

Christopher A. Gorski

Associate Professor of Civil & Environmental Engineering

Pennsylvania State University
212 Sackett Building
University Park, PA 16802-1408
(814)-865-5673
email: gorski@psu.edu

Appointments

- 08/2019 – present Associate Professor, Department of Civil & Environmental Engineering,
Pennsylvania State University, University Park, PA
- 08/2012 – 07/2019 Assistant Professor, Department of Civil & Environmental Engineering,
Pennsylvania State University, University Park, PA

Professional Preparation

Purdue University	Civil Engineering	B.S., 2005
University of Iowa	Environmental Engineering & Science	Ph.D., 2009
Eawag (Switzerland)	Environmental Chemistry	Post-doc, 2010-2012

Journal Publications

2009

1. Gorski CA, Scherer MM (2009) Influence of magnetite stoichiometry on Fe^{II} uptake and nitrobenzene reduction. *Environmental Science & Technology*, 43(10):3675–3680.

2010

2. Gorski CA, Nurmi JT, Tratnyek PG, Hofstetter TB, Scherer MM (2010) Redox behavior of magnetite: Implications for contaminant reduction. *Environmental Science & Technology*, 44(1):55–60.
3. Gorski CA, Scherer MM (2010) Determination of nanoparticulate magnetite stoichiometry by Mossbauer spectroscopy, acidic dissolution, and powder X-ray diffraction: A critical review. *American Mineralogist*, 95(7):1017–1026.
4. O'Loughlin EJ, Gorski CA, Scherer MM, Boyanov MI, Kemner KM (2010) Effects of oxyanions, natural organic matter, and bacterial cell numbers on the bioreduction of lepidocrocite (γ -FeOOH) and the formation of secondary mineralization products. *Environmental Science & Technology*, 44(12):4570–4576.
5. Rosso KM, Yanina SV, Gorski CA, Larese-Casanova P, Scherer MM (2010) Connecting observations of hematite (α -Fe₂O₃) growth catalyzed by Fe(II). *Environmental Science & Technology*, 44(1):61–67.

2011

6. Gorski CA, Sander M, Aeschbacher M, Hofstetter TB (2011) Assessing the redox properties of iron-bearing clay minerals using homogeneous electrocatalysis. *Applied Geochemistry*, 26:S191–S193.
7. Schaefer MV, Gorski CA, Scherer MM (2011) Spectroscopic evidence for interfacial Fe(II)-Fe(III) electron transfer in a clay mineral. *Environmental Science & Technology*, 45(2):540–545.
8. Gorski, CA, Sander, M, Aeschbacher, M, & Hofstetter, TB (2011) Assessing the redox properties of iron-bearing clay minerals using homogeneous electrocatalysis. *Applied Geochemistry* 26, S191-S193.

2012

9. Chen H, Laskin A, Baltrusaitis J, Gorski CA, Scherer MM, Grassian VH (2012) Coal fly ash as a source of iron in atmospheric dust. *Environmental Science & Technology*, 46(4):2112–2120.
10. Gorski CA, Aeschbacher M, Soltermann D, Voegelin A, Baeyens B, Marques Fernandes M, Hofstetter TB, Sander M (2012) Redox properties of structural Fe in clay minerals. 1. Electrochemical quantification of electron-donating and-accepting capacities of smectites. *Environmental Science & Technology*, 46(17):9360–9368.
11. Gorski CA, Handler RM, Beard BL, Pasakarnis T, Johnson CM, Scherer MM (2012) Fe atom exchange between aqueous Fe²⁺ and magnetite. *Environmental Science & Technology*, 46(22):12399–12407.
12. Gorski CA, Klüpfel L, Voegelin A, Sander M, Hofstetter TB (2012) Redox properties of structural Fe in clay minerals. 2. Electrochemical and spectroscopic characterization of electron transfer irreversibility in ferruginous smectite, SWa-1. *Environmental Science & Technology*, 46(17):9369–9377.
13. Latta DE, Gorski CA, Boyanov MI, O'Loughlin EJ, Kemner KM, Scherer MM (2012) Influence of magnetite stoichiometry on U^{VI} reduction. *Environmental Science & Technology*, 46(2):778–786.
14. Latta DE, Gorski CA, Scherer MM (2012) Influence of Fe²⁺-catalyzed iron oxide recrystallization on metal cycling. *Biochemical Society Transactions*, 40(6):1191–1197.
15. Lilova KI, Pearce CI, Gorski C, Rosso KM, Navrotsky A (2012) Thermodynamics of the magnetite-ulvöspinel (Fe₃O₄-Fe₂TiO₄) solid solution. *American Mineralogist*, 97(8–9):1330–1338.
16. Pearce CI, Qafoku O, Liu J, Arenholz E, Heald SM, Kukkadapu RK, Gorski CA, Henderson CMB, Rosso KM (2012) Synthesis and properties of titanomagnetite (Fe_{3-x}Ti_xO₄) nanoparticles: A tunable solid-state Fe(II/III) redox system. *Journal of colloid and interface science*, 387(1):24–38.

2013

17. Gorski CA, Klüpfel LE, Voegelin A, Sander M, Hofstetter TB (2013) Redox properties of structural Fe in clay minerals: 3. Relationships between smectite redox and structural properties. *Environmental Science & Technology*, 47(23):13477–13485.
18. 2. O'Loughlin EJ, Boyanov MI, Flynn TM, Gorski CA, Hofmann SM, McCormick ML, Scherer MM, Kemner KM (2013) Effects of bound phosphate on the bioreduction of lepidocrocite (γ-FeOOH) and maghemite (γ-Fe₂O₃) and formation of secondary minerals. *Environmental Science & Technology*, 47(16):9157–9166.

2014

19. Luan F, Gorski CA, Burgos WD (2014) Thermodynamic controls on the microbial reduction of iron-bearing nontronite and uranium. *Environmental Science & Technology*, 48(5):2750–2758.
20. Soltermann D, Marques Fernandes M, Baeyens B, Dähn R, Joshi PA, Scheinost AC, Gorski CA (2014) Fe (II) uptake on natural montmorillonites. I. Macroscopic and spectroscopic characterization. *Environmental Science & Technology*, 48(15):8688–8697.

2015

21. Luan F, Gorski CA, Burgos WD (2015) Linear free energy relationships for the biotic and abiotic reduction of nitroaromatic compounds. *Environmental Science & Technology*, 49(6):3557–3565.
22. Luan F, Liu Y, Griffin AM, Gorski CA, Burgos WD (2015) Iron (III)-bearing clay minerals enhance bioreduction of nitrobenzene by *Shewanella putrefaciens* CN32. *Environmental Science & Technology*, 49(3):1418–1426.
23. Sander M, Hofstetter TB, Gorski CA (2015) Electrochemical analyses of redox-active iron minerals: a review of nonmediated and mediated approaches. *Environmental Science & Technology*, 49(10):5862–5878.

2016

24. Gorski CA, Edwards R, Sander M, Hofstetter TB, Stewart SM (2016) Thermodynamic characterization of iron oxide–aqueous Fe²⁺ redox couples. *Environmental Science & Technology*, 50(16):8538–8547.
25. Joshi P, Gorski CA (2016) Anisotropic morphological changes in goethite during Fe²⁺-catalyzed recrystallization. *Environmental Science & Technology*, 50(14):7315–7324.
26. Kar A, McEldrew M, Stout RF, Mays BE, Khair A, Velegol D, Gorski CA (2016) Self-generated electrokinetic fluid flows during pseudomorphic mineral replacement reactions. *Langmuir*, 32(21):5233–5240.
27. Kim T, Rahimi M, Logan BE, Gorski CA (2016) Evaluating battery-like reactions to harvest energy from salinity differences using ammonium bicarbonate salt solutions. *ChemSusChem*, 9(9):981–988.
28. Kim T, Rahimi M, Logan BE, Gorski CA (2016) Harvesting energy from salinity differences using battery electrodes in a concentration flow cell. *Environmental Science & Technology*, 50(17):9791–9797.
29. Tomaszewski EJ, Cronk SS, Gorski CA, Ginder-Vogel M (2016) The role of dissolved Fe (II) concentration in the mineralogical evolution of Fe (hydr) oxides during redox cycling. *Chemical Geology*, 438:163–170.
30. Wu T, Kukkadapu RK, Griffin AM, Gorski CA, Konishi H, Xu H, Roden EE (2016) Interactions between Fe (III)-oxides and Fe (III)-phyllosilicates during microbial reduction 1: Synthetic sediments. *Geomicrobiology Journal*, 33(9):793–806.
31. Zhu X, Rahimi M, Gorski CA, Logan B (2016) A thermally-regenerative ammonia-based flow battery for electrical energy recovery from waste heat. *ChemSusChem*, 9(8):873–879.

2017

32. Gorski CA, Fantle MS (2017) Stable mineral recrystallization in low temperature aqueous systems: A critical review. *Geochimica et Cosmochimica Acta*, 198:439–465.
33. Joshi P, Fantle MS, Larese-Casanova P, Gorski CA (2017) Susceptibility of goethite to Fe²⁺-catalyzed recrystallization over time. *Environmental Science & Technology*, 51(20):11681–11691.
34. Kim T, Gorski CA, Logan BE (2017) Low energy desalination using battery electrode deionization. *Environmental Science & Technology Letters*, 4(10):444–449.
35. Kim T, Logan BE, Gorski CA (2017) A pH-gradient flow cell for converting waste CO₂ into electricity. *Environmental Science & Technology Letters*, 4(2):49–53.
36. 5. Kim T, Logan BE, Gorski CA (2017) High power densities created from salinity differences by combining electrode and Donnan potentials in a concentration flow cell. *Energy & Environmental Science*, 10(4):1003–1012.
37. Rahimi M, D'Angelo A, Gorski CA, Scialdone O, Logan BE (2017) Electrical power production from low-grade waste heat using a thermally regenerative ethylenediamine battery. *Journal of Power Sources*, 351:45–50.
38. Rahimi M, Schoener Z, Zhu X, Zhang F, Gorski CA, Logan BE (2017) Removal of copper from water using a thermally regenerative electrodeposition battery. *Journal of hazardous materials*, 322:551–556.
39. Rahimi M, Zhu L, Kowalski KL, Zhu X, Gorski CA, Hickner MA, Logan BE (2017) Improved electrical power production of thermally regenerative batteries using a poly (phenylene oxide) based anion exchange membrane. *Journal of Power Sources*, 342:956–963.
40. Schaefer MV, Guo X, Gan Y, Benner SG, Griffin AM, Gorski CA, Wang Y, Fendorf S (2017) Redox controls on arsenic enrichment and release from aquifer sediments in central Yangtze River Basin. *Geochimica et Cosmochimica Acta*, 204:104–119.
41. Wu T, Griffin A, Gorski C, Shelobolina E, Xu H, Kukkadapu R, Roden E (2017) Interactions between Fe (III)-oxides and Fe (III)-phyllosilicates during microbial reduction 2: natural subsurface sediments. *Geomicrobiology Journal*, 34(3):231–241.
42. Zhu X, Kim T, Rahimi M, Gorski CA, Logan BE (2017) Integrating reverse-electrodialysis stacks with flow batteries for improved energy recovery from salinity gradients and energy storage. *ChemSusChem*, 10(4):797–803.

2018

43. Aeppli M, Voegelin A, Gorski CA, Hofstetter TB, Sander M (2018) Mediated electrochemical reduction of iron (oxyhydr-) oxides under defined thermodynamic boundary conditions. *Environmental Science & Technology*, 52(2):560–570.
44. Kim T, Gorski CA, Logan BE (2018) Ammonium removal from domestic wastewater using selective battery electrodes. *Environmental Science & Technology Letters*, 5(9):578–583.

45. Rahimi M, Kim T, Gorski CA, Logan BE (2018) A thermally regenerative ammonia battery with carbon-silver electrodes for converting low-grade waste heat to electricity. *Journal of Power Sources*, 373:95–102.
46. Rahimi M, Straub AP, Zhang F, Zhu X, Elimelech M, Gorski CA, Logan BE (2018) Emerging electrochemical and membrane-based systems to convert low-grade heat to electricity. *Energy & Environmental Science*, 11(2):276–285.
47. Stewart SM, Hofstetter TB, Joshi P, Gorski CA (2018) Linking thermodynamics to pollutant reduction kinetics by Fe^{2+} bound to iron oxides. *Environmental Science & Technology*, 52(10):5600–5609.
48. Xiong B, Miller Z, Roman-White S, Tasker T, Farina B, Piechowicz B, Burgos WD, Joshi P, Zhu L, Gorski CA, others (2018) Chemical degradation of polyacrylamide during hydraulic fracturing. *Environmental Science & Technology*, 52(1):327–336.
49. Yan Z, Joshi P, Gorski CA, Ferry JG (2018) A biochemical framework for anaerobic oxidation of methane driven by Fe (III)-dependent respiration. *Nature communications*, 9(1):1642.

2019

50. Chanda P, Gorski CA, Oakes RL, Fantle MS (2019) Low temperature stable mineral recrystallization of foraminiferal tests and implications for the fidelity of geochemical proxies. *Earth and Planetary Science Letters*, 506:428–440.
51. Harouaka K, Gorski CA, Fantle MS (2019) Quantifying Ca exchange in gypsum using a ^{45}Ca tracer: Implications for interpreting Ca isotopic effects in experimental and natural systems. *Geochimica et Cosmochimica Acta*, 259:371–390.
52. O'Loughlin EJ, Gorski CA, Flynn TM, Scherer MM (2019) Electron donor utilization and secondary mineral formation during the bioreduction of lepidocrocite by *Shewanella putrefaciens* CN32. *Minerals*, 9(7):434.
53. Son M, Kim T, Yang W, Gorski CA, Logan BE (2019) Electro-forward osmosis. *Environmental Science & Technology*, 53(14):8352–8361.

2020

54. Chen G, Hofstetter TB, Gorski CA (2020) Role of carbonate in thermodynamic relationships describing pollutant reduction kinetics by iron oxide-bound Fe^{2+} . *Environmental Science & Technology*, 54(16):10109–10117.
55. Fortunato J, Pena J, Benkaddour S, Zhang H, Huang J, Zhu M, Logan BE, Gorski CA (2020) Surveying manganese oxides as electrode materials for harnessing salinity gradient energy. *Environmental Science & Technology*, 54(9):5746–5754.
56. Huang W, Komarneni S, Gorski C, Noh YD, Doroski A, Dong Y, Ma J, Griffin AM, Yang D, Xue X, others (2020) Few-layer clayenes for material and environmental applications. *ACS applied materials & interfaces*, 12(9):11171–11179.
57. Pothanamkandathil V, Fortunato J, Gorski CA (2020) Electrochemical desalination using intercalating electrode materials: a comparison of energy demands. *Environmental Science & Technology*, 54(6):3653–3662.

58. Shi L, Rossi R, Son M, Hall DM, Hickner MA, Gorski CA, Logan BE (2020) Using reverse osmosis membranes to control ion transport during water electrolysis. *Energy & Environmental Science*, 13(9):3138–3148.
59. Son M, Aronson BL, Yang W, Gorski CA, Logan BE (2020) Recovery of ammonium and phosphate using battery deionization in a background electrolyte. *Environmental Science: Water Research & Technology*, 6(6):1688–1696.
60. Son M, Kolvek E, Kim T, Yang W, Vrouwenvelder JS, Gorski CA, Logan BE (2020) Stepwise ammonium enrichment using selective battery electrodes. *Environmental Science: Water Research & Technology*, 6(6):1649–1657.
61. Son M, Pothanamkandathil V, Yang W, Vrouwenvelder JS, Gorski CA, Logan BE (2020) Improving the thermodynamic energy efficiency of battery electrode deionization using flow-through electrodes. *Environmental Science & Technology*, 54(6):3628–3635.

2021

62. Boualavong J, Gorski CA (2021) Electrochemically Mediated CO₂ Capture Using Aqueous Cu (II)/Cu (I) Imidazole Complexes. *ACS ES&T Engineering*, 1(7):1084–1093.
63. Cheng Y, Hall DM, Boualavong J, Hickey RJ, Lvov SN, Gorski CA (2021) Influence of Hydrotropes on the Solubilities and Diffusivities of Redox-Active Organic Compounds for Aqueous Flow Batteries. *ACS omega*, 6(45):30800–30810.
64. Fortunato J, Sassini MB, Chervin CN, Parker JF, DeBlock RH, Gorski CA, Long JW (2021) Optimizing Electrodeposited Manganese Oxide at Carbon Cloth Electrodes for Harvesting Salinity-Gradient Energy. *Journal of The Electrochemical Society*, 168(2):024505.
65. O'loughlin EJ, Boyanov MI, Gorski CA, Scherer MM, Kemner KM (2021) Effects of Fe (III) oxide mineralogy and phosphate on Fe (II) secondary mineral formation during microbial iron reduction. *Minerals*, 11(2):149.
66. Rossi R, Hall DM, Shi L, Cross NR, Gorski CA, Hickner MA, Logan BE (2021) Using a vapor-fed anode and saline catholyte to manage ion transport in a proton exchange membrane electrolyzer. *Energy & Environmental Science*, 14(11):6041–6049.
67. Shi L, Newcomer E, Son M, Pothanamkandathil V, Gorski CA, Galal A, Logan BE (2021) Metal-ion depletion impacts the stability and performance of battery electrode deionization over multiple cycles. *Environmental Science & Technology*, 55(8):5412–5421.
68. Springer R, Cross NR, Lvov SN, Logan BE, Gorski CA, Hall DM (2021) An all-aqueous thermally regenerative ammonia battery chemistry using Cu (I, II) redox reactions. *Journal of The Electrochemical Society*, 168(7):070523.

2022

69. Chen G, Thompson A, Gorski CA (2022) Disentangling the size-dependent redox reactivity of iron oxides using thermodynamic relationships. *Proceedings of the National Academy of Sciences*, 119(40):e2204673119.

70. Cross NR, Rau MJ, Lvov SN, Gorski CA, Logan BE, Hall DM (2022) Power and energy capacity tradeoffs in an all-aqueous copper thermally regenerative ammonia battery. *Journal of Power Sources*, 531:231339.
71. Ganesan A, Zimudzi TJ, Pothanamkandathil V, Gorski CA, Hall DM (2022) Spectroelectrochemical Examination of the Ferro-Ferricyanide Redox Reaction: Impacts of Electrode Thickness and Applied Potential. *Journal of The Electrochemical Society*, 169(10):106501.
72. Joshi P, Fantle MS, Boualavong J, Gorski CA (2022) Quantifying the rate of Fe^{2+} -catalyzed recrystallization based on a unifying model framework. *Geochimica et Cosmochimica Acta*, 336:423–435.
73. Pothanamkandathil V, Gorski CA (2022) Comparing energy demands and longevities of membrane-based capacitive deionization architectures. *Environmental Science: Water Research & Technology*, 8(7):1489–1496.
74. Shi L, Bi X, Newcomer E, Hall DM, Gorski CA, Galal A, Logan BE (2022) Co-precipitation synthesis control for sodium ion adsorption capacity and cycle life of copper hexacyanoferrate electrodes in battery electrode deionization. *Chemical Engineering Journal*, 435:135001.
75. Shi L, Bi X, Newcomer E, Hall DM, Gorski CA, Logan BE (2022) Thermodynamic and Kinetic Analyses of Ion Intercalation/Deintercalation Using Different Temperatures on NiHCF Electrodes for Battery Electrode Deionization. *Environmental Science & Technology*, 56(12):8932–8941.

2023

76. Boualavong J, Papakonstantinou KG, Gorski CA (2023) Determining desired sorbent properties for proton-coupled electron transfer-controlled CO_2 capture using an adaptive sampling-refined classifier. *Chemical Engineering Science*, 274:118673.
77. Cross NR, Rau MJ, Lvov SN, Gorski CA, Logan BE, Hall DM (2023) System efficiency and power assessment of the all-aqueous copper thermally regenerative ammonia battery. *Applied Energy*, 339:120959.
78. Cross, NR, Vazquez-Sanchez, H, Rau, MJ, Lvov, SN, Hickner, MA, Gorski, CA, Nagaraja, SS, Sarathy, SM, Logan, BE and Hall, DM, (2023) Hydrocarbon-based membranes cost-effectively manage species transport and increase performance in thermally regenerative batteries. *Electrochimica Acta*, p.143090.

Parts of Books

1. Gorski, C., & Scherer, M. M. (2011). Fe^{2+} Sorption at the Fe Oxide-Water Interface: A Revised Conceptual Framework. In Tratnyek, P. G.; Grundl, T. J.; Haderlein, S. B. (Eds.), *Aquatic Redox Chemistry*. (1071), (pp. 315-343). Peer-reviewed/refereed., ISBN/ISSN: 978-0-8412-2652-4

Externally Funded Research Projects

- *Thermodynamics and Redox Reactivity of Birnessite*. (PI: Gorski, C.A.; Co-PI: Heaney, P.) National Science Foundation: Environmental Chemistry. August 2023 – July 2025. \$425,346.

- *Development of an All-Aqueous Thermally Regenerative Redox Flow Battery to Support Fossil Fuel Assets.* (PI: Hall, D.E.; Co-PIs: Gorski, C.A., Lvov, S., Rau, M., Logan, B.E.) Department of Energy. March 2021 – February 2023. \$250,000.
- *Integrated electrode-membrane assemblies for energy efficient MCDI across the salinity spectrum.* (PI: Arges, C.; Co-PI: Gorski, C.A.) Office of Naval Research. July 2022 – June 2025. \$570,000.
- *Enabling Hydrogen Gas Production from Seawater Using Electrolytes Contained by Reverse Osmosis Membranes.* (PI: Logan, B.E.; Co-PI: Gorski, C.A. and Hickner, M.A.) National Science Foundation: Environmental Engineering. September 2020 – August 2023. \$300,000.
- *CAREER: Battery-inspired electrodes for efficiently desalinating water or harvesting salinity gradient energy.* (PI: Gorski, C.A.) National Science Foundation: Environmental Engineering. August 2018 – July 2023. \$500,000.
- *Materials and configurations for improved desalination performance using battery electrode deionization (BDI).* (PI: Loban, B.E.; Co-PI: Gorski, C.A.). U.S.-Egypt Joint Science and Technology Fund. July 2019 – June 2022. \$200,000.
- *Development of an All-Aqueous Thermally Regenerative Redox Flow Battery to Support Fossil Fuel Assets.* (PI: Hall, D.; Co-PI: Gorski, C.A., Logan, B.E., Lvov, S., Rau, M.). Department of Energy: Advanced Energy Storage Initiative Program. June 2021 – May 2023. \$312,500.
- *Linking Thermodynamics to Pollutant Reduction Rates by Fe(II) Bound to Iron Oxides.* (PI: Gorski, C.A.) National Science Foundation: Environmental Chemical Sciences. August 2018 – January 2021. \$361,265.
- *SusChem: Manganese oxide supercapacitor charging/discharging mechanisms to capture energy using capacitive mixing (CapMix).* (PI: Gorski, C.A.; Co-PI: Logan, B.E.) National Science Foundation: CBET Environmental Engineering. August 2016 – July 2019. \$330,000.
- *INGaR: Enhanced Gas Recovery using Chemical-Mechanical Fracturing.* (PI: Velegol, D.; Co-PI: Gorski, C.A.) Halliburton Energy Services. September 2015 – August 2016. \$169,296.
- *EAGER: SusChem: Enhanced electricity production from engineered salinity gradients using capacitive mixing.* (PI: Logan, B.E.; Co-PI: Gorski, C.A.) National Science Foundation: CBET Environmental Engineering. April 2015 – December 2015. \$130,000.
- *Collaborative Research: Recrystallization of Stable Iron Oxides in Reducing Environments.* (PI: Gorski, C.A.; Co-PI: Fantle, M.S.). National Science Foundation: EAR Geobiology and Low-temp geochemistry. August 2015 – July 2017. \$199,941.
- *Evaluate the Role of Fe-rich Mineral Phases in Controlling Tracer/ Contaminant Behavior.* (PI: Burgos, W.D.; Co-PI: Gorski, C.A.). Department of Energy: National Energy Technology Laboratory. November 2013 – November 2014. \$69,200.
- *Geochemical transformations caused by CO₂ injection or leakage.* (PI: Burgos, W.D.; Co-PI: Gorski, C.A.). Department of Energy: National Energy Technology Laboratory November 2012 – March 2014. \$111,450.
- *Redox reactivity of iron-bearing clay minerals.* (PI: Gorski, C.A.) National Science Foundation: International Research Fellowship Program (IRFP). 2010. Amounted awarded: \$139,500. (Awarded but declined due to an alternative funding source).

Internally Funded Research Projects

- *Optimizing Sorbent Properties for Aqueous Electrochemical CO₂ Capture.* (PI: Gorski, C.A.; Co-PI: Boualavong, J.) Institutes of Energy and the Environment (IEE) and the Institute for Computational and Data Sciences' (ICDS) Research Innovations with Scientists and Engineers (RISE) seed grant program. January 2023 – May 2023. \$15,000.
- *Constraining Olivine Carbonation Rates in Igneous Mafic Formations.* (PI: Fantle, M.S.; Co-PI: Gorski, C.A.) IEE Seed grant program, Area: Climate & Ecosystem Change: Climate Solutions. May 2023 – December 2023. \$30,000.
- *New Low-Cost Flow Battery Chemistries via Ligand-Enhanced Redox Reactions.* (PI: Hall, D.; Co-PI: Gorski, C.A.; Co-PI: Lvov, S.) Materials for Enhancing Energy and Environmental Stewardship Seed Grant Program. May 2019 – May 2020. \$40,000.
- *Unifying electrochemistry researchers at Penn State to identify strategic strengths and opportunities.* (PI: Gorski, C.A.) Energy 2100 Faculty Fellow Program. May 2019 – May 2020. \$12,000.
- *Utilizing hydrotropes to increase flow battery storage densities.* (PI: Gorski, C.A.; Co-PI: Hickey, R.; Co-PI: Logan, B.E.) IEE Seed Grant – Smart Energy Systems. May 2018 – December 2018. \$25,000.
- *Optimizing the conversion of salinity gradient energy into electrical power through computational simulations.* (PI: Gorski, C.A.; Co-PI: Dabo, I.) IEE Seed Grant – Future Energy Supplies. May 2017 – December 2017. \$25,000.
- *pH-gradient flow batteries for generating electricity from waste CO₂ streams.* (PI: Gorski, C.A.; Co-PI: Logan, B.E.) MRI-PSIEE Seed Grant - Convergence between Materials and Energy. May 2016 – June 2016. \$10,000.
- *High Pressure/High Temperature Reactor Systems for Unconventional Oil and Gas Research.* (PI: Burgos, W.D.; Co-PIs: Gorski, C.A., Alger, M., Velegol, D.) Research Equipment Grant, College of Engineering Penn State University. March 2015 – February 2016. \$114,230.
- *Chromium fate in groundwater systems: In situ investigation of chromium oxidation by manganese dioxide using electrochemical and synchrotron diffraction analyses.* Penn State Institute of Energy and the Environment (PSIEE) Seed grant. (PI: Gorski, C.A.; Co-PI: Heaney, P.). March 2015 – December 2015. \$25,000.

Advising

Completed PhD Students

- Jonathan Boualavong. *Energy-Rate Tradeoffs in Electrochemical Carbon Capture.* (January 2019 – May 2023).
- Yingchi Cheng. *Electrochemical Characterization of Redox Cycling for Energy Storage and Desalination.* (August 2018 – December 2022).
- Jenelle Fortunato. *Selection and characterization of manganese oxide electrodes for harnessing salinity gradient* (July 2016 – December 2020).
- Prachi Joshi. *The role of crystal defects in Fe²⁺-catalyzed recrystallization of iron oxides.* (May 2015 – May 2018).

- Mohammad Rahimi (Co-advised, Chemical Engineering) *Thermally Regenerative Ammonia Batteries for Converting Low-Grade Waste Heat to Electricity*. (). (January 2015 – December 2017).

In-progress PhD Students

- Vineeth Pothanamkandathil. *Tentative title: Charge storage mechanisms in intercalation materials*. (January 2020 – present).
- Timothy Hudak. (Co-advised, Chemical Engineering) *Redox Mediated Electrochemical Desalination*. (August 2022 – present).
- Anthony Pompa. (Co-advised, Chemistry) *Constraining olivine carbonation rates for CO₂ sequestration in igneous rock formations*. (January 2023 – present).

Completed Post-doctoral Scholars

- Le Shi. Co-advised with Bruce Logan. *Electrochemical Water Desalination*. (January 2020 – December 2022).
- Gongde Chen. *Thermodynamics to Pollutant Reduction Rates by Fe(II) Bound to Iron Oxides*. (February 2019 – October 2021).
- Taeyoung Kim. Co-advised with Bruce Logan. *Battery electrodes to harvest salinity gradient energy and desalinate water*. (January 2015 – August 2018).
- Xiuping Zhu. Co-advised with Bruce Logan. *Converting waste heat to electricity*. (January 2015 – 2016).
- Fubo Luan. Co-advised with William Burgos. *Reactivity of Fe(II)-bearing clay minerals with environmental contaminants*. (January 2015 – December 2017).

Completed Masters Students

- Vineeth Pothanamkandathil. *Comparing intercalation electrodes for energy efficient brackish water desalination*. (August 2018 – December 2019).
- Sydney Stewart. *Explaining Reaction Rates Between Iron Oxide-Associated Ferrous Iron and Nitrobenzene*. (August 2015 – May 2017).
- S. Sarah Cronk. *Soil Organic Carbon Protection in the Presence of Iron Oxides*. (August 2013 – December 2016).
- Prachi Joshi. *Morphological Changes in Goethite during Atom Exchange with Aqueous Fe²⁺*. (August 2013 – May 2015).
- Rebecca Edwards. *Measuring Reduction Potentials of Fe Oxide – Aqueous Fe²⁺ Redox Couples Using Mediated Electrochemical Techniques*. (January 2013 – August 2015).

Awards & Honors

- Environmental Science & Technology and Environmental Science & Technology Letters Virtual Issue: Early Career Scientists. (2019).
- NSF CAREER Award, National Science Foundation. (2018).

- Excellence in Review Award, Environmental Science & Technology Letters. (2018).
- Excellence in Review Award, Environmental Science & Technology. (2016).
- Emmert H. Bashore Faculty Development Professorship, Pennsylvania State University. (2012 - 2014).
- Telluride Science Research Center's Peter Salamon Award for Young Scientists, Telluride Science Research Center. (2012).
- C. Ellen Gonter Environmental Chemistry Paper Award, American Chemical Society. (2009).

Advisee Awards

Mohammad Rahimi

- Best Presentation Award at the Graduate Research Symposium in Chemical Engineering (Penn State University). 2017.

Jenelle Fortunato

- Penn State College of Engineering Graduate Excellence Fellowship. Fall 2016 – Fall 2017.
- Young Scientist Best Poster Award. 232nd National Electrochemical Society Meeting. October, 2017, National Harbor, MD.
- Best Poster Award. Student Association of Environmental Science and Engineering at Penn State. "A Flavin-based flow battery that recharges with waste heat or CO₂ emissions." April, 2017.

Taeyoung Kim

- "Electricity production from CO₂ and air in an entropic energy flow cell." Best Poster at Penn State Energy Days 2016 Conference in the Technology/Materials/Energy Storage category. May 19-20, 2016.

S. Sarah Cronk

- "The role of iron minerals in preserving organic carbon during aerobic degradation." Second Place for Best Poster. Environmental Chemistry Student Symposium at Penn State. April, 2016.
- Penn State College of Engineering Graduate Excellence Fellowship. Fall 2014 – Fall 2017.

Prachi Joshi

- American Chemical Society (ACS) – Geochemistry division student Travel award for the 2016 Spring National Meeting in San Diego for her talk "Mineralogical Changes in Goethite during Goethite-Fe(II) Atom Exchange: a Microscopic and ⁵⁵Fe-Tracer Study".

Patrick Dugan

- Penn State College of Engineering REU - Summer 2015.

Aron Griffin

- Penn State College of Engineering REU - Summer 2014.

Rebecca Edwards

- NSF Graduate Research Fellowship (Awarded 2014).

Select Invited Presentations

- *Using Electrodes for Desalination*. Environmental Sciences: Water - Gordon Research Conference 2022. June 19 – June 24, 2022. Holderness, NH.
- *Electrochemical analyses of redox-active minerals: Insights and persisting challenges*. Electrochemical Society (ECS) National Meeting. October 9 – 13, 2022. Atlanta, GA.
- *Nagging Free Energy Relationships*. University of Delaware, Environmental Engineering Seminar. December 2, 2022.
- *Experimentally comparing MCDI architectures in terms of energy demand and longevity*. International Capacitive deionization and electrosorption meeting. October 2021. (Virtual).
- *Rationally selecting electrode materials for harvesting salinity gradient energy*. American Chemical Society National Meeting. Orlando, FL. 4/2/19.
- *Rationally selecting intercalating electrode materials for the water-energy nexus*. Material Research Society National Meeting. Phoenix, AZ. 4/20/19.
- *What I think about when I think about Fe(II)-catalyzed recrystallization*. Biogeochemistry and Redox Transformations of Iron Workshop. Lech, Austria. 8/1/18.
- *Battery-Inspired Systems for Capturing Salinity Gradient Energy*. **Keynote**. Environmental Sciences: Water Gordon Research Seminar, Holderness, NH. June 2018.
- *Electrochemical Characterization of Manganese Oxide Electrodes for Water Desalination and Renewable Energy Production*. American Chemical Society National Meeting. 3/22/18.
- *Assessing the role of oxide-associated Fe²⁺ in contaminant reduction reactions*. John Hopkins University. Department of Geography and Environmental Engineering Seminar Series. 11/30/16.
- *Quantifying Mineral Redox Properties*. University of Delaware, Newark, Delaware. Civil and Environmental Engineering Seminar Series. 11/13/15.
- *Radionuclide-Mineral Redox Interactions: Current Progress and Future Outlook*. **Keynote**. Goldschmidt Conference. Prague, Czech Republic. 8/16/15-8/22/15.
- *Measuring and controlling reduction potentials in Fe oxide suspensions*. Science Research Center: Biogeochemistry and Redox Transformations of Iron Workshop. Telluride, CO. 8/4/14-8/8/14.
- *Mediated electrochemical analyses to characterize redox-active geochemical phases: Application to iron-bearing clay minerals*. Goldschmidt Conference. Florence, Italy. 8/25/13.
- *Dynamics of electron transfer to and from Fe-bearing minerals: Electrochemical characterization of redox properties*. Telluride Science Research Center: Biogeochemistry and Redox Transformations of Iron Workshop. Telluride, CO. 8/6/12-8/10/12.
- *Interfacial redox chemistry in aquatic environments: From minerals to mediators*. Providence, RI. Brown University. 3/5/12.

- *Influence of magnetite stoichiometry on Fe(II) uptake and nitrobenzene reduction*. Zurich, Switzerland. Environmental Chemistry dept., ETH, Swiss Federal Institute of Technology. 6/12/09.
- *Influence of magnetite stoichiometry on Fe(II) uptake and nitrobenzene reduction*. Tübingen, Germany. Institute of Geosciences, Tübingen University. 6/10/09.

Professional Memberships

- American Chemical Society (ACS) (Member, 2006–present)
- Association of Environmental Engineering and Science Professors (AEESP) (Member, 2012–present)
- Electrochemical Society (ECS) (Member, 2019–present)

Synergistic Activities

Editorial Board Membership

- Environmental Science & Technology: Editorial Advisory Board Member. October 2020 - Present.

Journal Reviewer

- Science, Nature, PNAS, Environmental Science & Technology, Environmental Science & Technology Letters, Chemical Reviews, Electrochemistry Communications, Geochimica et Cosmochimica Acta, The Journal of Physical Chemistry, Clays and Clay Minerals, Metals, Environmental Chemistry, Langmuir, Journal of Nanoparticulate Research, European Mineralogy Union book series.

Proposal Reviewer

- U.S. National Science Foundation, Department of Energy, Swiss National Science Foundation, Penn State Institutes of Energy and the Environment (PSIEE) Seed Grant Program, Penn State College of Engineering REU program.

Symposium Organizer

- *Aquatic Redox Chemistry*. American Chemical Society National Meeting. March 2024. New Orleans, LA.
- *Aquatic Redox Chemistry*. American Chemical Society National Meeting. March 2023. Indianapolis, IA.
- *Electrochemistry in the Environment*. Electrochemical Society National Meeting. October 2022. Atlanta, GA.
- *Processes: Osmotically-Driven Membrane Processes for Water and Energy*. North American Membrane Society (NAMS) meeting. Pittsburgh, Pennsylvania. May 2019.
- *Creating and Exploiting Salinity Gradients*. American Chemical Society National Meeting. August 2016. Philadelphia, PA.
- *Redox and Radical Biogeochemistry*. Goldschmidt Conference, Prague, Czech Republic. August 2015.
- *Global Biogeochemical Cycles in the Anthropocene*. Association of Environmental Engineering and Science Professors (AEESP) bi-annual conference. August 2013.

- *Iron redox transformations and their impact on trace elements in natural and engineered systems*. Goldschmidt Conference, Florence, Italy. August 2013.

Service to Penn State University

University

Academic Leadership and Support Work

- Reviewer for IEE Seed grant program, IEE, Reviewer. 2016, 2017, 2021, 2022.
- Energy 2100 Fellow - Electrochemistry, Administrator. (May 2019 - May 2020).
- Tasked with organizing researchers across the university working on electrochemistry to strategically pursue funding opportunities and improve education.

Committee Work

- Awards Committee, Institute for Energy and the Environment (IEE), Chairperson. (October 2022 - Present).
- Search committee member for faculty hire as part of the Consortium for Integrated Energy Systems (CIES), Member. (October 2020 - Present).
- Member of Dept. of Geosciences Faculty Search Committee, Faculty. (August 2015 - June 2016).
- A group formed to make decisions for how University contributed funds for new instrumentation dedicate to research in energy and environmental studies should be spent., Member. (September 2013 - 2015). *A group formed to make decisions for how University contributed funds for new instrumentation dedicate to research in energy and environmental studies should be spent.*

College

Academic Leadership and Support Work

- CoE NSF Career Panel - panel member discussing strategies, Contributor. (April 2019).
- CoE Summer REU proposal reviewer (10 proposals). (April 2015).
- CoE Summer REU proposal reviewer (6 proposals). (April 2014).

Assistance to Student Organizations

- Annual Environmental Chemistry & Microbiology Student Symposium (ECMSS), Judge. (March 1, 2013 - March 31, 2013).

Committee Work

- Engineering Voting Unit Nominating Committee for the Faculty Senate and Graduate Council Elections, Member. (November 2014 - April 2015).
- Engineering Librarian Search Committee, Participant. (March 1, 2013 - April 30, 2013). *Interviewed candidates for faculty openings in the Engineering Library.*

Department of Civil & Environmental Engineering

Academic Leadership and Support Work

- Area Coordinator (Environmental), Organizer. (May 2020 - May 2021).
- Director of Environmental Engineering Minor. (August 2015 - August 2018).

Committee Work

- Promotion and Tenure Committee, Member. (August 2022 - Present).
- CEE Undergraduate Committee, Organizer. (August 2020 – August 2023).
- Dept. Head Advisory Committee, Member. (August 2021 - May 2022).
- Covid 19: Research ramp up committee, Member. (May 2020 - August 2020).
- CEE Undergraduate Committee, Committee Member. (September 2017 - May 2020).
- Search Committee for Water Resources hire, Member. (September 2016 - March 2017).
- Dept. Events Committee, Director. (August 2014 - August 2015).
- CEE Undergraduate Committee, Member. (August 1, 2013 - August 1, 2014).
- CEE Safety Committee, Member. (August 1, 2012 - August 31, 2013).