

Henry J. Hamann

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Location: West Lafayette, IN 47906

Professional Summary

Motivated synthetic chemist working as a postdoctoral researcher applying modern synthesis techniques for the design of chemical methodologies and study of reaction mechanisms. Experienced in the preparation and handling of reactive materials and nanomaterials including hypergolic propellants, metal nanoparticles, and MXenes.

Highlights

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| • Synthetic chemistry | • Interdisciplinary collaboration |
| • Mechanistic studies | • Organic chemistry Ph.D. |
| • Reactive materials | • Adaptable and versatile |
| • Nanomaterials | • 19 published articles (3 additional pending) |

Experience

Postdoctoral Researcher

May 2021 – Present

Purdue University, H. C. Brown Center for Borane Research, West Lafayette, IN

Research Advisor: Professor P. V. Ramachandran

- Contributed to interdisciplinary collaboration with Purdue's Mechanical Engineering Department and Army Research Lab (ARL) as part of Purdue's Advancing Army Modernization Priorities Through Collaborative Energetic Materials Research (AAMP-EM) program.
- Collaborated with researchers in Purdue's Materials Engineering Department to develop methods for MXene production via MAX phase etching, functionalization and direct synthesis.
- Synthesized and characterized alane-amines and aluminum/composite nanomaterials.
- Prepared and characterized metal/MXene composite materials as propellant additives.
- Authored and assisted in the preparation of grant proposals (NSF-CHE, NIH-R01, NIH-R21, DEPSCoR)
- Developed titanium promoted methodologies for reductions, deoxygenation, and halogenation using boranes.
- Initiated project and led team developing room temperature, near instantaneous, titanium promoted direct amidation of carboxylic acids.
- Studied reaction mechanisms via deuterium labeling, kinetic isotope studies, and DFT calculations.
- Responsible for general laboratory and group management.

Graduate Research Assistant

August 2015 – May 2021

Purdue University, H. C. Brown Center for Borane Research, West Lafayette, IN

Research Advisor: Professor P. V. Ramachandran

Dissertation: Amine-boranes: Synthesis and Applications

- Developed synthetic methodologies for preparation and scale-up of borane-amines.
- Applied borane-amines for multiple amidation and borylation methodologies.
- Performed mechanistic studies via NMR analysis and isolation/crystallization of reaction intermediates.
- Managed laboratory chemicals, equipment, and instrumentation.
- Trained and mentored graduate (8) and undergraduate (20) researchers.
- 3 semesters as head teaching assistant for organic chemistry, and 3 semesters as lecture coordinator for general chemistry

Undergraduate Research Assistant

June 2013 – May 2015

Purdue University, Department of Chemistry, West Lafayette, IN

Research Advisor: Professor David Thompson

- Carried out protein growth, extraction, purification, and gel electrophoresis analysis procedures.
- Performed microfluidic flow chemistry experiments.

Education

Purdue University, West Lafayette, IN Ph.D. Chemistry, May 2021	2015-2021
Purdue University, West Lafayette, IN B.S. Chemistry, ACS Certified, Minor in Philosophy, May 2015	2012-2015
Purdue University, West Lafayette, IN B.A. Industrial Design Professional Program, May 2012	2007-2012

Campus/Professional Involvement and Recognitions

Purdue Research Foundation Research Grant (Spring 2018 – Fall 2019)
Phi Lambda Upsilon National Honorary Chemical Society (Spring 2017 – Present)
Ramachandran group Safety Committee representative (Fall 2015 – Spring 2021)
ACS Member (August 2015 – Present)
ACS-SA Member Purdue Chapter (2012-2013)
Harrison M. Stine Memorial Scholarship Recipient (2013)

Teaching Activities

Purdue University, Fall 2017, Fall 2018, & Fall 2020 Head Teaching Assistant – Organic Chemistry
Purdue University, Spring 2017, Spring 2018 & Spring 2020, Lecture Coordinator – General Chemistry
Purdue University, Spring 2016, Fall 2016, Teaching Assistant – Organic Chemistry
Purdue University, Fall 2015, Teaching Assistant – General Chemistry

Additional Information

Publications

- (19) Ramachandran, P. V.; Hamann, H. J.; Alawaed, A. A.; Stoichiometry Dependence in the Consecutive, Competing Reduction, Halogenation, or Deoxygenation of Aryl Carbonyls. *J. Org. Chem.* **2024**, *Accepted*. <https://doi.org/10.1021/acs.joc.4c00869>
- (18) Madison, J. Snyder, Abdulkhaliq A. Alawaed, Chung Li, Samantha Pacentine, Henry J. Hamann, and P. Veeraraghavan Ramachandran, TiF₄-mediated, one-pot, reductive amination of carboxylic acids with borane-ammonia. *RSC Adv.* **2024**, *14*, 31205-31209. <https://doi.org/10.1039/D4RA05888G>
- (17) Ramachandran, P. V.; Lin, R.; Alawaed, A. A.; Hamann, H. J. Aryl Carbonyls and Carbinols as Proelectrophiles for Friedel-Crafts Benzylolation and Alkylation. *RSC Adv.* **2024**, *14*, 15554-15559. <https://doi.org/10.1039/D4RA02213K>
- (16) Hamann, H. J.; Örneke, M.; Wu, C-C.; Walck, S. D.; Son, S. F.; Ramachandran, P. V., Reactive, Gallium–Aluminum Composite Nanoparticles for Application in Energetics. *ACS Appl. Nano Mater.* **2024**, *7*, 4, 3580–3588. <https://doi.org/10.1021/acsanm.3c04455>
- (15) Ramachandran, P. V.; Singh, A.; Walker, H.; and Hamann, H. J., Borane-Pyridine: An Efficient Catalyst for Direct Amidation. *Molecules*, **2024**, *29*, 268. <https://doi.org/10.3390/molecules29010268>.
- (14) Ramachandran, P. V.; Alawaed, A. A.; Hamann, H. J. Catalyst- and stoichiometry-dependent deoxygenative reduction of esters to ethers or alcohols with borane-ammonia. *Org. Lett.* **2023**, *25*(37), 6902–6906. <https://doi.org/10.1021/acs.orglett.3c02643>
[Highlighted in *Org. Process Res. Dev.* 2023, *27*, 12, 2197–2210]
- (13) Ramachandran, P. V.; Alawaed, A. A.; Hamann, H. J. Balancing Lewis acidity and carbocation stability for the selective deoxyhalogenation of aryl carbonyls and alcohols. *Org. Lett.* **2023**, *25*(25), 4650–4655. <https://doi.org/10.1021/acs.orglett.3c01462>

- (12) Rodriguez, J. R.; Hamann, H. J.; Mitchell, G. M.; Ortalan, V.; Pol, V. G.; Ramachandran, P. V. Interconnected Sn@SnO₂ Nanoparticles as a Superior Lithium-Ion Anode. *ACS Appl. Nano Mater.* **2023**, 6(13), 11070–11076. <https://doi.org/10.1021/acsanm.3c00854>
- (11) Ramachandran, P. V.; Hamann, H. J. Dehydroborylation of Terminal Alkynes Using Lithium Aminoborohydrides. *Molecules*, **2023**, 28(8), 3433. <https://doi.org/10.3390/molecules28083433>
- (10) Ramachandran, P. V.; Hamann, H. J.; Lin, R.; Singh, A. Scalable, Green Synthesis of Heteroaromatic Amine-boranes. *Org. Process Res. Dev.* **2023**, 27(4), 775–7783. <https://doi.org/10.1021/acs.oprd.3c00031>
- (9) Ramachandran, P. V.; Alawaed, A. A.; Hamann, H. J. A Safer Reduction of Carboxylic Acids with Titanium Catalysis. *Org. Lett.* **2022**, 24, 8481–8486. <https://doi.org/10.1021/acs.orglett.2c03326>
[Highlighted in *Org. Process Res. Dev.* 2023, 27, 238–247]
- (8) Ramachandran, P. V.; Alawaed, A. A.; Hamann, H. J. TiCl₄-Catalyzed Hydroboration of Ketones with Ammonia Borane. *J. Org. Chem.* **2022**, 87(19), 13259–13269. <https://doi.org/10.1021/acs.joc.2c01744>
- (7) Ramachandran, P. V.; Hamann, H. J.; Mishra, S. Aminoboranes via Tandem Iodination/Dehydroiodination for One-Pot Borylation. *ACS Omega* **2022**, 7, 14377–14389. <https://doi.org/10.1021/acsomega.2c01461>
- (6) Ramachandran, P. V.; Hamann, H. J.; Lin, R. Activation of sodium borohydride via carbonyl reduction for the synthesis of amine- and phosphine-boranes. *Dalton Trans.* **2021**, 50, 16770–16774. <https://doi.org/10.1039/D1DT03495B>
- (5) Ramachandran, P. V.; Hamann, H. J. Ammonia-borane as a catalyst for the direct amidation of carboxylic acids. *Org. Lett.* **2021**, 23, 2938–2942. <https://doi.org/10.1021/acs.orglett.1c00591>
[Highlighted in *Org. Process Res. Dev.* 2021, 25, 1081–1088]
- (4) Ramachandran, P. V.; Hamann, H. J.; Choudhary, S. Amine-boranes as dual-purpose reagents for direct amidation of carboxylic acids. *Org. Lett.* **2020**, 22, 8593–8597. <https://doi.org/10.1021/acs.orglett.0c03184>
[Highlighted in *Synfacts* 2021, 17(02), 0226]
- (3) Hamann, H. J.; Abutaleb, N.; Pal, R.; Seleem, M. B.; Ramachandran, P. V. β,γ-Diaryl α-methylene-γ-butyrolactones as potent antibacterials against methicillin-resistant *Staphylococcus aureus*. *Bioorg. Chem.* **2020**, 104, 104183. <https://doi.org/10.1016/j.bioorg.2020.104183>
- (2) Rodriguez, J. R.; Hamann, H. J.; Mitchell, G. M.; Ortalan, V.; Pol, V. G.; Ramachandran, P. V. Three-dimensional antimony nanochains for lithium-ion storage. *ACS Appl. Nano Mater.* **2019**, 2, 5351–5355. <https://doi.org/10.1021/acsanm.9b01316>
[Cover Page for the September 2019 issue of *ACS Appl. Nano Mater.*]
- (1) Münchow, E. A.; Hamann, H. J.; Carvajal, M. T.; Pinal, R.; Bottino, M. C.; Stain removal effect of novel papain- and bromelain-containing gels applied to enamel. *Clin. Oral Invest.* **2016**, 20, 2315. <https://doi.org/10.1007/s00784-016-1840-1>

Pending Publications

- (22) Henry J. Hamann, Madison J. Snyder, Aman G. Singh, Abdulkhalik A. Alawaed, and P. Veeraraghavan Ramachandran, Amido titanium complexes as activated amine surrogates for instantaneous, room temperature amidation of carboxylic acids
[Submitted to *J. Am. Chem. Soc.*]

- (21) Ramachandran, P. V.; Hamann, H. J.; Alawaed, A. A. Synthesis of Borane-Ammonia and its Application in the Titanium Tetrachloride Catalyzed Reduction of Carboxylic Acids, Including N-Protected Amino Acids. *[Submitted to Organic Syntheses][Invited submission]*
- (20) Noel, A. R.; Ramachandran, P. V.; Bransky, M.; Hamann, H. J.; Patel, D.; Harper, C.; McGuffey, M.; Wernex, C.; Son, S. F., Correlation of Molecular Structure to Hypergolic Ignition Delay in Amines and Amine Boranes. *[Submitted to Army Research Lab (ARL) for publication approval]*

Conference Presentations

- (3) Hamann, H. J.; Örneke, M.; Wu, C-C.; Walck, S. D.; Son, S. F.; Ramachandran, P. V. (2024, May). *Gallium–Aluminum Composite Nanoparticles for Application in Energetics*. Presentation given at 2024 PERC-ETS Spring Meeting, West Lafayette, IN
- (2) Rodriguez, J. R.; Hamann, H. J.; Manikanden, P.; Mitchell, G. M.; Ortalan, V.; Pol, V. G.; Ramachandran, P. V. (2019, April). *Enhanced lithium-ion storage in three-dimensional antimony nanochains*. Poster session presented at the Thirty-Sixth Herbert C. Brown Lectures in Organic Chemistry, West Lafayette, IN
- (1) Hamann, H. J.; Choudhary, S.; Ramachandran, P. V. (2019, April). *Amidation via Amine Boranes*. Poster session presented at the Thirty-Sixth Herbert C. Brown Lectures in Organic Chemistry, West Lafayette, IN

Upcoming Conference Presentations

- (4) Hamann, H. J.; Synder, M. J.; Singh, A. G.; Alawaed, A. A.; Ramachandran, P. V. (2025, March). *Monofunctional amido titanium complexes: Activated amine surrogates for the direct amidation of carboxylic acids*. Presentation will be given at 2025 ACS Spring Meeting, San Diego, CA

Patents

- (4) Ramachandran, P. V.; Hamann, H. J. Preparation of Carboxamides from Carboxylic Acids using Amine-Boranes. US 12071393 B2, 2024.
- (3) Ramachandran, P. V.; Hamann, H. J. Inexpensive and Green Synthesis Method for Amine-Boranes. Provisional-Patent, 2024.
- (2) Ramachandran, P. V.; Hamann, H. J. Novel Method of Reducing Carboxylic Acids. Provisional-Patent, 2023.
- (1) Ramachandran, P. V.; Hamann, H. J. Simple and Economical Preparation of Aminoboranes for Use in Organic Synthesis. Provisional-Patent, 2020.