

Stephen Gibbs

Ph. D. Candidate, University of Texas at Austin

sgibbs93@utexas.edu

EDUCATION

Ph.D. Chemical Engineering

Fall 2016 – Present

University of Texas at Austin

Advisor: Prof. Delia Milliron

Expected Graduation: Summer 2021

NSF Graduate Research Fellow

B.S. Chemical Engineering

Fall 2012 – Spring 2016

University of Florida, Gainesville

Undergraduate Thesis Advisor: Prof. Carlos Rinaldi

Thesis: *Synthesis of Monodisperse, Magnetic Nanoparticles for Biomedical Applications*

Minor in Spanish Language

Summa Cum Laude

DOCTORAL RESEARCH

My thesis work centers on leveraging colloidal synthetic techniques and optical modeling to study **localized surface plasmon resonance** in **doped semiconductor nanocrystals** (NCs) for use in emerging opto-electronic applications such as smart windows, infrared sensors, and photocatalysts. Specifically, I developed a model that incorporated **ensemble heterogeneity** and surface electron depletion to extract **single NC optical properties** from facile, benchtop optical measurements of NC dispersions. I also improved upon an existing slow-injection technique to synthesize NCs with **non-uniform dopant profiles** and was able to illustrate through experiment and modeling that the resulting dual-mode plasmonic response derived from intra-NC dopant segregation. I've also collaborated to use doped NCs as electron acceptors from the electroactive bacteria, *Shewanella oneidensis*. By modeling the change in the plasmonic response, the NCs serve as a ***in situ* infrared sensors** for the rate of extracellular electron transfer.

TEACHING AND MENTORING

First ChEnnections Mentorship Program

July 2020 - Present

McKetta Department of Chemical Engineering

- Paired with incoming first year graduate students to guide them in their first semester.

Teaching Assistant

University of Texas at Austin

Graduate Materials Physics

Spring 2019

Undergraduate Chemical Engineering Materials

Fall 2018

University of Florida

Material and Energy Balances

Fall 2015

Undergraduate Research Mentor

Fall 2017 - Present

Milliron Research Group

**denotes authorship credit on a publication*

Stephen Gibbs
sgibbs93@utexas.edu

- Christopher Dean* – colloid preparation and FT-IR Summer 2019 – present
- Joey Saad* – nanocrystal synthesis Summer 2018 – Spring 2019
- Yongdan Wang* – UV-vis spectroscopy and colloid preparation Fall 2017 – Spring 2020
- Ashley Bird – nanocrystal synthesis Fall 2017 – Spring 2018

LEADERSHIP & INVOLVEMENT, UNIVERSITY OF TEXAS AT AUSTIN

Graduate Chemical Engineering Leadership Council (GLC)

President Fall 2019 – Summer 2020

- Led an executive board serving chemical engineering graduate students. Communicated with faculty and staff, organized community outreach, and hosted enrichment events

Lab Design

Milliron Research Group Spring 2017 - Present

- Led the design of new lab space for the Energy Engineering Building (EEB) and helped customize what will become the Milliron lab space when EEB is move-in ready

Graduate Student Assembly (GSA)

Representative for the Chemical Engineering Department Fall 2018 – Spring 2019

- Served as liaison between GSA and constituents in order to bring to attention to the concerns within my department as well as disseminate pertinent information discussed in bi-weekly GSA meetings

Research Proposal Lead

Fall 2018

- Successfully led a team of post-docs and graduate students to acquire an NSF Division of Chemistry proposal. The proposal was entitled “Near-field coupling between molecular vibrations and plasmonic metal oxide nanocrystals.”

RELEVANT LAB TECHNIQUES AND SKILLS

- Spectroscopy: FT-IR, UV-vis, XPS, ICP-OES, Ellipsometry
- Microscopy: STEM, AFM
- Scattering: XRD, SAXS
- Software: MATLAB, Python, Igor Pro, Adobe Illustrator

HONORS & AWARDS

- National Science Foundation Graduate Research Fellow
- University Continuing Fellowship – awarded for major accomplishments since entering graduate school, a well-defined program of research, and a strong personal statement

PUBLICATIONS, UNIVERSITY OF TEXAS AT AUSTIN

- Graham, A. J.*; Gibbs, S. L.*; Saez Cabezas, C. A.*; Wang, Y.; Green, A. M.; Milliron, D. J.; Ketiz, B. K.; *In Situ* Optical Quantification of Planktonic Extracellular Electron Transfer using Plasmonic Metal Oxide Nanocrystals. *Submitted*.
<https://doi.org/10.1101/2020.10.13.336008>

Stephen Gibbs
sgibbs93@utexas.edu

- Gibbs, S. L.*; Staller, C. M.*; Saez Cabezas, C. A.; Milliron, D. J. Intrinsic Optical and Electronic Properties from Quantitative Analysis of Plasmonic Semiconductor Nanocrystal Ensembles. *JPCCC*. **2020**, 124 (44), 24351–24360. <https://doi.org/10.1021/acs.jpcc.0c08195>
- Gibbs, S. L.; Dean, C.; Saad, J.; Tandon, B.; Staller, C. M.; Agrawal, A.; Milliron, D. J. Dual-Mode Infrared Absorption by Segregating Dopants within Plasmonic Semiconductor Nanocrystals. *Nano Lett.* **2020**, 20 (10), 7498–7505. <https://doi.org/10.1021/acs.nanolett.0c02992>
- Kim, K.; Reimnitz, L. C.; Cho, S. H.; Noh, J.; Dong, Z.; Gibbs, S. L.; Korgel, B. A.; Milliron, D. J. Effect of Nonincorporative Cations on the Size and Shape of Indium Oxide Nanocrystals. *Chem. Mater.* **2020**. *Just Accepted*. <https://doi.org/10.1021/acs.chemmater.0c03281>
- Blemker, M.; Gibbs, S. L.; Raulerson, E.; Milliron, D. J.; Roberts, S.; Modulation of the Visible Absorption and Reflection Profiles of ITO Nanocrystal Thin Films by Plasmon Excitation. *ACS Phot.* **2020**. 7 (5), 1188–1196. <https://doi.org/10.1021/acsphotonics.9b01825>
- Staller, C. M.*; Gibbs, S. L.*; Saez Cabezas, C. A.; Milliron, D. J. Quantitative Analysis of Extinction Coefficients of Tin-Doped Indium Oxide Nanocrystal Ensembles. *Nano Lett.* **2019**. 19 (11), 8149–8154. <https://doi.org/10.1021/acs.nanolett.9b03424>
- Gibbs, S. L.; Staller, C. M.; Milliron, D. J. Surface Depletion Layers in Plasmonic Metal Oxide Nanocrystals. *Acc. Chem. Res.* **2019**, 52 (9), 2516–2524. <https://doi.org/10.1021/acs.accounts.9b00287>
- Staller, C. M.; Robinson, Z. L.; Agrawal, A.; Gibbs, S. L.; Greenberg, B. L.; Lounis, S. D.; Kortshagen, U. R.; Milliron, D. J. Tuning Nanocrystal Surface Depletion by Controlling Dopant Distribution as a Route Toward Enhanced Film Conductivity. *Nano Lett.* **2018**, 18 (5), 2870–2878. <https://doi.org/10.1021/acs.nanolett.7b05484>

*authors contributed equally

PRESENTATIONS

- *Materials Research Society*, Fall Meeting, Virtual. “Dual-Mode Infrared Absorption by Segregating Dopants within Plasmonic Semiconductor Nanocrystals”, **Fall 2020**, Oral Presentation.
- *Materials Research Society*, Fall Meeting, Virtual. “*In Situ* Optical Quantification of Planktonic Extracellular Electron Transfer using Plasmonic Metal Oxide Nanocrystals”, **Fall 2020**, Oral Presentation.
- *Plasmonically Powered Processes Gordon Research Conference*, Hong Kong. “Efficient and Tunable Infrared Extinction in Plasmonic Semiconductor Nanocrystals”, **Summer 2019**, Poster.
- *Colloidal Semiconductor Nanocrystals Gordon Research Conference*, Smithfield, RI. “Engineering Dopant Segregation in Tin-doped Indium Oxide Nanocrystals to Mitigate Carrier Depletion and Tune the Plasmonic Response”, **Summer 2018**, Poster.