

Nicholas P. Stadie

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Birthdate: October 28, 1985

Birthplace: Calgary, Canada

Ph.D.	Materials Science, California Institute of Technology	2013
M.S.	Materials Science, California Institute of Technology	2008
B.S.	Chemistry, Arizona State University	2007

Our research spans the fields of solid-state, physical, and materials chemistry. We explore synthesis routes towards designable (metal-free) carbon-based frameworks and their applications as energy storage materials. Understanding gas physisorption phenomena at the solid interface is also an objective of our work, using classical and statistical thermodynamics.

Assistant Professor		2017–Present
	Department of Chemistry and Biochemistry Montana State University (MSU)	

Research Fellow		2015–2016
	with Prof. Maksym Kovalenko Laboratory of Inorganic Chemistry Eidgenössische Technische Hochschule (ETH) Zürich	

Visiting Scientist		2013–2015
	with Prof. Brent Fultz Department of Materials Science and Applied Physics California Institute of Technology (Caltech)	

Postdoctoral Scholar		2013–2014
	with Prof. Andreas Züttel and Dr. Andreas Borgschulte Abteilung Wasserstoff & Energie Swiss Federal Laboratories (Empa)	

Research Assistant		2007–2012
	with Prof. Brent Fultz and Dr. Channing Ahn Department of Materials Science and Applied Physics California Institute of Technology (Caltech)	

Research Assistant		2005–2007
	with Prof. Michael O’Keeffe Department of Chemistry and Biochemistry Arizona State University (ASU)	

Publications and Patents:

Peer-Reviewed Journal Articles

31. D. McGlamery, A. A. Baker, Y.-S. Liu, M. Mosquera, N. P. Stadie, "Phonon Dispersion Relation of Bulk Boron-Doped Graphitic Carbon" **J. Phys. Chem. C**, *just accepted* (2020).
30. E. E. Taylor, K. Garman, N. P. Stadie, "Atomistic Structures of Zeolite-Templated Carbon" **Chem. Mater.**, 32 (7), 2742-2752 (2020).
- 29.* E. Remington, A. Fahad, N. P. Stadie, "The Role of Adsorbed Phase Volume on the Thermodynamics of Supercritical Methane Adsorption on Microporous Carbon" *in revision* (2020).
28. R. J.-C. Dubey, T. Colijn, M. Aebli, E. E. Hanson, K. V. Kravchyk, M. V. Kovalenko, N. P. Stadie, "Zeolite-Templated Carbon as a Stable, High Power Magnesium-Ion Cathode Material" **ACS Appl. Mater. Inter.**, 11 (43), 39902-39909 (2019).
27. R. J.-C. Dubey, J. Nüssli, L. Piveteau, K. V. Kravchyk, M. D. Rossell, M. Campanini, R. Erni, M. V. Kovalenko, N. P. Stadie, "Zeolite-Templated Carbon as the Cathode for a High Energy Density Dual-Ion Battery" **ACS Appl. Mater. Inter.**, 11 (19), 17686-17696 (2019).
26. H. Swenson, N. P. Stadie "Langmuir's Theory of Adsorption: a Centennial Review" **Langmuir**, 35 (16), 5409-5426 (2019). **Invited Feature Article**
25. K. V. Kravchyk, L. Piveteau, R. Caputo, M. He, N. P. Stadie, M. I. Bodnarchuk, R. T. Lechner, M. V. Kovalenko, "Colloidal Bismuth Nanocrystals as a Model Anode Material for Rechargeable Mg-ion Batteries: Atomistic and Mesoscale Insights" **ACS Nano**, 12 (8), 8297-8307 (2018).
24. E. Billeter, D. McGlamery, M. Aebli, L. Piveteau, M. V. Kovalenko, N. P. Stadie, "Bulk Phosphorus-Doped Graphitic Carbon" **Chem. Mater.**, 30 (14), 4580-4589 (2018).
23. M. Walter, S. Doswald, F. Krumeich, M. He, R. Widmer, N. P. Stadie, M. V. Kovalenko, "Oxidized Co-Sn Nanoparticles as Long-Lasting Anode Materials for Lithium-Ion Batteries" **Nanoscale**, 10, 3777-3783 (2018).
22. N. P. Stadie, E. Billeter, L. Piveteau, K. Kravchyk, M. Döbeli, M. V. Kovalenko, "Direct Synthesis of Bulk Boron-Doped Graphitic Carbon" **Chem. Mater.**, 29 (7), 3211-3218 (2017).
21. X. Tang, N. Ripepi, N. P. Stadie, L. Yu, "Thermodynamic Analysis of High Pressure Methane Adsorption in Longmaxi Shale" **Fuel**, 193, 411-418 (2017).
20. N. P. Stadie, S. Wang, K. V. Kravchyk, M. V. Kovalenko, "Zeolite-Templated Carbon as an Ordered Microporous Electrode for Aluminum Batteries" **ACS Nano**, 11 (2), 1911-1919 (2017).
19. D. Dirin, L. Protesescu, D. Trummer, I. Kochetygov, S. Yakunin, F. Krumeich, N. P. Stadie, M. V. Kovalenko, "Harnessing Defect-Tolerance at the Nanoscale: Highly Luminescent Lead Halide Perovskite Nanocrystals in Mesoporous Silica Matrices" **Nano Lett.**, 16 (9), 5866-5874 (2016).
18. X. Tang, N. Ripepi, N. P. Stadie, L. Yu, M. R. Hall, "A dual-site Langmuir equation for accurate estimation of high pressure deep shale gas resources" **Fuel**, 185, 10-17 (2016).
17. M. Murialdo, N. P. Stadie, C. C. Ahn, B. Fultz, "A Generalized Law of Corresponding States for the Physisorption of Classical Gases with Cooperative Adsorbate-Adsorbate Interactions" **J. Phys. Chem. C**, 120 (22), 11847-11853 (2016).
16. C. J. Sahle, S. Kujawski, A. Remhof, Y. Yan, N. P. Stadie, A. Al-Zein, M. Tolan, S. Huotari, M. Krisch, C. Sternemann, "In-situ characterization of Mg(BH₄)₂ by X-ray Raman scattering spectroscopy" **Phys. Chem. Chem. Phys.**, 18, 5397-5403 (2016).
15. E. Callini, P. Á. Szilágyi, M. Paskevicius, N. P. Stadie, J. Réhault, C. E. Buckley, A. Borgschulte, A. Züttel, "Stabilization of Volatile Ti(BH₄)₃ by Nano-Confinement in a Metal-Organic Framework" **Chem. Sci.**, 7, 666-672 (2016).
14. N. P. Stadie, M. Murialdo, C. C. Ahn, B. Fultz, "Unusual Entropy of Adsorbed Methane on Zeolite-Templated Carbon" **J. Phys. Chem. C**, 119 (47), 26409-26421 (2015).

13. A. Borgschulte, E. Callini, N. P. Stadie, Y. Arroyo, M. D. Rossell, R. Erni, H. Geerlings, A. Züttel, "Manipulating the reaction path of the CO₂ hydrogenation reaction in molecular sieves" **Catal. Sci. Technol.**, 5, 4613-4621 (2015).
12. N. P. Stadie, E. Callini, P. Mauron, A. Borgschulte, A. Züttel, "Supercritical Nitrogen Processing for the Purification of Reactive Porous Materials" **J. Vis. Exp.**, 99, e52817 (2015).
11. M. Murialdo, N. P. Stadie, C. C. Ahn, B. Fultz, "Observation and Investigation of Increasing Isothermic Enthalpy of Adsorption of Ethane on Zeolite-Templated Carbon" **J. Phys. Chem. C**, 119 (2), 944-950 (2015).
10. M. Murialdo, N. P. Stadie, C. C. Ahn, B. Fultz, "Krypton Adsorption on Zeolite-Templated Carbon and Anomalous Surface Thermodynamics" **Langmuir**, 31 (29), 7991-7998 (2015).
9. N. P. Stadie, E. Callini, B. Richter, T. R. Jensen, A. Borgschulte, A. Züttel, "Supercritical N₂ Processing as a Route to the Clean Dehydrogenation of Porous Mg(BH₄)₂" **J. Am. Chem. Soc.**, 136 (23), 8181-8184 (2014).
8. S. A. Eyer, N. P. Stadie, A. Borgschulte, L. Emmenegger, J. Mohn, "Methane Preconcentration by Adsorption: a Methodology for Materials and Conditions Selection" **Adsorption**, 20, 657-666 (2014).
7. N. P. Stadie, M. Murialdo, C. C. Ahn, B. Fultz, "Anomalous Isothermic Enthalpy of Adsorption of Methane on Zeolite-Templated Carbon" **J. Am. Chem. Soc.**, 135 (3), 990-993 (2013).
6. N. P. Stadie, J. J. Vajo, R. W. Cumberland, A. A. Wilson, C. C. Ahn, B. Fultz, "Zeolite-Templated Carbon Materials for High-Pressure Hydrogen Storage" **Langmuir**, 28 (26), 10057-10063 (2012).
5. N. P. Stadie, J. J. Purewal, C. C. Ahn, B. Fultz, "Measurements of Hydrogen Spillover in Platinum Doped Superactivated Carbon" **Langmuir**, 26 (19), 15481-15485 (2010).
4. Z. Jin, Z. Z. Sun, L. J. Simpson, K. J. O'Neill, P. A. Parilla, Y. Li, N. P. Stadie, C. C. Ahn, C. Kittrell, J. M. Tour, "Solution-phase synthesis of heteroatom-substituted carbon scaffolds for hydrogen storage" **J. Am. Chem. Soc.**, 132 (43), 15246-15251 (2010).
3. T. P. McNicholas, A. Wang, K. O'Neill, R. J. Anderson, N. P. Stadie, A. Kleinhammes, P. Parilla, L. Simpson, C. C. Ahn, Y. Wang, Y. Wu, J. Liu, "H₂ Storage in Microporous Carbons from PEEK Precursors" **J. Phys. Chem. C**, 114 (32), 13902-13908 (2010).
2. A. Borgschulte, R. Gremaud, S. Kato, N. P. Stadie, A. Remhof, A. Züttel, M. Matsuo, S. I. Orimo, "Anharmonicity in LiBH₄-LiI Induced by Anion Exchange and Temperature" **Appl. Phys. Lett.**, 97, 031916 (2010).
1. N. P. Stadie, R. Smith, T. Groy, "Di-μ-acetato-κ⁴O:O'-μ-oxido-κ²O:O-bis[(acetic acid-κO)bis(1H-imidazole-κN³)magnesium(II)]" **Acta Cryst.**, E63, m2153-m2154 (2007).

Patents

- 3.* E. Billeter, N. P. Stadie, "Phosphorus-Doped Graphitic Carbon with Low Oxygen Content" **US Patent**, No. 62/534,792, *application pending* (filed: July 20, 2017).
- 2.* N. P. Stadie, E. Billeter, M. V. Kovalenko, "Boron-Doped Graphitic Carbon" **European Patent**, No. EP16190855.3, *application pending* (filed: September 27, 2016).
1. N. P. Stadie, B. Fultz, C. C. Ahn, M. Murialdo, "Nanostructured Carbon Materials for Adsorption of Methane and Other Gases" **US Patent** 9,067,848, issued: June 30, 2015 (filed: October 10, 2013).

Theses

2. N. P. Stadie, "Synthesis and Thermodynamic Studies of Physisorptive Energy Storage Materials" California Institute of Technology, Ph.D. thesis (2013).
1. N. P. Stadie, "A Search for Magnesium Imidazolate Zeolitic Frameworks" Arizona State University, honours thesis (2007).

Mentorship Activity:

* - co-mentorship

Graduate Students

Connor Welty (MSU, Chemistry, Ph.D. expected in 2024)	2019–Present
Dalton Compton (MSU, Chemistry, Ph.D. expected in 2024)	2019–Present
Isabelle Gordon (MSU, Materials Science, Ph.D. expected in 2023)	2018–Present
*Romain J.-C. Dubey (ETH Zürich, Chemistry, Ph.D. expected in 2021)	2017–Present
Devin McGlamery (MSU, Chemistry, Ph.D. expected in 2022)	2017–Present
Erin Taylor (MSU, Chemistry, Ph.D. expected in 2022)	2017–Present
Daniel Arenas (MSU, Chemistry, M.S. 2019)	2017–2019
Emily Remington (MSU, Mechanical Engineering, M.S. 2019)	2017–2019
*Emanuel Billeter (ETH Zürich, Chemistry, M.S. 2018)	2017–2018

Undergraduate Students

Demetrius White (MSU, Chemical Engineering, B.S. expected in 2023)	2020–Present
Sophia Randak (MSU, Biomedical Science, B.S. expected in 2022)	2020–Present
LeeAnn Strand (MSU, Biochemistry, B.S. expected in 2021)	2020–Present
Anna Stewart (MSU, Chemical Engineering, B.S. expected in 2023)	2019–Present
Eddie Kelly (MSU, General Engineering, B.S. expected in 2023)	2019–Present
Jacob Michaletz (MSU, Chemical Engineering, B.S. expected in 2022)	2018–Present
Rylan Rowsey (FYRE Program, MSU, Chemistry, B.S. expected in 2021)	2018–Present
Katrina Sandoval (MSU, Electrical Engineering, B.S. expected in 2021)	2018–Present
Kaitlin Garman (MSU, Chemistry, B.S. expected in 2021)	2017–Present
Seth Putnam (MSU, Chemistry, B.S. expected in 2021)	2017–Present
Hans Swenson (MSU, Chemistry, B.S. 2020)	2017–2020
Abigail Harrington (MSU, Chemical Engineering, B.S. 2020)	2019–2020
Russell Dorsman (MSU, Chemical Engineering, B.S. 2020)	2019–2020
Grace Suenram (Caltech, Electrical Engineering, B.S. expected in 2022)	Summer 2019
Dylan Ladd (MSU, Chemical Engineering, B.S. 2019)	2018–2019
Emily McKeever (MSU, Chemical Engineering, B.S. expected in 2021)	Fall 2018
Danny Kaiser (MSU, Chemistry, B.S. 2018)	Summer 2018
Emily Morley (Idaho State University, Chemistry, B.S. expected in 2021)	Summer 2018
Sergei Zvenigorodsky (MSU, Physics, B.S. expected in 2021)	2017–2018
Allen Simpson (MSU, Computer Science, B.S. expected in 2021)	2017–2018
Dylan Barbagallo (MSU, Physics, B.S. expected in 2021)	2017–2018
Kaitlin Benda (MSU, Biochemistry, B.S. 2018)	2017–2018
Michael Laase (MSU, Geology, B.S. 2019)	Summer 2017
Jack Buckner (Carleton College, Chemistry/Mathematics, B.S. 2018)	Summer 2017
Abdulaziz Fahad (MSU, Chemical Engineering, B.S. 2017)	Summer 2017

Teaching Activity:

CHMY 373, "Physical Chemistry: Kinetics and Thermodynamics" MSU, Primary Instructor	2017–Present
CHMY 558, "Classical and Statistical Thermodynamics" MSU, Primary Instructor	2017–Present
CHMY 490, "Undergraduate Research" MSU, Research Advisor	2017–Present
CHMY 151, "Honors College Chemistry I" MSU, Primary Instructor	Fall 2018
US 103, "Learning Strategies" MSU, Primary Instructor	Spring 2020
CHE 834, "Nanochemistry" University of Zürich, Assistant Lecturer	Spring 2014
MS 105, "Phase Transformations" Caltech, Teaching Assistant, Occasional Lecturer	Spring 2011
MS 130/132, "Diffraction and Structure of Materials" Caltech, Teaching Assistant, Occasional Lecturer	2009–2010

Academic Service Highlights:

Hilleman Scholars Program Internship/Research Supervisor, Study Abroad Trip Leader	2017–Present
NSF Research Experience for Undergraduates (REU) Program Co-Principal Investigator	2017–Present
<i>Frontiers in Energy Research</i> Associate Editor	2015–Present
Undergraduate Research Committee, Chemistry & Biochemistry Committee Member	2019–Present
Undergraduate Scholars Program, Montana State University Review Panel Member, Research Advisor	2017–Present