

Eli Fahrenkrug Ph.D.

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- Experience**
- Assistant Professor** 2017 – Present
Colorado College, Dept. Chemistry & Biochemistry
- Consultant** 2016 – 2018
High Alt. Brewing Consultant Xinduqiao, Tibetan Autonomous Prefecture
Electroplating Consultant, Weiser Co., Bangkok, Thailand
- Visiting Research Scientist** 2016 – 2017
Chinese Academy of Sciences, Institute of Semiconductors, Beijing, CN
Electrochemical Preparation of Nano-perovskite solar cells
- Engineer** 2010 – 2011
Hummingbird Scientific, Lacey, WA
Development of In-situ Transmission Electron Microscopy Sample Holders
- Education**
- University of Michigan** 2011 – 2016
Ph.D., Department of Chemistry
Advisor: Dr. Stephen Maldonado
Thesis: *Electrochemically-modulated semiconductor crystal growth at liquid metal electrodes.*
- The Evergreen State College** 2007 – 2010
B.S. Chemistry, Minor in Chemical Biology
- Teaching**
- CH107: General Chemistry I**
CH108: General Chemistry II
CH241: Introduction to Analytical Chemistry
CH342: Instrumental Chemistry
CH490: Senior Seminar in Chemistry & Biochemistry
- Publications**
- Humphrey, N., Miranda, J., Thomas, B., Kinney, R., **Fahrenkrug, E.**, On-chip Optical Anodic Stripping Voltammetry. *In Preparation.*
- Fahrenkrug, E.**, Hlynchuk, S., Myers, J., Maldonado, S., Direct Covalent Anchoring of SU8 Photoresist Layers to Si(111) Surfaces Leads to Increased Chemical and Mechanical Adhesion Properties. *In Preparation.*
- Buckley, P., **Fahrenkrug, E.**, The Flint, Michigan Water Crisis as an Experiential Case Study for Treating Environmental Justice in an Analytical Chemistry Curriculum. *Submitted.*
- Cheek, Q., **Fahrenkrug, E.**, †Alsem, D. H., †Salmon, N., Maldonado, S. Direct Observation of Ge Nanowire Nucleation in Gallium Nanodroplets with Liquid Cell TEM. *Submitted.*

Bower, N., Brasuel, M., **Fahrenkrug, E.**, Cooney, M., Insights into Geographic and Temporal Variation in Fatty Acid Composition of Croton Nuts using ATR-FTIR. *Int. J. Anal. Chem.*, 1-8, (2018).

Fahrenkrug, E., DeMuth, J.; Ma, L.; Shodiya, T.; Deitz, J. I.; Grassman, T. J.; and Maldonado, S., Electrochemical Liquid Phase Epitaxy (ec-LPE): A New Methodology for the Synthesis of Crystalline Group IV Semiconductor Epifilms. *J. Am. Chem. Soc.*, 139, 6960-6968, (2017).

Fahrenkrug E., Rafson, J., Lancaster, M., Maldonado, S., Concerted Electrodeposition and Alloying of Antimony on Indium Electrodes for Selective Formation of Crystalline Indium Antimonide *Langmuir*, 33, 9280-9287, (2017).

Ma, L., **Fahrenkrug, E.**, *Gerber, E., Maldonado, S., High-Performance Ge Microwire Li-ion Battery Anodes As-Prepared by the Electrochemical Liquid-Liquid-Solid Deposition Process. *ACS Energy Letters*, 2, 238-243 (2017).

Fahrenkrug, E., †Alsem, D. H., †Salmon, N., Maldonado, S., Electrochemical Measurements in In Situ TEM Experiments. *J. Electrochem. Soc.*, 164, H358-H364 (2017).

DeMuth, J., **Fahrenkrug E.**, Maldonado S. Controlling Nucleation and Crystal Growth of Ge in a Liquid Metal Solvent. *Cryst. Growth Des.*, 16, 7130-7138 (2016).

Zhang, T., **Fahrenkrug, E.**, Maldonado, S., Electrochemical Liquid-Liquid-Solid Growth of Crystalline Ge at Hg Microdroplet Ultramicroelectrodes. *J. Electrochem. Soc.* 163, D500-D505 (2016).

Lee S., Bielinski, A., **Fahrenkrug E.**, Dasgupta, N., Maldonado S. Macroporous p-GaP Photocathodes Prepared by Anodic Etching and Atomic Layer Deposition Doping. *ACS Appl. Mater. Inter.* 8, 16178-16185 (2016).

DeMuth, J.; Ma, L.; **Fahrenkrug, E.**, Maldonado, S. Electrochemical Liquid-Liquid-Solid Deposition of Crystalline Gallium Antimonide. *Electrochim. Acta*, 197, 353-362 (2016).

Fahrenkrug E., *Biehl J., Maldonado S. Electrochemical Liquid-Liquid-Solid Crystal Growth of Germanium Microwires on Hard and Soft Conductive Substrates at Low Temperature in Aqueous Solution. *Chem. Mater.* 27, 3389-3396 (2015).

Lee S., **Fahrenkrug E.**, Maldonado S. Synthesis of photoactive ZnSnP₂ semiconductor nanowires. *J. Mater. Res.* 30, 2170-2178 (2015).

Gu J, **Fahrenkrug E.**, Maldonado S. Analysis of the Electrodeposition and Surface Chemistry of CdTe, CdSe, and CdS Thin Films through Substrate-Overlayer Surface-Enhanced Raman Spectroscopy. *Langmuir* 30, 10344-10353 (2014).

Fahrenkrug, E., Gu, J. & Maldonado, S. Electrochemically-Gated Alloy Formation of Crystalline InAs Thin Films at Room Temperature in Aqueous Electrolytes. *Chem. Mat.*, 26, 4535-4543 (2014).

Ma, L.; Gu, J.; **Fahrenkrug, E.**; Maldonado, S., Electrochemical Liquid-Liquid-Solid Deposition of Crystalline Ge Nanowires as a Function of Ga Nanodroplet Size. *J. Electrochem. Soc.* 161, D3044-D3050 (2014).

Fahrenkrug E., Gu J, Jeon S, Veneman PA, Goldman RS, Maldonado S. Room-Temperature Epitaxial Electrodeposition of Single-Crystalline Germanium Nanowires at the Wafer Scale from an Aqueous Solution. *Nano Lett.* 14, 847-852 (2014).

Gu J, **Fahrenkrug E.**, Maldonado S. Direct Electrodeposition of Crystalline Silicon at Low Temperatures. *J. Am. Chem. Soc.* 135, 1684-1687 (2013).

Fahrenkrug, E., Gu, J. & Maldonado, S. Electrodeposition of Crystalline GaAs on Liquid Gallium Electrodes in Aqueous Electrolytes. *J. Am. Chem. Soc.* 135, 330-339 (2012).

*Undergraduate students

†Industrial collaborators

Patents

Fahrenkrug, E., Optical Anodic Stripping Voltammetry, Provisional Patent App.

Maldonado, S.; Demuth, J.; **Fahrenkrug, E.**; Devices and Methods for Electrochemical Liquid Phase Epitaxy. US Patent 20180195203, United States, 2018.

Research Advising

Nicole Chavarria '22, *Fountain Valley Water Project*, CC, 2019.

Rowan Kinney '22, *Optical Bipolar Electrochemistry of Metal Ions in Water*, CC, 2019.

Cecelia Mweka '20, *Electric Field Control of Crystal Polymorphism*, CC, 2019.

Mags Vlasimsky '19, *Fountain Valley Water Project*, CC, 2019.

Cameron McDonald '20, *Developing a Virtual Reality Course Companion for Organic Chemistry*, CC, 2019.

Max Kronstadt '20 (political science). *Fountain Valley Water Project*. CC, 2019

*Presented: SCoRE 2019, Pike's Peak Environmental Forum (invited), Pike's Peak Library district panel (invited).

Sam Sanson '20 (journalism). *Fountain Valley Water Project*. CC, 2019

*Presented: SCoRE 2019, Pike's Peak Environmental Forum (invited), Pike's Peak Library district panel (invited).

Karina Grande '20. *Fountain Valley Water Project*. CC, 2019

*Presented: SCoRE 2019, Pike's Peak Environmental Forum (invited), Pike's Peak Library district panel (invited).

Karina Grande '20. *Fountain Valley Water Project*. CC, 2019

*Presented: SCoRE 2019, Pike's Peak Environmental Forum (invited), Pike's Peak Library district panel (invited).

Keenan Wright '19. *Fountain Valley Water Project*. CC 2018 – 2019

*Presented: SCoRE 2018, Peak Alliance for a Sustainable Future PIPS 2019, CSURF 2019.

Jose Monge-Castro '21. *Finite Element Analysis of Closed Bipolar Electrochemical Cells for Metal Ion Quantification*, CC, 2018.

*Presented: 2018 Associated Colleges of the Midwest Conference, Invited 2019 CC IGNITE, 2019 Colorado College Big Idea Innovation Awards (2nd place, \$10,000).

Riley O'Sullivan '19. *Optical Bipolar Electrochemistry of Metal Ions in Water*, CC 2019

Bradley Thomas '19. *BPE Metal Ion Sensor LED Project*. Colorado College, CC 2018

Nick Humphrey '19. *Optical Bipolar Electrochemistry of Metal Ions in Water*. CC 2018-2019

*Presented: 2019 PittCon National Conference on Analytical Chemistry (Best Undergraduate Poster Award), 2018 SCoRe Symposium, 2019 Colorado College Big Idea Innovation Awards (2nd Place, \$10,000).

Prakhar Gautam '20. *Electric Field Control of Crystal Polymorphism*, CC 2018 – 2019 and *VR Platforms for Chemical Education*, 2019

*Invited presentation: 2018 CC IGNITE, 2019 Colorado College Big Idea Innovation Awards (semi-finalist)

Jeronimo Miranda '18. *BPE Metal Ion Electrochemiluminescence Project*, CC 2018

*Presented: 2019 Colorado College Big Idea Innovation Awards (2nd place, \$10,000).

Eric Gerber. *Germanium Microwires for Lithium Ion Battery Anode Materials*. University of Michigan, 2015-2017.

*Published work in *ACS Energy Mat.* in 2017.

Janel Biehl. *Electrochemical Liquid Liquid Solid Growth of Germanium Microwires*. NSF REU, University of Michigan, Summer 2014.

*Published work in *Chem. Mat.* 2015.

Jessica Rafson. *Electrochemically Induced Alloying of InSb Thin Films*. NSF REU, University of Michigan, Summer 2013.

*Published work in *Langmuir* in 2017.

Scott Su. *Electrodeposition of Single Nanowires on AFM Cantilevers*. High School Student Intern. University of Michigan, 2012.

Awards

Exemplary Achievement in Community-Engaged Research Award, <i>nominee</i>	2019
National Nanotechnology Infrastructure Network Postdoc. Fellowship	2017
Rackham Predoctoral Fellowship	2015
Karle Research Symposium Award	2015
Sokol Graduate Summer Research Fellowship	2013
Rackham Centennial Fellowship	2013
NSF GRFP Honorable Mention	2013
Rackham Travel Award	2011 – 2016

	Rackham Merit Fellowship	2011 – 2013
	Dean's Scholar Award	2008 – 2011
	NSF S-STEM Scholarship	2007 – 2011
Invited Talks	Pike's Peak Environmental Forum	2019
	<i>PFAS Contamination in Southern Colorado Springs</i>	
	Pike's Peak Library District, panel	2019
	<i>PFAS Contamination in Southern Colorado Springs</i>	
	Alum NUM University of Michigan, Panelist	2019
	<i>The Academic Job Search</i>	
	Peak Alliance for a Sustainable Future, SIP	2019
	<i>PFAS Contamination in Southern Colorado Springs</i>	
	Environmental Action Summit, Panelist	2019
	<i>Fountain Valley Water Project and Environmental Justice</i>	
	Nucleation and Growth Research, Kyoto, Japan	2016
	<i>Electron Beam Induced Electrochemical Liquid Liquid Solid Growth of Ge Nanowires</i>	
	Chinese Academy of Sciences, Institute of Semiconductors	2016
	<i>Electrochemically-modulated semiconductor crystal growth at liquid metals</i>	
	Chinese Academy of Sciences, Institute of Chemistry	2016
	<i>Electrochemically-modulated semiconductor crystal growth at liquid metals</i>	
	Northwestern University, Mirkin Research Group, Chemistry	2016
	<i>Electrochemically-Modulated Semiconductor Crystallization at the Liquid Metal-Liquid Electrolyte Interface</i>	
	Stanford University, Chueh Research Group, Materials Science	2016
	<i>Electrochemically-Modulated Semiconductor Crystallization at the Liquid Metal-Liquid Electrolyte Interface</i>	
	PittCon, First Annual Student Symposium in Electroanalysis	2014
	<i>In-situ Spectroelectrochemical Investigation of the Reactive Aqueous Electrodeposition of Crystalline III-V Semiconductor Thin Films</i>	
	Evergreen State College, Hummingbird Scientific	2011
	<i>Correlating Properties and Microstructure of Materials Using in-situ TEM</i>	
Talks	ECS Spring National Meeting, Dallas	2019
	<i>On-Chip Optical Anodic Stripping Voltammetry</i>	
	Thesis Defense, University of Michigan	2016
	<i>Electrochemically-modulated semiconductor crystal growth at liquid metal electrodes</i>	
	ECS Spring National Meeting, Chicago	2015
	<i>Direct Electrochemical Synthesis of Epitaxial Nano- and Micro-wire Arrays at Room Temperature in Water</i>	
	Ohio Inorganic Weekend	2014
	<i>Room Temperature Aqueous Electrochemical Synthesis of Epitaxial Germanium Nano- and Micro-wire Arrays</i>	
	ACS, Central Regional Meeting, Fall	2014
	<i>Epitaxial Electrodeposition of Single Crystal Germanium Nanowire Arrays at Room Temperature in Water</i>	
	PittCon Conference	2014
	<i>In-situ Spectroelectrochemical Investigation of the Reactive Aqueous Electrodeposition of Crystalline III-V Semiconductors</i>	

- *Invited, First Annual Society of Electroanalytical Chemists*
Materials Research Society Spring Meeting, San Francisco 2014
Aqueous Electrochemical Synthesis of Crystalline III-V Thin Films and Group IV Nanowires at or Near Room Temperature
ACS, Central Regional Meeting, Spring 2013
Non-innocent Group III Metal Electrodes for Aqueous Electrodeposition of Crystalline III-V Semiconductors

Posters

- Fahrenkrug, E.**; Gu, J.; Maldonado, S.; *Electrochemical Synthesis of Epitaxial Germanium Nano- and Micro-wire Arrays at Room Temperature in Water*, Gordon Research Symposium & Conference, Electrochemistry, 2016
- Fahrenkrug, E.**; Gu, J.; Maldonado, S.; *Low Temperature Electrochemical Synthesis of Covalent Semiconductor Crystals from Liquid Metal Electrodes*, Karle Research Symposium, U. of Michigan, 2015
- Fahrenkrug, E.**; Gu, J.; Maldonado, S.; *Liquid Metal Electrodes for Direct Electrodeposition of Crystalline Ge Nano- and Microwires*, Gordon Research Symposium & Conference: Electrodeposition, 2014
- Fahrenkrug, E.**; Gu, J.; Maldonado, S.; *Epitaxial Electrodeposition of Single Crystal Germanium Nanowire Arrays at Room Temperature in Water*, Gordon Research Symposium & Conference: Electrochemistry, 2014
- Fahrenkrug, E.**; Gu, J.; Maldonado, S.; *Bench-top Electrochemical Growth of Nanostructured Crystalline Inorganic Semiconductors*, Michigan Green Chemistry and Engineering Conference, 2013
- Fahrenkrug, E.**; Gu, J.; Maldonado, S.; *Bench-top Electrochemical Growth of Nanostructured Crystalline Inorganic Semiconductors*, Vaughan Research Symposium, U. of Michigan, 2013
- Fahrenkrug, E.**; Gu, J.; Maldonado, S.; *Electrodeposition of c-GaAs on Sacrificial Ga(l) Cathodes: Insight into the Electrochemical-Liquid-Liquid-Solid Growth Model*, Gordon Research Symposium & Conference: Electrodeposition, 2012
***elected as chair by my peers for this conference**
- Fahrenkrug, E.**; Gu, J.; Maldonado, S.; *Electrodeposition of Crystalline GaAs on Liquid Gallium Electrodes*, ECS Regional Conference, Detroit, 2012
- Fahrenkrug, E.**; Wiley, T.; Arruda, B.; McKinstry, L.; *Synthesis of Metallocene-Bridged Diphosphines as Suzuki Reaction Catalysts* ACS Regional Conference, Puget Sound, 2010
- Fahrenkrug, E.**; Wiley, T.; Arruda, B.; McKinstry, L.; *Ferrocenyl Phosphine Derivatives as Suzuki Reaction Catalysts* U. Washington Undergraduate Research Symposium, 2010
- Fahrenkrug, E.**; Barlow, C.; *Correlating Chemical Composition and Physical Morphometry Depth Profiles with Meromictic Lake Stability in Two Eastern Washington Lakes*, The Evergreen State College Research Symposium, 2009

Skills	Sensors, Electrochemistry, analytical chemical methods, <i>operando</i> S/TEM, SEM, FIB, Raman spectroscopy, X-ray methods, Auger Spectroscopy, Microfabrication, 3D CAD design, fabrication/machining, electronics assembly & interfacing, metrology.	
College Service	Lab Lecturer Search Committee, Chemistry & Biochemistry	2019 – 2020
	Tenure Track Search Committee, Chemistry & Biochemistry	2019 – 2020
	CSURF Session Chair	2019
	Barnes Scholarship Marketing Departmental Sub-committee	2019
	Innovation Institute: Big Idea, advisor to two teams	2019
	Departmental Workshops on Inclusive Teaching, <i>co-founder</i>	2019 – Present
	Junior STEM Faculty Workshops on Inclusivity, <i>co-founder</i>	2019 – Present
	Community Engaged Research Panel, Fall Conference	2019
	Academic Adviser: <i>8 students</i>	2018 – Present
	Tenure Track Search Committee, Computer Science	2018 – 2019
	Lab Lecturer Search Committee, Chemistry & Biochemistry	2018 – 2019
	CCE Engaged Faculty Luncheons	2018 – 2019
	First SCoRe Research Program	2018 – 2019
	Departmental Academic Assessment Representative	2018 – 2019
	Campus Sustainability Council	2018 – 2019
	Watson Fellowship Committee	2018 – 2019
	Guest Lecturer: Environmental Studies Capstone, EV421	2018
	Sophomore JUMP Dinner	2018
	Guest Lecturer: Field Botany, BE202	2018
	Departmental Research Handbook, <i>co-creator</i>	2018
Professional Development	Excel@CC: Towards a Daily Anti-Racist Agenda – Workshop, CC	2019
	Workshop on the Past, Present, & Future of Liberal Arts, CC	2018
	Excel@CC: Good to Great – Workshop, CC	2018
	Midstates Early Career Workshop, Gustavus Adolphus College	2017