using existing iron dissolution model displaying non-linear behavior
- Solving ODEs with various parameters and variables
- Using adaptive and PID controllers to isolated the stable and unstable manifolds of the system
- **Conclusion** – Trajectory of oscillations follows the nullcline of the fast variable

Production of graphene-coated nickel electrodes for improvement charge transfer behavior

- Create graphene-coated nickel electrodes
 - Chemical vapor deposition
 - Change temperature and gas concentration/pressure to achieve graphene growth
 - Single and multi-layer graphene electrodes
- Characterize graphene growth using Scanning electron microscopy (SEM)
- Perform linear sweep voltammetry with graphene electrodes
- **Conclusion** – behavior similar to plain nickel cathode

Optimal Waveform for the Entrainment of a Weakly Forced Oscillator

- Experiments with uniform corrosion of nickel
- Use LabView virtual instrumentation to systematically perturb the reactions at different phases
- Measured the power needed to control the corrosion rate of nickel
- Experimental data exchanged with system engineer collaborators
- **Conclusion** – Open-loop control optimizes corrosion response

Awards/Grant Submissions

- FY 2017 Research Equipment and Tools Grant - \$13,000
- NSF Illinois LSAMP Sub-award - \$110,000
- NEH Humanities Connections Implementation Grant (under review) - \$100,000