Paul Chirik

• 292 Frick Laboratory, Department of Chemistry, Princeton, New Jersey, 08544
Phone: 609-254-4130 • E-Mail: pchirik@princeton.edu

Education

Ph.D. **California Institute of Technology, June 2000**
Advisor: John E. Bercaw, Thesis: *Ancillary Ligand Effects on Fundamental Transformations in Metallocene Catalyzed Olefin Polymerization.*

B.S. **Virginia Tech, *Magna Cum Laude*, In Honors, May, 1995**
Advisor: Joseph S. Merola, Thesis: *Studies in to Iridium- and Rhodium- Hydrogenation Catalysts for Alkene Hydrogenation in Aqueous Solution*.

Experience

• Edwards S. Sanford Professor, Princeton University	2011-present
• Peter J. W. DeBye Professor, Cornell University	2009-2011
• Associate Professor, Cornell University	2006-2009
• Assistant Professor, Cornell University	2001-2006
• Postdoctoral Fellow, Massachusetts Institute of Technology	2000-2001

Selected Honors and Awards

• Gabor Somorjai Award for Creative Research in Catalysis	2021
• Catalysis Society of South Africa (CATSA) Eminent Visitor	2021
• Linus Pauling Medal (postponed to 2021)	2020
• Rylander Award in Catalysis Sponsored by BASF (postponed)	2020
• Eni Award, Advanced Environmental Solutions Prize	2019
• *ACS Catalysis* Lectureship for Advancement of Catalysis Science	2017
• Presidential Green Chemistry Challenge Award	2016
• Arthur C. Cope Scholar Award, American Chemical Society	2009
• Bessel Fellow of the Alexander von Humboldt Foundation	2008
• Camille Dreyfus-Teacher Scholar	2006
• Stephen and Margery Russell Distinguished Teaching Award	2005
• David and Lucile Packard Fellow in Science and Engineering	2004
• NSF CAREER Award	2003
• Herbert Newby McCoy Award for Outstanding Dissertation, Caltech	2000

Selected Synergistic Activities

- Editor-in-Chief, *Organometallics* 2015-present
- Associate Chair, Department of Chemistry, Princeton University 2020-present
- ACS Sustainable Development Advisory Council 2021-present
- Chair, Department of Energy Basic Energy Sciences Contractor's Meeting 2017
- Associate Director for External Partnerships, Andlinger Center 2015-2016
- Defense Science Study Group 2010-2011

Selected Named Lectureships

- Thomas Lecture, University of Missouri 2021
- Fishel Lecture, Vanderbilt University 2021
- Novartis Lecture (postponed) 2020
- Behringer Simon Lecture – ETH Zürich (postponed) 2020
- Jefferson Lecture, University of Virginia 2020
- Frontiers Lecture, Max Planck, Kohlenforschung 2019
- ICI Lecture, University of Calgary 2018
- Richard Walton Lecture, Purdue University 2017
- Allergan Lecture, University of California – Irvine 2017
- Singapore Nanyang Distinguished Lectureship 2017
- J. Clarence Karcher Lecture, University of Oklahoma 2017
- Xingda Lecturer, Peking University 2015
- Closs Lecturer, University of Chicago 2014

Publications (h-index 71, Web of Science)

229. Mohadjer Beromi, M.; Younker, J. M.; Zhong, H., Pabst, T. P.; Chirik, P. J. "Catalyst design principles enabling intermolecular alkene-diene [2+2] cycloaddition and depolymerization reactions." *J. Am. Chem. Soc.* **2021**, DOI: 10.1021/jacs.1c08912.

228. Park, Y.; Kim, S.; Tian, L.; Zhong, H.; Scholes, G. D.; Chirik, P. J. "Visible light enables catalytic formation of weak chemical bonds with molecular hydrogen." *Nat. Chem.* **2021**, *13*, 969-976.

227. Park, Y.; Semproni, S. P.; Zhong, H.; Chirik, P. J. "Synthesis, electronic structure, and reactivity of a planar four-coordinate, cobalt-imido complex." *Angew. Chem. Int. Ed.* **2021**, *60*, 14376-14380.

226. Rummelt, S.; Peterson, P.; Zhong, H.; Chirik, P. J. "Oxidative addition of aryl and alkyl halides to a reduced iron pincer complex." *J. Am. Chem. Soc.* **2021**, *143*, 5928-5936.

225. Viereck, P.; Rummelt, S.; Soja, N.; Pabst, T.; Chirik, P. J. "Synthesis and asymmetric alkene hydrogenation of activity of C_2-symmetric enantioenriched pyridine dicarbene iron dialkyl complexes." *Organometallics* **2021**, *40*, 1053-1061.

224. Pabst, T. P.; Chirik, P. J. "A tutorial on selectivity determination in C(sp^2)–H oxidative addition of arenes by transition metal complexes." *Organometallics* **2021**, *40*, 813-831.

223. Kennedy, C. R.; Joannou, M. V.; Steves, J. E.; Hoyt, J. M.; Kovel, C. B.; Chirik, P. J. "Iron-catalyzed vinylsilane dimerization and cross-cycloadditions with 1,3-dienes: Probing the origins of chemo- and regioselectivity." *ACS Catal.* **2021**, *11*, 1368-1379.

222. Mendelsohn, L. N.; MacNeil, C. S.; Tian, L.; Park, Y.; Scholes, G. D.; Chirik, P. J. "Visible-light-enhanced cobalt-catalyzed hydrogenation: Switchable catalysis enabled by divergence between thermal and photochemical pathways." *ACS Catal.* **2021**, 11, 1351-1360.

221. Pabst, T. P.; Quach, L.; MacMillan, K. T.; Chirik, P. J. "Mechanistic origins of regioselective in cobalt-catalyzed C(sp^2)–H borylation of benzoate esters and arylboronate esters." *Chem* **2021**, *7*, 237-254.

220. Mohadjer Beromi, M.; Kennedy, C. R.; Younker, J. M.; Carpenter, A. E.; Mattler, S. J.; Throckmorton, J. A.; Chirik, P. J. "Iron catalyzed synthesis and chemical recycling of telechelic 1,3-enchained oligocyclobutanes." *Nature Chem.* **2021**, *13*, 156-162.

219. Margulieux, G. W.; Kim, S.; Chirik, P. J. "Determination of the N–H bond dissociation free energy in a pyridine(diimine)molybdenum complexes prepared by proton-coupled electron transfer." *Inorg. Chem.* **2020**, *59*, 15394-15401.

218. Ludwig, J. R.; Simmons, E. M.; Wisniewski, S. R.; Chirik, P. J. "Cobalt-catalyzed C(sp^2)–C(sp^3) Suzuki-Miyaura cross coupling." *Org. Lett.* **2021**, *23*, 625-630 (ACS Editor's Choice).

216. Bullock, R. M.; Chen, J. G.; Gagliardi, L.; Chirik, P. J.; Farha, O. M.; Hendon, C. H.; Jones, C. W.; Keith, J. A.; Klosin, J.; Minteer, S. D.; Morris, R. H.; Radosevich, A. T.; Rauchfuss, T. B.; Strotman, N. A.; Vojvodic, A.; Ward, T. R.; Yang, J. Y.; Surendranath, Y. "Using Nature's blueprint to expand catalysis with Earth-abundant metals." *Science* **2020**, *369*, DOI: 10.1126/science.abc3183.

214. Corpas, J.; Viereck, P.; Chirik, P. J. "C(sp^2)–H activation with pyridine dicarbene iron dialkyl complexes: Hydrogen isotope exchange of arenes using benzene-d_6 as a deuterium source." *ACS Catal.* **2020**, *10*, 8640-8647.

210. Kim, S.; Zhong, H.; Park, Y.; Loose, F.; Chirik, P. J. "Catalytic hydrogenation of a manganese(V) nitride to ammonia." *J. Am. Chem. Soc.* **2020**, *142*, 9518-9524.

209. MacNeil, C.; Mendelsohn, L. N.; Zhong, H.; Pabst, T.; Chirik, P. J. "Synthesis and reactivity of organometallic intermediates relevant to cobalt-catalyzed hydroformylation." *Angew. Chem. Int. Ed.* **2020**, *59*, 8912-8915.

208. Joannou, M. V.; Hoyt, J. M.; Chirik, P. J. "Investigations into the mechanism of inter- and intramolecular iron-catalyzed [2+2] cycloaddition of alkenes." *J. Am. Chem. Soc.* **2020**, *142*, 5314-5330.

207. Zhong, H.; Shevlin, M.; Chirik, P. J. "Cobalt-catalyzed asymmetric hydrogenation of α, β-unsaturated carboxylic acids by homolytic H_2 cleavage." *J. Am. Chem. Soc.* **2020**, *142*, 5272-5281.

206. Viereck, P.; Krautwald, S.; Pabst, T. P.; Chirik, P.J. "A boron activating effect enables cobalt-catalyzed asymmetric hydrogenation of sterically hindered alkenes." *J. Am. Chem. Soc.* **2020**, *142*, 3923-3930.

205. Lee, B.; Chirik, P. J. "Ketone synthesis from benzyldiboronates and esters: Leveraging α-borylcarbanions for carbon–carbon bond formation." *J. Am. Chem. Soc.* **2020**, *142*, 2429-2437.

202. Rosenkoetter, K. E.; Kennedy, C. R.; Chirik, P. J.; Harvey, B. G. "[4+4]-cycloaddition of isoprene for the production of high-performance bio-based jet fuel." *Green Chemistry* **2019**, *21*, 5616-5623.

201. Kim, S.; Loose, F. W.; Bezdek, M. J.; Wang, X.; Chirik, P. J. "Hydrogenation of *N*-heteroarenes using rhodium precatalysts: Reductive elimination leads to formation of multimetallic clusters." *J. Am. Chem. Soc.* **2019**, *141*, 17900-17908.

200. Pabst, T. P.; Obligacion, J. V.; Rochette, E.; Pappas, I.; Chirik, P. J. "Cobalt-catalyzed borylation of fluorinated arenes: Thermodynamic control of C(sp^2)–H oxidative addition results in *ortho*-to-fluorine selectivity." *J. Am. Chem. Soc.* **2019**, *141*, 15378-15389.

197. Arévalo, R.; Chirik, P. J. "Enabling two-electron pathways with iron and cobalt: From ligand design to catalytic applications." *J. Am. Chem. Soc.* **2019**, *141*, 9106-9123.

196. Zhong, H.; Friedfeld, M. R.; Chirik, P. J. "Syntheses and catalytic hydrogenation performance of cationic bis(phosphine) cobalt(I) diene and arene compounds." *Angew. Chem. Int. Ed.* **2019**, *58*, 9194-9198.

195. Kennedy, C. R.; Zhong, H.; Macaulay, R.; Chirik, P. J. "Regio- and diastereoselective iron-catalyzed iron-catalyzed [4+4] cycloaddition of 1,3-dienes." *J. Am. Chem. Soc.* **2019**, *141*, 8557-8573.

194. Bezdek, M.; Chirik, P. J. "A fresh approach to ammonia synthesis." *Nature* **2019**, *568*, 464-466.

193. Loose, F.; Wang, D.; Tian, L.; Scholes, G. D.; Knowles, R. R.; Chirik, P. J. "Evaluation of excited state bond weakening for ammonia synthesis from a manganese nitride: Stepwise proton coupled electron transfer is preferred over hydrogen atom transfer." *Chem. Commun.* **2019**, *55*, 5595-5598.

192. Bezdek, M. J.; Chirik, P. J. "Pyridine(diimine) chelate hydrogenation in a molybdenum nitrido ethylene complex." *Organometallics* **2019**, *38*, 1682-1687.

191. Zarate, C.; Yang, H.; Bezdek, M. J.; Hesk, D.; Chirik, P. J. "Ni(I)–X complexes bearing a bulky α-diimine ligand: Synthesis, structure and superior catalytic performance in the hydrogen isotope exchange in pharmaceuticals." *J. Am. Chem. Soc.* **2019**, *141*, 5034-5044.

190. Wang, D.; Loose, F.; Chirik, P. J.; Knowles, R. R. "N–H bond formation in a manganese(V) nitride yields ammonia by light-driven proton coupled electron transfer." *J. Am. Chem. Soc.* **2019**, *141*, 4795-4799.

186. Rafiq, S.; Bezdek, M. J.; Chirik, P. J.; Scholes, G. D. "Dinitrogen coupling to a terpyridine-molybdenum chromophore switched on by Fermi-resonance." *Chem* **2019**, *5*, 402-416.

183. Bezdek, M. J.; Chirik, P. J. "Proton-coupled electron transfer to a molybdenum ethylene complex yields a β-agostic ethyl: Structure, dynamics, and mechanism." *J. Am. Chem. Soc.* **2018**, *140*, 13817-13826.