

Raúl Hernández Sánchez
 Chevron Science Center
 219 Parkman Ave., Pittsburgh, PA 15260
 (412) 648-4218, www.hernandezsanchezgroup.org
 raulhs@pitt.edu

A. Professional preparation

ITESM Campus Monterrey	Monterrey, Mexico	Chemistry	B.S. 2010
Harvard University	Cambridge, MA, USA	Chemistry	A.M. 2012, Ph.D. 2015
Columbia University	New York, NY, USA	Chemistry	Postdoc 2016-18

B. Appointments

Assistant Professor, University of Pittsburgh, 2018 – present
 Columbia Nano Initiative Postdoctoral Fellow, 2016 – 2018

C. Products

Publications (Google scholar metrics: H-index=16; 1009 citations as of 7/23/2020)

At Pitt

31. Castro, E.; Mirzaei, S.; **Hernández Sánchez, R.*** "Expanding the tubularene family". *In preparation*.
30. Gadjeva, N. A.; Szimai, P.; Sági, O.; Alemany, P.; Conejeros, S.; Paley, D. W.; **Hernández Sánchez, R.**; Fowler, B.; Náfrádi, B.; Forró, L.; Roy, X. S.; Batail, P.;* Canadell, E.;* Steigerwald, M. L.;* Nuckolls, C.* "Antiferromagnetism in K-Doped p-Terphenyl: Caught Between Two Resonance Structures". *Submitted*.
29. Mirzaei, S.;[§] Castro, E.;[§] **Hernández Sánchez, R.*** "Tubularenes". *Chem. Sci.* **2020**, DOI: 10.1039/D0SC03384G. [§] contributed equally.

Before Pitt

28. Liu, T.; Yang, J.; Geyer, F.; Conrad-Burton, F.; **Hernández Sánchez, R.**; Li, H.; Zhu, X.; Xiao, S.; Nuckolls, C.; Steigerwald, M. "Stringing the PDI Bow". *Angew. Chem. Int. Ed.* **2020**, DOI: 10.1002/anie.202004989.
27. Conrad-Burton, F.; Liu, T.; Geyer, F.; Costantini, R.; Schlaus, A.; Spencer, M.; Wang, J.; **Hernández Sánchez, R.**; Zhang, B.; Xu, Q.; Steigerwald, M.; Xiao, S.; Li, H.; Nuckolls, C.; Zhu, X. "Controlling Singlet Fission by Molecular Contortion". *J. Am. Chem. Soc.* **2019**, *141*, 13143.
26. Bartholomew A. K.; Teesdale, J. J.; **Hernández Sánchez, R.**; Malbrecht, B.J.; Juda, C.; Ménard, G.; Bu, W.; Iovan, D. A.; Mikhailine, A. A.; Zheng, S.-L.; Sarangi, R.; Wang, S. G.; Chen, Y.-S.; Betley, T. A. "Exposing the inadequacy of redox formalisms by resolving redox inequivalence within isovalent clusters". *Proc. Natl. Acad. Sci.* **2019**, *116*, 15836.
25. Milton, M.; Schuster, N.; Paley, D. W.; **Hernández Sánchez, R.**; Ng, F.; Steigerwald, M. L.; Nuckolls, C. "Defying Strain in the Synthesis of an Electroactive Bilayer Helicene". *Chem. Sci.* **2019**, *10*, 1029.
24. **Hernández Sánchez, R.**; Betley, T. A. "Thermally Persistent High-Spin Ground States in Octahedral Iron Clusters". *J. Am. Chem. Soc.* **2018**, *140*, 16792.
23. **Hernández Sánchez, R.***; Champsaur, A. M.; Choi, B.; Wang, S. G.; Bu, W.; Roy, X.; Chen, Y.-S.*; Steigerwald, M. L.*; Nuckolls, C.*; Paley, D. W.*. "Electron cartography in clusters". *Angew. Chem. Int. Ed.* **2018**, *57*, 13815.
22. Schuster, N.; **Hernández Sánchez, R.**; Bukharina, D.; Kotov, N. A.; Breova, N.; Ng, F.*; Steigerwald, M. L.*; Nuckolls, C.*. "A Helicene Nanoribbon with Greatly Amplified Chirality". *J. Am. Chem. Soc.* **2018**, *140*, 6235.
21. Zhang, B.;[§] **Hernández Sánchez, R.**;[§] Zhong, Y.; Ball, M.; Terban, M. W.; Paley, D.; Billinge, S. J. L.; Ng, F.; Steigerwald, M. L.; Nuckolls, C. "Hollow Organic Capsules Assemble into Cellular Semiconductors". *Nat. Commun.* **2018**, *9*, 1957. [§] = equal contribution.

20. Milton, M.; Cheng, Q.; Yang, Y.*; Nuckolls, C.*; **Hernández Sánchez, R.***; Sisto, T.* “Molecular materials for Non-Aqueous Flow Batteries with High Coulombic Efficiency and Stable Cycling”. *Nano Lett.* **2017**, *17*, 7859.
19. Keener, M.; Peterson, M.; **Hernández Sánchez, R.**; Oswald, V. F.; Wu, G.; Ménard, G.*. “Towards Catalytic Ammonia Oxidation to Dinitrogen: A Synthetic Cycle Using a Simple Manganese Complex”. *Chem. Eur. J.* **2017**, *23*, 11479.
18. Amiri, H.; Shepard, K.*; Nuckolls, C.*; **Hernández Sánchez, R.***. “Single-Walled Carbon Nanotubes: Mimics of Biological Ion Channels”. *Nano Lett.* **2017**, *17*, 1204.
17. Lee, H.; Campbell, M. G.; **Hernández Sánchez, R.**; Börgel, J.; Raynaud, J.; Parker, S. E.; Ritter, T. “Mechanistic Insight Into High-Spin Iron(I)-Catalyzed Butadiene Dimerization”. *Organometallics* **2016**, *35*, 2923.
16. Furneaux, A. G.; Piro, N. A.; **Hernández Sánchez, R.**; Garmigna, K. M.; Fey, N.; Robinson, M. J.; Kassel, W. S.; Nataro, C. “Spectroscopic, structural and computational analysis of $[\text{Re}(\text{CO})_3(\text{dippM})\text{Br}]^{n+}$ (dippM = 1,1'-bis(diiso-propylphosphino)metallocene, M = Fe, $n = 0$ or 1; M = Co, $n = 1$)”. *Dalton Trans.* **2016**, *45*, 4819.
15. Blass, B. L.; **Hernández Sánchez, R.**; Decker, V. A.; Robinson, M. J.; Piro, N. A.; Kassel, W. S.; Diaconescu, P. L.; Nataro, C. “Structural, Computational, and Spectroscopic Investigation of $[\text{Pd}(\kappa^3\text{-}1,1'\text{-bis}(\text{di-tert-butylphosphino})\text{ferrocenediyl})\text{X}]^+$ (X = Cl, Br, I) Compounds”. *Organometallics* **2016**, *35*, 462.
14. **Hernández Sánchez, R.**; Bartholomew, A.; Powers, T.; Ménard, G.; Betley, T. A. “Maximizing electron exchange in a $[\text{Fe}_3]$ cluster”. *J. Am. Chem. Soc.* **2016**, *138*, 2235.
13. **Hernández Sánchez, R.**; Betley, T. A. “Meta-Atom Behavior in Clusters Revealing Large Spin Ground States”. *J. Am. Chem. Soc.* **2015**, *137*, 13949.
12. **Hernández Sánchez, R.**; Zheng, S.-L.; Betley, T. A. “Ligand Field Strength Mediates Electron Delocalization in Octahedral $[(^{\text{H}}\text{L})_2\text{Fe}_6(\text{L}')_m]^{n+}$ Clusters”. *J. Am. Chem. Soc.* **2015**, *137*, 11126.
11. **Hernández Sánchez, R.**; Willis, A. M.; Zheng, S.-L.; Betley, T. A. “Synthesis of Well-Defined Biccapped Octahedral Iron Clusters $[(^{\text{ten}}\text{L})_2\text{Fe}_8(\text{PMe}_2\text{Ph})_2]^n$ ($n = 0, -1$)”. *Angew. Chem. Int. Ed.* **2015**, *54*, 12009.
10. Cramer, S. A.; **Hernández Sánchez, R.**; Brakhage, D. F.; Jenkins, D. M. “Probing the role of an Fe^{IV} tetrazene in catalytic aziridination”. *Chem. Commun.* **2014**, *50*, 13967.
9. Wu, B.; **Hernández Sánchez, R.**; Bezpalko, M. W.; Foxman, B. M.; Thomas, C. M. “Formation of a Heterobimetallic Zirconium/Cobalt Diimido Complexes via a Four-Electron Transformation”. *Inorg. Chem.* **2014**, *53*, 10021.
8. Powers, T. M.; Gu, N. X.; Fout, A. R.; Baldwin, A. M.; **Hernández Sánchez, R.**; Alfonso, D. M.; Chen, Y.-S.; Zheng, S.-L.; Betley, T. A. “Synthesis of Open-Shell, Bimetallic Mn/Fe Trinuclear Clusters”. *J. Am. Chem. Soc.* **2013**, *135*, 14448.
7. Eames, E.; **Hernández Sánchez, R.**; Betley, T. A. “Metal atom lability in polynuclear complexes”. *Inorg. Chem.* **2013**, *56*, 5006.
6. Kraft, S. J.; **Hernández Sánchez, R.**; Hock, A. S. “A Remarkably Active Iron Catecholate Immobilized in a Porous Organic Polymer”. *ACS Catal.* **2013**, *3*, 826.
5. Wong, L. J.; **Hernández Sánchez, R.**; Glancy Logan, J.; Zarkesh, R. A.; Ziller, J. W.; Heyduk, A. F. “Disulfide reductive elimination from an iron(III) complex”. *Chem. Sci.* **2013**, *4*, 1906.
4. Harris, T. D.; Zhao, Q.; **Hernández Sánchez, R.**; Betley, T. A. “Expanded Redox Accessibility via Ligand Substitution in an Octahedral Fe_6Br_6 Cluster”. *Chem. Commun.* **2011**, *47*, 6344.
3. Yamazaki, Y.; **Hernandez-Sanchez, R.**; Haile, S. M. “Cation nonstoichiometry in yttrium-doped barium zirconate: phase behavior, microstructure, and proton conductivity”. *J. Mater. Chem.* **2010**, *20*, 8158-8166.
2. Telila, H.; Mamo, T.; **Hernandez Sanchez, R.** “The Fabrication of nanoparticle CsH_2PO_4 Electrolyte for Fuel Cell Applications”. *Caltech Undergraduate Research Journal* **2009**, Vol. 9 (No. 1), 33 – 39.
1. Yamazaki, Y.; **Hernandez-Sanchez, R.**; Haile, S. M. “High Total Proton Conductivity in Large-Grained Yttrium-Doped Barium Zirconate”. *Chem. Mater.* **2009**, *21* (13), 2755-2762.

Patents

1. Milton, M.; Cheng, Q.; Yang, Y.*; Nuckolls, C.*; **Hernández Sánchez, R.***; Sisto, T.* “Non-Aqueous Flow Batteries”. International Publication No. **WO 2019/036633 A1**.

D. Awards and honors

- 2019** SNI Level I (National System of Researchers in México).
2016 Columbia Nano Initiative Postdoctoral Research Scientist Fellowship.
2015 Poster Prize Award 5th European Conference on Molecular Magnetism.
2015 Fellowship from the 5th European Conference on Molecular Magnetism.
2015 Featured in "Las 30 promesas" (The 30 promises) emitted by Grupo Editorial Expansion.
2012 ACS, Division of Inorganic Chemistry Student Travel Award.
2011 – 2012 CONACYT/Fundación México en Harvard Research Award.
2010 CONACYT/Fundación Mexico en Harvard Fellowship and Research Award, Fieser Graduate Research Award.
2008 Research Assistant Scholarship, Caltech.
2007 Summer Undergraduate Research Fellowship (SURF), Caltech.
2005 – 2010 Xorge A. Domínguez Scholarship, ITESM.
2005 – 2010 Special Chemistry Scholarship L.C.Q., ITESM.
2004 Honorary Mention in XV Mexican Physics Olympiad.

E. Synergistic Activities and contributions to diversity

4. Faculty support for the Alliance for Diversity in Science and Engineering (ADSE) Chapter at the University of Pittsburgh. **2019 – present**.
3. Mentor at Eureka Street Corporation (www.eurekastreet.org). **2018 – present**. Student mentoring program to support students from minority serving institutions on their applications to graduate programs in Physics and Chemistry in the USA. Students mentored (2018-present) = 2. (one about to start PhD in Fall 2020).
2. City Coordinator of “Clubes de Ciencia México” (www.clubesdeciencia.mx). **2017 – present**. Science outreach program designed to bring hands-on week-long workshops in STEM to students in high school and undergraduate in Mexico. The instructors are PhD/postdocs volunteers from top universities in the United States and Mexico.
1. PQI Quantum Day, **April 2019**. Science outreach to show high school students the day-to-day work of a researcher through a laboratory tour.

F. Collaborators

Collaborators at the University of Pittsburgh: Professor James McKone (Department of Chemical and Petroleum Engineering).

Collaborators at Argonne National Laboratory: Dr. Yu-Sheng Chen (ChemMatCARS – The University of Chicago).

Graduate Advisor: Professor Theodore A. Betley (Harvard).

Postdoctoral Sponsors: Professor Colin Nuckolls (Columbia) and Columbia Nano Initiative.

G. Mentorship

Current: postdoctoral supervision: (2) Dr. Thomas H. Allen and Dr. Edison Arley Castro Portillo. *Ph.D. students:* (4) Saber Mirzaei, Brett Lucht, Manasseh Osei, and Mohammad Azizur Rahman.

Past: undergraduate students: (8) Nicolas D'Annunzio, Ryan W. McLane, Madison Keating, James Dages, Bridget Glessner, Addison Averill, Derek Lamb, and Emily Nicola.

H. Teaching assignments

Chem 2120 Fall 2020 – Descriptive Inorganic and Organometallic Chemistry.

Chem 1130 Spring 2020 – Inorganic Chemistry (capstone course) – 33 undergraduate students enrolled.

Chem 2120 Fall 2019 – Descriptive Inorganic and Organometallic Chemistry – 17 PhD students enrolled.

Chem 2120 Fall 2018 – Descriptive Inorganic and Organometallic Chemistry – 18 PhD students enrolled.

I. Invited talks

22. Hampton University, October **2019**, Hampton, VA, USA.
21. University of Maryland, October **2019**, College Park, MD, USA.
20. Northwestern University, September **2019**, Evanston, IL, USA.
19. University of Colorado Boulder, February **2018**, Boulder, CO, USA.
18. Indiana University Bloomington, February **2018**, Bloomington, IN, USA.
17. University of California San Diego, January **2018**, San Diego, CA, USA.
16. University of California Riverside, January **2018**, Riverside, CA, USA.
15. University of Pittsburgh, January **2018**, Pittsburgh, PA, USA.
14. University of Illinois Urbana-Champaign, January **2018**, Champaign, IL, USA.
13. Princeton University, January **2018**, Princeton, NJ, USA.
12. University of Minnesota, December **2017**, Minneapolis, MN, USA.
11. Tufts University, December **2017**, Medford, MA, USA.
10. Duke University, December **2017**, Durham, NC, USA.
9. University of Massachusetts Amherst, December **2017**, Amherst, MA, USA.
8. Columbia Friday Synthesis Symposium, November **2017**, New York, USA.
7. Boston Regional Inorganic Colloquium (BRIC, Harvard), April **2017**, Cambridge, MA.
6. MRSEC Seminar, Columbia University, October **2016**, New York, USA.
5. Nanostructure in the City Symposium, October **2016**, New York, USA.
4. Columbia Friday Synthesis Symposium, May **2016**, New York, USA.
3. Undergraduate Chemistry Seminar (ITESM), October **2015**, Monterrey, México.
2. MIT Enterprise Forum Mexico, August **2015**, Oaxaca, México.
1. Movimiento NOMADX, August **2015**, Chihuahua, México.

J. Contributed talks

17. American Chemical Society National Meeting, August **2019**, San Diego, CA.
16. MRSEC retreat seminar, Columbia University, May **2017**, New York, USA.
15. American Chemical Society National Meeting, April **2017**, San Francisco, CA.
14. Gordon Research Conference and Seminar: Inorg. Reaction Mech., March **2017**, Houston, TX.
13. 5th European Conference on Molecular Magnetism, September **2015**, Zaragoza, Spain.
12. American Chemical Society National Meeting, August **2015**, Boston, MA.
11. American Chemical Society National Meeting, August **2014**, San Francisco, CA.
10. Gordon Research Conference and Seminar: Inorganic Chemistry, June **2014**, Biddeford, MA.
9. American Chemical Society National Meeting, April **2013**, New Orleans, LA.
8. American Chemical Society National Meeting, March **2012**, San Diego, CA.
7. Boston Regional Inorganic Colloquium (BRIC), October **2011**, Worcester, MA.
6. Bachelor Thesis Proposal Seminar, November **2009**, Monterrey, México.
5. Undergraduate Chemistry Seminar: “Nanodics at interfaces: combined application of SPR and AFM”, October **2009**, Monterrey, México.
4. Undergraduate Chemistry Seminar: “Yttrium-Doped Barium Zirconate. Defect Chemistry Study to Understand its Protonic Conductivity”, November **2008**, Monterrey, México.
3. Undergraduate Chemistry Seminar: “Effect of Barium Deficiency on the Proton Conductivity of $Ba_{1-x}Zr_{0.8}Y_{0.2}O_{3-\delta}$ ”, September **2007**, Monterrey, México.
2. Summer Undergraduate Research Fellowship Seminar: “Effect of Barium Deficiency on the Proton Conductivity of $Ba_{1-x}Zr_{0.8}Y_{0.2}O_{3-\delta}$ ”, August **2007**, Pasadena, CA.
1. Undergraduate Chemistry Seminar: “Thermal Differential Analysis of a Vitreous Sample”, November **2006**, Monterrey, México.