

Curriculum Vitae for Vincent Lavallo

General Information

Name: Vincent Lavallo
Date of birth: March 24, 1978
Citizenship: U.S.A.
Email address: vincent.lavallo@ucr.edu
Phone: Office- 1-951-827-3685
Cell- 1-626-375-1318
Website : <http://faculty.ucr.edu/~vincentl/index.html>

Curent Position

2017-present ***Department of Chemistry, University of California Riverside***
Associate Professor with Tenure

Projects: Carborane Based Ligands/Organometallic Chemistry/Catalysis
Ionic conducting Materials/Batteries

2011-2017 Assistant Professor

Postdoctoral

2008-2011 ***Department of Chemistry, California Institute of Technology***
Postdoctoral Scholar with Robert H. Grubbs
Project: Exploratory Iron Chemistry/Catalysis

Consulting

2019-present ***Maple Ventures LLC.***

2010-2015. ***Materia inc.***

Academic History

2005-2008 ***Department of Chemistry, University of California Riverside***
Ph.D. Chemistry with Guy Bertrand
Projects: Novel Stable Carbenes/ Transition Metal Catalysts

2001-2005 ***Department of Biochemistry, University of California Riverside***
B.S. Biochemistry with Guy Bertrand
Project: Novel Stable Carbenes

Awards Since UCR Appointment 2011

NSF CAREER Award 2015-2020
Hellman Fellowship 2014-2015.
A.C.S. Petroleum Research Fund D.N.I Award, 2012-2015.

Funding Post Tenure

Project Title: Complex Carboranes as Weakly Coordinating yet Functional Anions (current)

Source of Support: NSF (CHE-2003418) (Lavallo P.I. 100%)

Total Award Amount: \$445,000

Total Award Period Covered: 06/1/2020 - 5/31/2023

Project Title: Single Ion Conducting Polymers of Boron Rich Nanoclusters: Synthesis and Fundamental Properties (current)

Source of Support: NSF (DMR-2004497) (J. Guo P.I 50%; Lavallo Co P.I. 50%)

Total Award Amount: \$525,000

Total Award Period Covered: 08/1/2020 - 7/31/2023

Project Title: Robust Ionic Liquids with Boron Cluster Anions (current)

Source of Support: UCR Proof of Concept funding safe ionic liquids for Li-ion batteries

Total Award Amount: \$12,500

Total Award Period Covered: 1/1/2020 - 12/31/2020

Project Title: Robust Ionic Liquids with Boron Cluster Anions (expired)

Source of Support: Phase II Air Force STTR Grant (Boron Specialties LLC ; Co I.'s Lavallo and Spokoyny UCLA)

Total Award Amount: \$750,000 (Lavallo amount \$168,000)

Total Award Period Covered: 09/1/2017 - 8/31/2019

Funding Pre Tenure

Project Title: CAREER: Olefin Polymerization Catalysts with Ligands Featuring Weakly Coordinating Carborane Anions

Source of Support: NSF

Total Award Amount: \$675,000

Total Award Period Covered: 4/1/2015 - 6/30/2020

Project Title: High Capacity Mg Batteries Based on Inert and Non-Nucleophilic Carborane Electrolytes

Source of Support: NSF (P.I. Lavallo, Co P.I. Juchen Guo UCR)

Total Award Amount: \$445,000

Total Award Period Covered: 8/1/2015 - 7/31/2018

Project/Proposal Title: Armor-Plated Ligands: Applications in Catalytic Alkane Functionalization

Source of Support: ACS Petroleum Research Foundation

Total Award Amount: \$100,000

Total Award Period Covered: 7/1/2012 - 8/31/2015

Project Title: Chemistry with Carborane Anions

Source of Support: NSF

Total Award Amount: \$525,000

Total Award Period Covered: 3/1/2012 - 2/28/2016

Hellman Fellowship

Source of Support: Hellman Foundation

Total Award Amount: \$30,000

Total Award Period Covered: 7/1/2014 - 6/31/2015

Project Title: New Pathways Toward Metastable Solids Through Moderate Pressure and Large Plastic Shear: Multiscale Simulations and Experiments

Source of Support: DARPA (subcontract from PI: Bill Goddard)

Total Award Amount: \$100,000

Total Award Period Covered: 01/01/2016 - 6/30/2017

Project Title: Coordination of nitrated NHC ligands to form novel organometallic complexes

Source of Support: LAWRENCE LIVERMORE NATIONAL SECURITY, LLC (subcontract)

Total Award Amount: \$45,000

Total Award Period Covered: 03/01/2016 - 9/15/2016

Project Title: Robust Ionic Liquids with Boron Cluster Anions

Source of Support: Phase I Air Force STTR Grant (Boron Specialties LLC ; Co I.'s Lavallo and Spokoyny UCLA)

Total Award Amount: \$150,000

Total Award Period Covered: 04/1/2016 - 12/31/2016

Publications (Post Tenure) (current *h-index* = 30, total citations: no self-citations = 3,852)

- 52) Fisher S.; McArthur S.; Tej V.; Lee S.; Chan A.; Banda I.; Gregory A.; Berkely K.; Tsay C.; Rheingold A.; Guisado-Barrios G.; Lavallo* V., Strongly Coordinating Ligands to Form Weakly Coordinating yet Functional Organometallic Anions ***J. Am. Chem. Soc.***, **2020**, 142, 1, 251-256.
- 51) M. Jørgensen; P. Shea; A. W. Tomich; J. Varley; M. Bercx; S. Lovera; R. Cerný*; W. Zhou; T. J. Udovic; V. Lavallo*; T. Jensen*; B. Wood*; V. Stavila*, Understanding Superionic Conductivity in Lithium and Sodium Salts of Weakly Coordinating Closo-Hexahalocarborate Anions ***Chem. Mater.***, 2020, 32, 4, 1475-1487.
- 50) Wigman, B.; Popov, S.; Bagdasarian, A. L.; Shao, B.; Benton, T. R.; Williams, C. G.; Fisher, S. P.; Lavallo*, V.; Houk*, K. N.; Nelson*, H. M., Vinyl Carbocations Generated under Basic Conditions and Their Intramolecular C–H Insertion Reactions. ***J. Am. Chem. Soc.*** **2019**, 141, 9140-9144.
- 49) Jones, C. G.; Asay, M.; Kim, L. J.; Kleinsasser, J. F.; Saha, A.; Fulton, T. J.; Berkley, K. R.; Cascio, D.; Malyutin, A. G.; Conley, M. P.; Stoltz*, B. M.; Lavallo*, V.; Rodríguez*, J. A.; Nelson*, H. M., Characterization of Reactive Organometallic Species via MicroED. ***ACS Cent. Sci.*** **2019**, 5, 1507-1513.
- 48) D. Pichon, M. Soleilhavoup, J. Morvan, G. P. Junor, T. Vives, C. Crévisy, V. Lavallo, J. M. Campagne, M. Mauduit*, R. Jazzar*, G. Bertrand*. "The Debut of Chiral Cyclic (Alkyl)(Amino)Carbenes (CAACs) in Enantioselective Catalysis" ***Chem. Sci.***, **2019**, 10, 7807-7811.
- 47) R. Jay, A. W. Tomich, J. Zhang, Y. Zhao, A. D. Gorostiza, V. Lavallo*, J. Guo*, "A Comparative Study of Mg(CB₁₁H₁₂)₂ and Mg(TFSI)₂ at the Magnesium/Electrolyte Interface: ***ACS Appl. Mater. Interfaces***, **2019**, 11 (12), pp 11414–11420
- 46) Fisher, S. P.; Tomich, A. W.; Lovera, S. O.; Kleinsasser, J. F.; Guo, J.; Asay, M. J.; Nelson, H. M.*; Lavallo, V.*, Nonclassical Applications of closo-Carborane Anions:

From Main Group Chemistry and Catalysis to Energy Storage. **Chem. Rev.** **2019**, 119, 8262-8290 (invited).

- 45) Fisher, S. P.; Tomich, A.; Guo, J.; Lavallo, V.*; Teaching an Old Dog New Tricks: New Directions in Fundamental and Applied closo-Carborane Anion Chemistry. **Chem. Commun.** **2019**, 55, 1684-1701 (invited).
- 44) Uday B. Chauhan, A. W. Tomich*, V. Lavallo*, "The First example of a "Click" Reaction with a Carboranyl Azide and an Olefin" **Tetrahedron**, **2019**, 75, 1323-1325 (Invited).
- 43) Kleinsasser, J. F.; Reinhart, E. D.; Estrada, J.; Jordan, R. F.; Lavallo, V.*; Ethylene Oligomerization and Polymerization by Palladium(II) Methyl Complexes Supported by Phosphines Bearing a Perchlorinated 10-Vertex closo-Carborane Anion Substituent. **Organometallics** **2018**, 37, 4773-4783.
- 42) J. F. Kleinsasser, S. E. Lee, C. A. Lugo, V. Tej, S. G. McArthur, V. Lavallo* "Synthesis of an Anionic Au(I) Hydroamination Precatalyst Supported by Charged Hydrido-Carboranyl Phosphine Ligands, **Polyhedron**, **2018**, 156, 245-248 (Invited: In celebration of Bill Jones's 65th birthday).
- 41) R. Dziedzic, M. Waddington, S. E. Lee; J. F. Kleinsasser, J. Plumley, W. Ewing, B. Bosley*, V. Lavallo*, T. Peng*, A. Spokoiny*, "Reversible Silver Electrodeposition from Boron Cluster Ionic Liquid (BCIL) Electrolytes" **ACS Appl. Mater. Interfaces**, **2018**, 10, 8, 6825-6830.
- 40) J. Estrada, V. Lavallo*, "Fusing Dicarbolide Ions with N-Heterocyclic Carbenes" **Angew. Chem. Int. Ed.**, **2017**, 56, 9906.
- 39) J. F. Kleinsasser, S. P. Fisher, F.S. Tham, V. Lavallo*, "On the Reactivity of the Carba-closo-Dodecaborate Anion with the Trityl Cation" **Eur. J. Inorg. Chem.**, **2017**, 4417-4419 (Invited: Boron Special Issue).
- 38) S.G. McArthur, R. Jay, L. Geng, J. Guo*, V. Lavallo* Below the 12-Vertex: 10-Vertex Carborane Anions as NonCorrosive, Halide Free, Electrolytes for Rechargeable Mg Batteries, **Chem. Commun.**, **2017**, 53, 4453-4456.

Publications Pre-Tenure

- 37) A.L. Chan, J. Estrada, C.E Kefalidis, V. Lavallo*, "Changing the Charge: Electrostatic Effects in Pd Catalyzed Cross-Coupling" **Organometallics**, **2016**, 35, 3257.
- 36) S.P. Fisher, A. El-Hellani, F. Tham, V. Lavallo*, "Anionic and Zwitterionic Carboranyl N-Heterocyclic Carbene Au(I) Complexes" **Dalton Trans.**, **2016**, 45, 9762 (Invited: **New Talent in the Americas Special Issue**).
- 35) O. Hamdy, T.H. Pham, S.G. McArthur, V. Lavallo, R. Julian* "Dehydrogenation of Icosahedral Carborane Anions via Gas-Phase Collisional Activation", **Rapid Commun. Mass Spectrom.**, **2016**, 30, 1223-1227.

- 34) H. Yang, A.L. Chan, V. Lavallo, Q. Cheng* "Quantitation of alpha-glucosidase activity using fluorinated carbohydrate array and MALDI-TOF-MS", **ACS Appl. Mater. Interfaces**, **2016**, 8, 2872-2878.
- 33) J. Estrada, C.A. Lugo, S.G. McArthur, V. Lavallo* "The Inductive Effects of 10 and 12-Vertex *closo*-Carborane Anion Ligand Substituents: Cluster Size and Charge Make a Difference", *Chem. Commun.*, **2016**, 52, 1824-1826.
- 32) S.G. McArthur, L. Geng, J. Guo*, V. Lavallo* "Cation Reduction and Comproportionation as Novel Strategies to Produce High Voltage, Halide Free, Carborane Based Electrolytes for Rechargeable Mg Batteries", **Inorg. Chem. Frontiers**, **2015**, 2, 1101-1104.
- 31) J. Estrada, S.E. Lee, S. McArthur, A. El-Hellani, F.S. Tham, V. Lavallo*, "Resisting B-H Oxidative Addition: The Divergent Reactivity of the *o*-Carborane and Carba- *closo*-dodecaborate Ligand Substituents" **J. Organomet. Chem.**, **2015**, 798, 214-217, (Invited: Russell Grimes 80th Birthday)
- 30) J. Estrada, D.H. Woen, F.S. Tham, G.M. Miyake, V. Lavallo*, "Synthesis and Reactivity of a Zwitterionic Pd Allyl Complex Supported by a Perchlorinated Carboranyl Phosphine Ligand Substituents" **Inorg. Chem.** **2015**, 54, 5142.
- 29) C.A. Lugo, C. Moore, A. Rheingold, V. Lavallo*, "Synthesis of a Hybrid *m*-Terphenyl/*o*-Carborane Building Block: Applications in Phosphine Ligand Design" **Inorg. Chem.**, **2015**, 54, 2094-2096.
- 28) M. J. Asay, S. P. Fisher, S. E. Lee, D. Borchardt, F. S. Tham, V. Lavallo*, "Synthesis of Unsymmetrical N-Carboranyl NHCs: Directing Effect of the Carborane Anion" **Chem. Commun.** **2015**, 51, 5359 (Invited, Emerging Investigators Special Issue)
- 27) J. Fajardo, Jr., A. L. Chan, F.S. Tham, V. Lavallo*, "Synthesis and Characterization of Anionic Polybrominated Carboranyl Azides" **Inorg. Chim. Acta**, **2014**, 422, 206-208 (invited T.D Tilley 60th birthday issue).
- 26) A. El-Hellani, V. Lavallo*, "Fusing N-Heterocyclic Carbenes with Carborane Anions" **Angew. Chem. Int. Ed.** **2014**, 53, 4489.
- 25) D. Martin, Y. Canac, V. Lavallo, G. Bertrand*, "Comparative Reactivity of Different Types of Stable Cyclic and Acyclic Mono- and Di-Amino Carbenes with Simple Organic Substrates" **J. Am. Chem. Soc.**, **2014**, 136, 5023-5030.
- 24) M. Asay, C. E. Kefalidis, J. Estrada, D. S. Weinberger, J. Wright, C. E. Moore, A. L. Rheingold, L. Maron, V. Lavallo*, "Isolation of a Carborane-Fused Triazole Radical Anion" **Angew. Chem. Int. Ed.** **2013**, 52, 11560.
- 23) V. Lavallo*, J. H. Wright II, F. S. Tham, and S. Quinlivan, "Perhalogenated Carba-*closo*-dodecaborate Anions as Ligand Substituents: Applications in Gold Catalysis" **Angew. Chem. Int. Ed.** **2013**, 52, 3172.
- 22) A. El-Hellani, C. E. Kefalidis, F. S. Tham, L. Maron, V.Lavallo*, "Structure and Bonding of a Zwitterionic Iridium Complex Supported by a Phosphine with the Parent Carba-*closo*-dodecaborate CB₁₁H₁₁⁻ Ligand Substituent"

***Organometallics* 2013, 32, 6887.**

- 21) A. L. Chan , J. Fajardo, J. H. Wright, M. Asay , V. Lavallo* “Observation of Room Temperature B-Cl Activation of the HCB₁₁Cl₁₁-Anion and Isolation of a Stable Anionic Carboranyl Phosphazide”
***Inorg. Chem.* 2013, 52, 12308.**
- 20) J. H. Wright II, C. E. Kefalidis, F. S. Tham, L. Maron, V. Lavallo*,
“Click-Like Reactions with the Inert HCB₁₁Cl₁₁⁻ anion leads to Heterocycles with Unusual Aromatic Character”
***Inorg. Chem.* 2013, 52, 6223.**
- 19) V. Lavallo* (**Book Chapter**). Chapter Title: “Olefin Metathesis Catalysts Bearing Cyclic Alkyl Amino Carbenes” Book Title: “Handbook of Olefin Metathesis 2nd Ed.” Wiley Publishing. (2015).

Publications Before UCR Appointment 2011

- 18) V. Lavallo, A. El-Batta, G. Bertrand, R. H. Grubbs,
“Insights Into the Carbene Initiated Aggregation of Fe(COT)₂”
***Angew. Chem. Int. Ed.* 2011, 50, 268.**
- 17) V. Lavallo, R. H. Grubbs,
“Carbenes as Catalysts for Transformations of Organometallic Iron Complexes”
***Science* 2009, 326, 559,**. see also: *Science* 2009 326, 532; *Chem. Eng. News* 2009, 87(43), 9.
- 16) V. Lavallo, C. A. Dyker, B. Donnadieu, G. Bertrand,
“Are Allenes with Zwitterionic Character Still Allenes? Of course!”
***Angew. Chem. Int. Ed.* 2009, 48, 1540.**
- 15) V. Lavallo, G. D. Frey, M. Soleilhavoup, B. Donnadieu, G. Bertrand,
“Homogeneous Catalytic Hydroamination of Alkynes and Allenes with Ammonia.”
***Angew. Chem. Int. Ed.* 2008, 47, 5224.**
- 14) V. Lavallo, C. A. Dyker, B. Donnadieu, G. Bertrand, “Synthesis and ligand properties of stable five-membered-ring allenenes containing only second-row elements.”
***Angew. Chem. Int. Ed.* 2008, 47, 5411.**
- 13) C. A. Dyker, V. Lavallo, B. Donnadieu, G. Bertrand,
“An Extremely Bent Acyclic Allene (A “Carbodicarbene”): A Strong Donor Ligand”
***Angew. Chem. Int. Ed.* 2008, 47, 3206.** see also: *Science* 2008, 321, 5892,.
- 12) V. Lavallo, G. D. Frey, S. Kousar, B. Donnadieu, G. Bertrand, “Allene Formation by Gold Catalyzed Cross-Coupling of Masked Carbenes and Vinylidenes”
***Proc. Natl. Acad. Sci. USA* 2007, 104, 13569.**
- 11) G. D. Frey, V. Lavallo, Y. Canac, B. Donnadieu, W. W. Schoeller, G. Bertrand,
“Facile Splitting of H₂ and NH₃ by Nucleophilic Activation at a Single Carbon Center”
***Science* 2007, 316, 439.** see also: *Chem. Eng. News* 2007, 85(19), 67;
Angew. Chem. Int. Ed. 2008, 47, 38; *Angew. Chem. Int. Ed.* 2008, 47, 831.

- 10) A. DeHope, V. Lavallo, B. Donnadiou, W. W. Schoeller, G. Bertrand, "Recently Reported Crystalline Isothiazole Carbenes: Myth or Reality" **Angew. Chem. Int. Ed.** **2007**, 46, 6922. [Angew. Chem. Hot Paper]. see also: *Angew. Chem. Int. Ed.* 2007, 46, 6926.
- 9) D. R. Anderson, V. Lavallo, D. J. O'Leary, G. Bertrand, R. H. Grubbs, "Synthesis and Reactivity of Olefin Metathesis Catalysts Bearing Cyclic(Alkyl)(Amino)Carbenes" **Angew. Chem. Int. Ed.** **2007**, 46, 7262.
- 8) V. Lavallo, Y. Canac, B. Donnadiou, W. W. Schoeller, G. Bertrand, "Cyclopropenylienes: From Interstellar Space to an Isolated Deriv. in the Laboratory" **Science** **2006**, 312, 722. see also: *Chem. Eng. News* 2006, 84(16), 33.
- 7) V. Lavallo, Y. Ishida, B. Donnadiou, G. Bertrand, "Isolation of Cyclopropenyliene-Lithium Adducts: The Weiss-Yoshida Reagent" **Angew. Chem. Int. Ed.** **2006**, 45, 6652.
- 6) V. Lavallo, Y. Canac, B. Donnadiou, W. W. Schoeller, G. Bertrand "CO Fixation to Alkyl Amino Carbenes: Stable Amino Ketenes with a Small HOMO–LUMO Gap" **Angew. Chem. Int. Ed.** **2006**, 45, 3488. [Angew. Chem. V.I.P. paper] see also: *Angew. Chem. Int. Ed.* 2006, 45, 5580.
- 5) V. Lavallo, Y. Canac, A. DeHope, B. Donnadiou, W. W. Schoeller, G. Bertrand, "Rigid CAAC ligands lead to the isolation of low-coordinate metal complexes" **Angew. Chem. Int. Ed.** **2005**, 44, 7236. [Angew. Chem. Hot Paper]. see also: *Angew. Chem. Int. Ed.* 2006, 45, 1348.
- 4) V. Lavallo, Y. Canac, C. Prasang, B. Donnadiou, W. W. Schoeller, G. Bertrand, "Stable CAACs as rigid or flexible, bulky, electron-rich ligands for transition-metal catalysts: A quaternary carbon atom makes the difference" **Angew. Chem. Int. Ed.** **2005**, 44, 5705. [Angew. Chem. V.I.P. paper]. see also: *Science* 2005, 309, 1155; *Chem. Eng. News* 2005, 83(32), 15; *Angew. Chem. Int. Ed.* 2006, 45, 1348.
- 3) V. Lavallo, J. Mafhouz, Y. Canac, B. Donnadiou, W. W. Schoeller, G. Bertrand, "Synthesis, reactivity, and ligand properties of a stable alkyl carbene" **J. Am. Chem. Soc.** **2004**, 126, 8670.
- 2) K. Miqueu, J. M. Sotiropoulos, G. Pfister-Guillouzo, K. Miqueu, J. M. Sotiropoulos, G. Pfister-Guillouzo, V. L. Rudzevich, H. Gornitzka, V. Lavallo, V. D. Romanenko, "Syntheses, structures, bonding and photoelectron spectra of "push-pull" substituted P-[2,6-bis(trifluoromethyl)phenyl]-sigma(2)lambda(3)-iminophosphanes" **Eur. J. Inorg. Chem.** **2004**, 2289.
- 1) V. D. Romanenko, C. Thoumazet, V. Lavallo, F. S. Tham, G. Bertrand, "Synthesis and Reactivity of a Stable Crystalline Diastereomerically Pure Trifluoromethanesulfinic Acid Derivative: (S)-(-)-1-Trifluoromethylsulfinyl-(R)-4-phenyloxazolidin-2-one" **Chem. Commun.** **2003**, 1680.

Invited Lectures

2020: ACS National Meeting Spring Philadelphia, Organometallic Gordon Conference
Salve Regina University, BORAM Virginia Tech

2019: U Wyoming Summer Lectureship, ACS National Meeting San Diego, 0 to 4-D
Materials Symposium UCSD

2018: Boron in the America's (BORAM), Michigan State

2017: USC, Baylor University

2015-2016: University Seminars: Harvard, MIT, U Penn, Princeton, Columbia,
Northwestern, U Chicago, UC Berkeley, U Washington, UCSD, UCI, UCSB, USC,
Texas A&M, Rutgers.

2015-2016: Conferences: Pacific Chem. (Boron Cluster symposium).

2014: two talks at ACS National Meeting Dallas

2013: Pfizer, La Jolla Ca

Patents since UCR Appointment 2011

V. Lavallo "High Voltage 10 and 12-Vertex Carborane Electrolytes and Processes
for the Preparation of Rechargeable Mg Batteries **2015**."

V. Lavallo "Catalyst and Battery Components Derived from Condensation Reactions
with Carba-*closo*-Dodecaborate Amines" WO 2015139060 **2015**."

V. Lavallo "Complexes of Phosphine Ligands Comprising a Carba-*closo*-
Dodecaborate Substituent WO 2014071401, **2014**."

Patents Before

G. Bertrand, V. Lavallo, C. A. Dyker, "Bent Allenes and their metal complexes"
WO 2009089483 A1, **2009**."

G. Bertrand, V. Lavallo, G.D. Frey, B. Donnadiou, M. Soleilhavoup, "Gold catalyzed
hydroamination of alkynes and allenes with NH₃" WO 2009137810 A2, **2009**."

G. Bertrand, V. Lavallo, Y. Canac, B. Donnadiou, "Preparation of stable
cyclopropenylidenes and metal complexes thereof" US 2008269525 A1, **2008**."

G. Bertrand, V. Lavallo, Y. Canac, "Stable cyclic (alkyl)(amino) carbenes as ligands for
transition metal catalysts" WO 2006138166 A2, **2006**."

