Krista M. Kulesa

Curriculum Vitae
Chemistry, Inorganic

Ph.D. Candidate
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Education

Aug. 2017 – Present	Doctor of Philosophy in Inorganic Chemistry, *Indiana University (Bloomington)*
Aug. 2013 – May 2017	Post-Bachelor Studies in Chemistry, *Wayne State University*
Aug. 2011 – May 2013	Master of Arts in Classics: Ancient Greek and Latin, *Wayne State University*
Aug. 2008 – Jun. 2011	Bachelor of Arts in Classics, *Wayne State University*

Professional Experience

Aug. 2017 – Present — *Ph. D. Candidate, Indiana University, Bloomington, IN; USA*
Advisors: Lane Baker, Jeremy Smith
Expected Graduation: Spring 2023

- Synthesis and exploration of first row transition metal-based planar macrocycles for electrocatalytic and electrophotocatalytic N-O bond activation (in collaboration with the Zaleski Group, IU).
- Novel electrochemical method development, including spectroelectrochemistry, molecular electrophotochemistry, and carbon-based and semiconductor surface functionalization.
- Dye-sensitized semiconductor and carbon nanomaterial interfaces for electrochemical small molecule activation, *operando* mechanistic probes, and nitrous oxide reduction.
- Project development and mentorship of junior graduate students and undergraduates on the synthesis and electrocatalytic activity of Schiff-base first row transition metal complexes and hybrid catalysts.
- Molecular and materials synthesis, characterization methods, and electrochemistry for N-O bond activation and N-N bond formation.
- High-throughput electrochemistry for rapid reaction targeting, catalyst screening, and optimization.
- Electrochemical instrument purchase and maintenance; technique training for new users and students.
- Outreach and event coordination through the Electrochemical Society at IU, student chapter.

Apr. 2022 – Present — *Visiting Scholar, Texas A&M University, College Station, TX; USA*
Advisors: Lane Baker, Jeremy Smith

- High-throughput electrochemical instrumentation and applications for synthesizing and quantitating energy-dense nitrogen cycle intermediates.
- Electrosynthetic N-N homocoupling and optimization coupled to automated mass spectrometry.
- Arrayed electroanalytical kinetics of cobalt- and iron-based macrocycles for nitrate reduction.

Aug. 2021 – Mar. 2022 — *Department of Energy Office of Science Graduate Researcher, Center for Molecular Electrocatalysis, Pacific Northwest National Laboratory, Richland, WA; USA*
Mentor: Eric Wiedner
Supervisor: Aaron Appel

- High-pressure, interfacial electrocatalytic nitrous oxide reduction, using a novel copper-doped carbon nitride with extensive characterization.
- Method development and engineering, Swage construction, and design and safe implementation of novel preparative scale high-pressure electrochemistry.
- Direct and alternating-current voltammetry methods for rate constant determination, and molecular kinetic derivations in an electrocatalytic material.

Aug. 2017 – May 2020 — *Graduate Associate Instructor, Indiana University, Bloomington, IN; USA*

- Instructed undergraduate inorganic laboratory and discussion sections (N330, C430).
- Wrote new procedure manuals and instructional guidelines to be distributed throughout the semester on electrochemistry experiments.
- Endorsed students through letters of reference for admittance to health profession programs.

Jun. 2017 – Aug. 2017 — *Summer Graduate Researcher, University of Michigan, Ann Arbor, MI; USA*
Advisor: Bart Bartlett

- Hydrothermal and solvothermal synthesis of transition metal dichalcogenide cathode materials for Li-ion and Mg-ion secondary batteries.

- Developed a novel solvothermal synthesis of VSe_2 materials without annealing.
- Swagelok and coin cell battery assembly.

Jan. 2016 – May 2017 *Post-bachelor Researcher, Wayne State University, Detroit, MI; USA*
Advisor: Claudio Verani

- Systematic investigation of the redox, electronic, and catalytic properties of monometallic transition metal complexes geared towards electro- and photocatalytic water splitting.
- Electrocatalytic water reduction *via* proton relay in copper-based complexes.
- Bifunctional electrocatalytic water splitting using a molecular cobalt-based catalyst in a N-donor framework (in collaboration with the Scarpellini Group, Instituto de Química at Universidade Federal, Rio de Janeiro, Brazil).
- DFT calculations of a molecular cobalt-based water oxidation mechanism.
- Peer editing of manuscripts, presentations, posters, proposals, prospecti, theses, letters, nominations.

Jul. 2014 – Jul. 2015 *Textbook Editor, The Olivia and Hill Press, Ann Arbor, MI; USA*

- Amended the 3rd edition and 3rd edition revised of *English Grammar for Students of Latin*.
- Formulated each chapter as a stand-alone unit paralleling Latin and English.
- Adapted new versions of ancient texts for relevant exercises.

Professional Skills

- Molecular and materials characterization using spectroscopic, chromatographic and electrochemical techniques; ESI-MS, TCD-GC, SEM, TEM, EDS, XPS, powder and single crystal XRD, UV-Vis-NIR, DRS, NMR, EPR, FTIR, DLS, Raman and rRaman, DC/AC voltammetry, potentiometry, amperometry, coulometry, electrodeposition, spectroelectrochemistry, and electrosynthesis.
- Surface modification and analysis.
- Organic, inorganic, and materials synthesis and purification.
- Hermetic electrochemistry and air-free manipulations using Schlenk line and glovebox techniques.
- Electro-, photo- and electrophotocatalytic small molecule activation.
- High-pressure electroanalytical chemistry and electrocatalysis.
- Combinatorial electrochemistry.
- Secondary battery development, assembly, and testing.
- Development of analytical techniques and standard operating procedures.
- Electroanalytical instrument purchase, installation, and maintenance.
- Proficiency in Origin; MultiPak; FreeCAD; Mnova; relevant instrument software. Familiarity with MATLAB; EasySpin; Gaussian; Terminal; SHELX; Python; LabView.
- Proposal and manuscript writing and reviewing.
- Efficient communication skills, and mentorship of graduate and undergraduate students.

Publications

- **Kulesa, K.M.**; Wiedner, E.S.; Peiris, H.; Rodrigues, M.Q.; Crossland, P.; Anderson, J.S.; Losovyj, Y.; Smeu, M.; Baker, L.A.; Smith, J.M.; High-pressure electrocatalysis and kinetics of nitrous oxide reduction by a copper-based carbon nitride. *In Preparation (Science).*
- Gerroll, B.H.; **Kulesa, K.M.**; Baker. L.A.; Unprecedented high-throughput electrochemistry by a first-generation 96-cell 'Multistat'. *In Preparation (ACS Meas. Sci. Au).*
- **Kulesa, K.M.**; Padilha, D.; Thapa, B.; Amado, R.; Mazumder, S.; Schlegel, H.B.; Scarpellini, M.; Verani, C.; A bioinspired cobalt catalyst based on a tripodal imidazole/pyridine platform capable of water reduction and oxidation. *J. Inorg. Biochem. (Invited), In Review.*
- Partovi, S.; Xiong, Z.; **Kulesa, K.M**.; Smith, J. M. Electrocatalytic reduction of nitrogen oxyanions with a redox active cobalt macrocycle complex. *Inorg. Chem.*, **2022**, 61, 9034.
- Braley, S.E.; Ashley, D.C.; **Kulesa, K.M**.; Jakubikova, E.; Smith, J.M. Electrode-adsorption activates *trans*-$[Cr(cyclam)Cl_2]^+$ for electrocatalytic nitrate reduction. *Chem. Commun*., **2020**, 56, 603.
- Ekanayake, D.; **Kulesa, K.;** Singh, J.; Mazumder, S; Kpogo, K.; Schlegel, H.B.; Verani, C.; A pentadentate nitrogen-rich copper electrocatalyst for water reduction with pH-dependent molecular mechanisms. *Dalton Trans.* **2017**, 46, 16812.

Presentations

- **Kulesa, K.M.**; Wiedner, E.S.; Baker, L.A.; Smith, J.M. "High-pressure electrocatalysis of nitrous oxide reduction by a crystalline carbon nitride", *2022 Inorganic Chemistry Gordon Research Conference*. May 30-31, 2022, Salve Regina University, RI, USA. (*poster*)
- **Kulesa, K.M.**; Wiedner, E.S.; Baker, L.A.; Smith, J.M. "High-pressure electrocatalysis of nitrous oxide reduction by a crystalline carbon nitride", *2022 Inorganic Chemistry Gordon Research Conference Graduate Research Seminar*. May 29, 2022, Salve Regina University, RI, USA. (*oral*)
- **Kulesa, K.M.**; Wiedner, E.S.; Baker, L.A.; Smith, J.M. "High-pressure electrocatalysis of nitrous oxide reduction by a crystalline carbon nitride", *2022 Inorganic Chemistry Gordon Research Conference Graduate Research Seminar*. May 28, 2022, Salve Regina University, RI, USA. (*poster*)
- **Kulesa, K.M.**; Wiedner, E.S.; Baker, L.A.; Smith, J.M. "High-pressure electrocatalysis of nitrous oxide reduction by a crystalline carbon nitride", *2022 Dow Chemical Chemistry Graduate Award Symposium*. May 17, 2022, Texas A&M University, TX, USA. (*poster; **award-winning***)
- **Kulesa, K.M.**; Baker, L.A.; Smith, J.M. "Electrocatalytic reduction of nitrogen oxides by a crystalline carbon nitride", *239th ECS Meeting with the 18th IMCS*: *L02 Live Session 1, Electrocatalysis B*. Jun. 1, 2021. Virtual. (*oral*)
- **Kulesa, K.M.**; Baker, L.A.; Smith, J.M. "Electrocatalytic reduction of nitrogen oxides by a crystalline carbon nitride", *239th ECS Meeting with the 18th IMCS*. May 30 – Jun. 3, 2021. Virtual. (*oral*)
- **Kulesa, K.M.**; Fahey, M.M.; Zaleski, J.M.; Baker, L.A.; Smith, J. M. "Surface-dependent phenomena in cobalt-based electrocatalysts for improved nitrogen oxyanion reduction", *Pittcon Conference & Expo*. Mar. 9, 2021, Virtual. (*oral*)
- **Kulesa, K.M.**; Baker, L.A.; Smith, J.M. Electrocatalytic reduction of nitrogen oxides by a crystalline carbon nitride", *Center for Bioanalytical Metrology Fall 2020 Industry Advisory Board Meeting*. Dec. 2, 2020, Virtual. (*poster*)
- **Kulesa, K.M.**; Fahey, M.M.; Zaleski, J.M.; Smith, J.M. "Surface-Dependent Phenomena in Cobalt-Based Electrocatalysts for Improved Nitrogen Oxyanion Reduction", *Inorganic Chemistry Gordon Research Conference and Seminar*. May 30-Jun. 5, 2020, Salve Regina University, RI, USA. (*poster; cancelled due to COVID-19*)
- **Kulesa, K.M.**; Fahey, M.M.; Zaleski, J.M.; Smith, J.M. "Surface-Dependent Phenomena in Cobalt-Based Electrocatalysts for Improved Nitrogen Oxyanion Reduction", *239th ECS Meeting with the 18th IMCS*. May 10-14, 2020, Montreal, Canada. (*poster; cancelled due to COVID-19*)
- **Kulesa, K.M.**; Fahey, M.M.; Zaleski, J.M.; Smith, J.M. "Light-enhanced electrocatalytic NO_2^- reduction by a cobalt macrocycle", *Purdue, Indiana, and Notre Dame Universities (PINDU) Inorganic Symposium*. Nov. 16, 2019, Purdue University, IN, USA. (*poster*)
- **Kulesa, K.M.**; Smith, J.M.; "Surface-dependent phenomena in cobalt-based electrocatalysts for improved nitrogen oxyanion reduction", *Inorganic Seminar*. Oct. 30, 2019, Indiana University, IN, USA. (*oral*)
- **Kulesa, K.M.**; Fahey, M.M.; Zaleski, J.M.; Smith, J.M.; "Light-enhanced electrocatalytic NO_2^- reduction by a cobalt macrocycle", *Purdue, Indiana, and Notre Dame Universities (PINDU) Inorganic Symposium*. Dec. 1, 2018, Notre Dame University, IN, USA. (*poster*)
- **Kulesa, K.**; Padilha, D.; Scarpellini, M.; Verani, C.; **"**Bifunctional electrocatalytic water splitting under neutral conditions by a mononuclear cobalt(II) molecular catalyst", *ACS CERM: Inorganic*. Jun. 8, 2017, Henry Ford Hotel, Dearborn, MI, USA. (*poster)*
- **Kulesa, K.**; Padilha, D.; Scarpellini, M.; Verani, C.; **"**Bifunctional water splitting by a bioinspired cobalt(II) molecular electrocatalyst", *ECS Detroit Section Student Poster Session*. May 18, 2017, ABC Brewery, Ypsilanti, MI, USA. (*poster; **award-winning**)*
- **Kulesa, K.**; Padilha, D.; Scarpellini, M.; Verani, C.; "Electrocatalytic water splitting using a promiscuous cobalt-based molecular catalyst", *Ohio Inorganic Weekend.* Nov. 4, 2016, Goodyear Polymer Institute, University of Akron, Akron, OH, USA. (*poster*)
- **Kulesa, K.** Padilha, D.; Scarpellini, M.; Verani, C.; **"**A cobalt-based molecular electrocatalyst for bifunctional water splitting", *18th Annual Graduate Research Symposium*. Oct. 22, 2016, Wayne State University, Detroit, MI, USA. (*poster*)

- **Kulesa, K.**; Padilha, D.; Scarpellini, M.; Verani, C.; **"**A cobalt-based molecular electrocatalyst for bifunctional water splitting", *WSU Inorganic Seminar Series: Selected Graduate Research.* Oct. 13, 2016, Wayne State University, Detroit, MI, USA. (*oral*)
- **Kulesa, K.** "STEM in Classics: An Updated English Grammar for Students of Latin", *2014 Annual Detroit Classical Association and MCC Meeting*. Oct. 14, 2014, University of Detroit Jesuit H. S., Detroit, MI, USA. (*oral*)

Activities and Distinctions

- Dow Symposium, Outstanding Poster Award, Texas A&M University; *2022*
- Department of Energy Office of Science Graduate Research Program Award, *2021-2022*
- President of the Electrochemical Society at Indiana University, Student Chapter; *2021-2022*
- Department of Chemistry Associate Instructor Award, Indiana University; *2020*
- Chemistry Graduate Representative Committee Spring 2020 Travel Award, Indiana University; *2020*
- Vice President of the Electrochemical Society at Indiana University, Student Chapter; *2019-2021*
- Science Fest (Electrochemical Society at IU Room): Electrochemistry demonstrations for Bloomington youth, including electroplating and cathodic protection, Indiana University; *2019*
- College of Liberal Arts and Sciences Fall Travel Award, Indiana University; *2019-2020*
- Outstanding poster presentation: 2nd place, Electrochemical Society, Detroit Chapter; *2017*
- American Chemical Society, Inorganic Chemistry Award, Wayne State University; *2017*
- Hellenic Society Modern Greek Studies Endowment, Wayne State University; *2011-2013*
- Excellence in Ancient Greek Linguistics, Wayne State University; *2011*
- Κάλη Κἀγαθή: Exceptional caliber in Classics; Wayne State University; *2011*
- Outstanding achievement in Classics; Classical Association of the Middle West & South; *2011*
- R. Miller Annual Graduate Scholars Fund, Wayne State University; *2011*

Professional Organizations

Electrochemical Society, Indiana University
Electrochemical Society, National Chapter
International Society of Electrochemistry
Electrochemical Society, Detroit Chapter
American Chemical Society
Classical Association of the Middle West and South
Detroit Classical Association
Hellenic Society of Detroit