BERLINGUETTE RESEARCH

CURTIS P. BERLINGUETTE

Professor of Chemistry and Chemical and Biological Engineering, The University of British Columbia
Principal Investigator, Stewart Blusson Quantum Matter Institute (SBQMI)
Program Co-Director, Canadian Institute for Advanced Research (CIFAR)

CONTACT INFORMATION

CHEM A333 | 2036 Main Mall
The University of British Columbia
Vancouver BC, V6T 1Z1, CANADA
cberling@chem.ubc.ca
(604) 827-5969

METRICS, September 2024 *(over last 5 years)*

Total publications: 196 *(67)*
No. of citations: 19241 *(12522)*
h-index: 69 *(54)*

POST-SECONDARY EDUCATION

University or Institution	Program	Dates
Harvard University	Postdoctoral Associate	2004-2006
Texas A&M University	Ph.D.	2000-2004
University of Alberta	B.Sc.	1996-2000

EMPLOYMENT RECORD

University of British Columbia	Professor of Chemistry and Chemical and Biological Engineering	2017-present
Stewart Blusson Quantum Matter Institute (SBQMI)	Professor / Principal Investigator	2015-present
Canadian Institute for Advanced Research (CIFAR)	Program Co-Director (Accelerated Decarbonization) Fellow	2020-present 2014-present
Miru Smart Technologies Corp. (formerly Click Materials)	CEO & Co-Founder	2016-present
University of British Columbia	Associate Professor of Chemistry and Chemical and Biological Engineering	2013-2017
École Polytechnique Fédérale de Lausanne, Switzerland	Visiting Scientist	2013
University of Calgary	Associate Professor	2011-2013
Centre for Advanced Solar Materials	Director	2011-2013
Institute for Sustainable Energy, Environment & Economy	Fellow	2006-2013
University of Calgary	Assistant Professor	2006-2011

SERVICE TO THE COMMUNITY

Editor, Journal of Materials Chemistry A (RSC Publication) | 2020-2021
Schmidt Science Fellows Academic Reviewer | 2020-2022
Rutherford Memorial Medal (Chemistry) Selection Committee, The Royal Society of Canada | 2019
Editorial Board, EnergyChem (Elsevier) | 2018-2021
Editorial Advisory Board, Journal of Materials Chemistry A (RSC Publication) | 2017-2019
Participant, Mission Innovation Workshop on Carbon Capture and Utilization (Houston, TX, USA) | Sep 2017
Participant, Mission Innovation Workshop on Accelerated Materials Discovery (Mexico City, MX) | Sep 2017
IPS-22 International Organization Committee | 2016-2022
Canadian Institute for Advanced Research | 2015-present
Editorial Advisory Board, Chemistry of Materials (ACS Publications) | 2014-2020
Editorial Advisory Board, Inorganic Chemistry (ACS Publications) | 2012-2015

AWARDS AND DISTINCTIONS

Canada's 2023 Clean50 Award | 2022
Fellow of the Royal Society of Canada | 2021-Present
Distinguished University Scholar Award | 2021
CSC Award for Research Excellence in Materials Chemistry | 2020
CIFAR Program Co-Director (Accelerated Decarbonization) | 2020-2025
Fellow of the Royal Society of Chemistry (UK) | 2018
NSERC E.W.R. Steacie Memorial Fellowship | 2016
RSC Alex Rutherford Medal for Chemistry | 2016
Strem Chemicals Award for Pure and Inorganic Chemistry | 2016
CIFAR Fellow | 2014-present
International Conference for Coordination Chemistry "Rising Star" | 2014
Tier II Canada Research Chair in Solar Energy Conversion | 2014-2019
Top 40 Under 40, Avenue Magazine (Calgary) | 2012
Alfred P. Sloan Fellowship | 2011
Canadian National Committee for the IUPAC Travel Award | 2011
Tier II Canada Research Chair in Energy Conversion | 2008-2013
Alberta Ingenuity New Faculty Award | 2007
NATO-ASI Award, NATO | 2003
European Science Bursary, European Science Foundation | 2003
Outstanding Oral Presentation, Texas A&M IUCCP Symposium | 2003
Martell Travel Award, Texas A&M University | 2002
Dean's Graduate Scholarship, College of Sciences, Texas A&M University | 2000

RESEARCH AND TEACHING INTERESTS

Reactive CO_2 capture
Our program has pioneered electrochemical reactors that convert reactive CO_2 capture solutions, generated from common air capture technologies, into fuels, chemicals, and building materials. We design electrocatalysts and membranes to build unique reactor configurations that will contribute to a carbon-neutral future.

Electrification of the chemicals industry
Electrification of the chemicals manufacturing sector is needed to reduce CO_2 emissions. Our team has invented a membrane reactor "Thor" that drives hydrogenation reactions using only water and electricity, and not at the high temperatures and pressures used by the industry today. Membrane reactors provide an opportunity to electrify and decarbonize the production of specialty chemicals, (bio)fuels, pharmaceuticals, and plastics.

Curriculum Vitae
Curtis P. Berlinguette

Flexible automation and self-driving labs
We build self-driving laboratories that combine flexible automation and artificial intelligence. Self-driving laboratories discover new materials faster than a human can. This approach will help us advance clean energy technologies from laboratory to market faster than ever before. Our flagship system, “Ada”, autonomously optimizes thin films and coatings for solar cells, electrolyzers, and other technologies.

Advanced nuclear fusion
We build electrochemical reactors to study nuclear fusion reactions at lower temperatures than conventional fusion reactors. Our mission is to combine electrochemistry, materials science and nuclear physics to reduce the energy needed for fusion reactions. We hope to discover a low-cost clean energy source that can scale within the span of a human lifetime.

FEATURED PUBLICATIONS

Lu, X.; Zhou, C.; Delima, R. S.; Lees, E. W.; Soni, A.; Dvorak, D. J.; Ren, S.; Ji, T.; Bahi, A.; Ko, F.*; Berlinguette, C. P.* “Visualization of CO_2 Electrolysis Using Optical Coherence Tomography.” *Nat. Chem.* **2024**. *16*, 979-987.
DOI: 10.1038/s41557-024-01465-5

Stankovic, M. D.; LeSage, N. E.; Sperryn, J. F.; Kurimoto, A.; Berlinguette, C. P.* “Electrochemical Hydrogenation of a Liquid Organic Hydrogen Carrier Using a Pd Membrane Reactor.” *ACS Energy Lett*. **2024**. *9*, 4459-4464.
DOI: 10.1021/acsenergylett.4c01417

Fink, A. G.; Delima, R. S.; Rousseau, A. R.; Hunt, C.; LeSage, N. E.; Huang, A.; Stolar, M.; Berlinguette, C. P.* “Indirect H_2O_2 Synthesis without H_2.” *Nat. Commun.* **2024**. *15* (766).
DOI: 10.1038/s41467-024-44741-1

Pimlott, D. J. D.; Kim, Y.; Berlinguette, C. P.* “Reactive Carbon Capture Enables CO_2 Electrolysis with Liquid Feedstocks.” *Acc. Chem. Res.* **2024**. *57* (7), 1007-1018.
DOI: 10.1021/acs.accounts.3c00571

Pimlott, D. J. D.; Jewlal, A.; Kim, Y.; Berlinguette, C. P.* “Oxygen-Resistant CO_2 Reduction Enabled by Electrolysis of Liquid Feedstocks.” *J. Am. Chem. Soc.* **2023**. *145* (48), 25933-25937.
DOI: 10.1021/jacs.3c08930

Hunt, C.; Kurimoto, A.; Wood, G.; LeSage, N. E.; Peterson, M.; Luginbuhl, B. R.; Horner, O.; Issinski, S.; Berlinguette. C. P.* “Endergonic Hydrogenation at Ambient Conditions Using an Electrochemical Membrane Reactor.” *J. Am. Chem. Soc.* **2023**. *145* (26), 14316-14323.
DOI: 10.1021/jacs.3c02839

Stankovic, M. D.; Sperryn, J. F.; Delima, R. S.; Rupnow, C. C.; Rooney, M. B.; Stolar, M.; Berlinguette, C. P.* “Electrochemical Production of Methyltetrahydrofuran, a Biofuel for Diesel Engines.” *Energy Environ. Sci.* **2023**. *16*, 3453-3461.
DOI: 10.1039/d3ee01079a

Kurimoto, A.; Nasseri, S. A.; Hunt, C.; Rooney, M. B.; Dvorak, D. J.; LeSage, N. E.; Jansonius, R. P.; Withers, S. G.; Berlinguette, C. P.* “Bioelectrocatalysis with a Palladium Membrane Reactor.” *Nat. Commun.* **2023**. *14*, 1814.
DOI: 10.1038/s41467-023-37257-7

Zhang, Z.; Mowbray, B. A. W.; Parkyn, C. T. E.; Waizenegger, C. E. B.; Williams, A. S. R.; Lees, E. W.; Ren, S.; Kim, Y.; Jansonius, R. P.; Berlinguette, C. P.* “Cement Clinker Precursor Production in an Electrolyser.” *Energy Environ. Sci.* **2022**. *15*, 5129-5136.
DOI: 10.1039/D2EE02349K

Zhang, Z.; Lees, E. W.; Ren, S.; Mowbray, B. A. W.; Huang, A.; Berlinguette, C. P.* "Conversion of Reactive Carbon Solutions into CO at Low Voltage and High Carbon Efficiency." *ACS Cent. Sci.* **2022**. *8* (6), 749-755.
DOI: 10.1021/acscentsci.2c00329

Ren, S.; Zhang, Z.; Lees, E. W.; Fink, A. G.; Melo, L.; Hunt, C.; Dvorak, D. J.; Wu, W. Y.; Grant, W. R.; Berlinguette, C. P.* "Electrocatalysts Derived from Copper Complexes Transform CO into C2+ Products Effectively in a Flow Cell." *Chem. Eur. J.* **2022**. *28* (25).
DOI: 10.1002/chem.202200340

Fink, A. G.; Lees, E. W.; Gingras, J.; Madore, E.; Fradette, S.; Jaffer, S. A.; Goldman, M.; Dvorak, D. J.; Berlinguette, C. P.* "Electrolytic Conversion of Carbon Capture Solutions Containing Carbonic Anhydrase." *J. Inorg. Biochem.* **2022**. *231*.
DOI: 10.1016/j.jinorgbio.2022.111782

MacLeod, B. P.; Parlane, F. G. L.; Brown, A. K.; Hein, J. E.; Berlinguette, C. P. Flexible automation for self-driving laboratories. in Accelerated Materials Discovery: How to Use Artificial Intelligence to Speed Up Development. 105-122 (De Gruyter, **2022**).
DOI: 10.1515/9783110738087

Lees, E. W.; Bui, J. C.; Song, D.; Weber, A. Z.*; Berlinguette, C. P.* "Continuum Model to Define the Chemistry and Mass Transfer in a Bicarbonate Electrolyzer." *ACS Energy Lett.* **2022**, *7*, 834-842.
DOI: 10.1021/acsenergylett.1c02522

Hunt, C.; Zhang, Z.; Ocean, K.; Jansonius, R. P.; Abbas, M.; Dvorak, D. J.; Kurimoto, A.; Lees, E. W.; Ghosh, S.; Turkiewicz, A.; Garcés Pineda, F. A.; Fork, D. K.; Berlinguette, C. P.* "Quantification of the Effect of an External Magnetic Field on Water Oxidation with Cobalt Oxide Anodes." *J. Am. Chem. Soc.* **2022**, *144* (2), 733-739.
DOI: 10.1021/jacs.1c08759

MacLeod, B. P.; Parlane, F. G. L.; Dettelbach, K. E.; Elliott, M. S.; Rupnow, C. C.; Morrissey, T. D.; Haley, T. H.; Proskurin, O.; Rooney, M. B.; Taherimakhsousi, N.; Dvorak, D. J.; Chiu, H. N.; Waizenegger, C. E. B.; Ocean, K.; Berlinguette, C. P.* "A Self-Driving Laboratory Advances the Pareto Front for Material Properties." *Nat. Commun.* **2022**, *13* (995).
DOI: 10.1038/s41467-022-28580-6

Zhang, Z.; Lees, E. W.; Habibzadeh, F.; Salvatore, D. A.; Ren, S.; Simpson, G.; Wheeler, D. G.; Liu, A.; Berlinguette, C. P.* "Porous metal electrodes enable efficient electrolysis of carbon capture solutions." *Energy Environ. Sci.* **2022.** *15*, 705-713.
DOI: 10.1039/D1EE02608A

Delima, R. S.; Stankovic, M. D.; MacLeod, B. P.; Fink, A. G.; Rooney, M. B.; Huang, A.; Jansonius, R. P.; Dvorak, D. J.; Berlinguette, C. P.* "Selective Hydrogenation of Furfural Using a Membrane Reactor." *Energy Environ. Sci.* **2022.** *15,* 215-224.
DOI: 10.1039/D1EE02818A

MacLeod, B. P.; Parlane, F. G. L.; Brown, A. K.; Hein, J. E.; Berlinguette, C. P. "Flexible Automation Accelerates Materials Discovery." *Nat. Mater.* **2021.** *21*, 722-726.
DOI: 10.1038/s41563-021-01156-3

Lees, E. W.; Mowbray, B. A. W.; Parlane, F. G. L.; Berlinguette, C. P.* "Gas Diffusion Electrodes and Membranes for CO_2 Reduction Electrolysers." *Nat. Rev. Mater.* **2021**. *7*, 55-64.
DOI: 10.1038/s41578-021-00356-2

Kellett, C. W.; Kennepohl, P.; Berlinguette, C. P.* "π Covalency in the Halogen Bond." *Nat. Commun.* **2020**, *11,* 3310.
DOI: 10.1038/s41467-020-17122-7

Taherimakhsousi, N.; MacLeod, B. P.; Parlane, F. G. L.; Morrissey, T. D.; Booker, E. P.; Dettelbach, K. E.; Berlinguette, C. P.* "Quantifying Defects in Thin Films Using Machine Vision." *NPJ Comput. Mater.* **2020,** *6* (111).
DOI: 10.1038/s41524-020-00380-w

Kurimoto, A.; Sherbo, R. S.; Cao, Y.; Loo, N. W. X.; Berlinguette, C. P.* "Electrolytic Deuteration of Unsaturated Bonds Without Using D_2." *Nat. Catal.* **2020,** *3*, 719-726.
DOI: 10.1038/s41929-020-0488-z

Salvatore, D. A.; Berlinguette, C. P.* "Voltage Matters When Reducing CO_2 in an Electrochemical Flow Cell." *ACS Energy Lett.* **2020,** *5* (1)*,* 215-220.
DOI: 10.1021/acsenergylett.9b02356

MacLeod, B. P.; Parlane, F. G. L.; Morrissey, T. D.; Häse, F.; Roch, L.; Dettelbach, K. E.; Moreira, R.; Yunker, L. P. E.; Rooney, M. B.; Deeth, J. R.; Lai, V.; Ng, G. J.; Situ, H.; Zhang, R. H.; Elliott, M. S.; Haley, T. H.; Dvorak, D. J.; Aspuru-Guzik, A.*; Hein, J. E.*; Berlinguette, C. P.* "Self-Driving Laboratory for Accelerated Discovery of Thin-Film Materials." *Science Advances* **2020,** *6* (20), eaaz8867.
DOI: 10.1126/sciadv.aaz8867

Kurimoto, A.; Sherbo, R. S.; Cao, Y.; Loo, N. W. X.; Berlinguette, C. P.* "Electrolytic Deuteration of Unsaturated Bonds Without Using D_2." *Nat. Catal.* **2020**, *3*, 719-726.
DOI: 10.1038/s41929-020-0488-z

Li, T.; Lees, E. W.; Goldman, M.; Salvatore, D. A.; Weekes, D. M.; Berlinguette, C. P.* "Electrolytic Conversion of Bicarbonate into CO in a Flow Cell." Joule **2019,** *3* (6), 1487-1497.
DOI: 10.1016/j.joule.2019.05.021

Ren, S.; Joulié, D.; Salvatore, D. A.; Torbensen, K.; Wang, M.; Robert, M., Berlinguette, C. P.* "Molecular Electrocatalysts can Mediate Fast, Selective CO_2 Reduction in a Flow Cell." *Science* **2019,** *365* (6451), 367-369.
DOI: 10.1126/science.aax4608

Chiang, Y.-M.; Munday, J. N.; Schenkel, T.; Fork, D. K.; Koningstein, R.; Trevithick, M. D.; Berlinguette, C. P.* "Revisiting the Cold Case of Cold Fusion." *Nature* **2019,** *570,* 45-51.
DOI:10.1038/s41586-019-1256-6

Johnson, N. J. J.; Lam, B.; MacLeod, B. P.; Sherbo, R. S.; Moreno-Gonzales, M.; Fork, D. K.; Berlinguette, C. P.* "Facets and Vertices Regulate Hydrogen Uptake and Release in Palladium Nanocrystals." *Nat. Mater*. **2019**, *18*, 454-458.
DOI: 10.1038/s41563-019-0308-5

Berlinguette, C. P.*; Chiang, Y.-M.; Munday, J. N.; Schenkel, T.; Fork, D. K.; Koningstein, R.; Trevithick, M. D. "Revisiting the Cold Case of Cold Fusion." *Nature* **2019**, *570*, 45-51.
DOI: 10.1038/s41586-019-1256-6

Sherbo, R. S.; Delima, R. S.; Chiykowski, V. A.; MacLeod, B. P.; Berlinguette, C. P.* "Complete Electron Economy by Pairing Electrolysis with Hydrogenation" *Nat. Catal*. **2018**, *1,* 501-507
DOI: 10.1038/s41929-018-0083-8

Weekes, D. M.; Salvatore, D. A.; Reyes, A.; Huang, A.; Berlinguette, C. P.* "Electrolytic CO_2 Reduction in a Flow Cell." *Acc. Chem. Res.* **2018**, *51,* 910-918.
DOI: 10.1021/acs.accounts.8b00010

PAST AREAS

Kellett, C. W.; Kennepohl, P.; Berlinguette, C. P.* "π Covalency in the Halogen Bond." *Nat. Commun.* **2020**, *11,* 3310.
DOI: 10.1038/s41467-020-17122-7

Cao, Y.; Li, Y.; Morrissey, T.; Lam, B.; Patrick, B. O.; Dvorak, D. J.; Xia, Z.; Kelly, T. L.*; Berlinguette, C. P.* "Dopant-free Molecular Hole Transport Material that Mediates a 20% Power Conversion Efficiency in a Perovskite Solar Cell." *Energy Environ. Sci.* **2019**, *12* (12), 3502-3507.
DOI: 10.1039/C9EE02983D

Cheng, W.; He, J.; Dettelbach, K. E.; Johnson, N.; Sherbo, R. S.; Berlinguette, C. P.* "Photodeposited Amorphous Oxide Films for Electrochromic Windows." *Chem* **2018**, *4*, 821-832.
DOI: 10.1016/j.chempr.2017.12.030

Kellett, C. W.; Swords, W. B.; Turlington, M. D.; Meyer, G. J.*; Berlinguette, C. P.* "Resolving Orbital Pathways for Intermolecular Electron Transfer." *Nat. Commun.* **2018**, *9*, 4916.
DOI: 10.1038/s41467-018-07263-1__

Chiykowski, V.; Cao, Y.; Tan, H.; Tabor, D. P.; Sargent, E. H.; Aspuru-Guzik, A.; Berlinguette, C. P.* "Precise Control of Thermal and Redox Properties of Organic Hole-Transport Materials." *Angew. Chem. Int. Ed.* **2018**, *57* (47), 15529-15533.
DOI: 10.1002/anie.201810809

Parlane, F.; Mustoe, C.; Kellett, C.; Simon, S. J. C.; Swords, W.; Meyer, G. J.; Kennepohl, P.; Berlinguette, C. P.* "Spectroscopic Detection of Halogen Bonding Resolves Dye Regeneration in the Dye-Sensitized Solar Cell." *Nat. Commun.* **2017**, *8,* 1761.
DOI: 10.1038/s41467-017-01726-7

Chiykowski, V.; Lam, B.; Du, C.; Berlinguette, C. P.* "Comparative analysis of triarylamine and phenothiazine sensitizer donor units in dye-sensitized solar cells." *Chem. Commun.* **2017**, *53* (15), 2367-2370.
DOI: 10.1039/c6cc09178d

Hu, K.; Blair, A. D.; Piechota, E. J.; Schauer, P. A.; Sampaio, R.; Parlane, F. G. L.; Meyer, G. J.*; Berlinguette, C. P.* "Kinetic Pathway for Interfacial Electron Transfer from a Semiconductor to a Molecule." *Nat. Chem.* **2016**, *8*, 853-859.
DOI: 10.1038/nchem.2549

Salvatore, D. A.; Dettelbach, K. E.; Hudkins, J. R.; Berlinguette, C. P.* "Near-Infrared–Driven Decomposition of Metal Precursors Yields Amorphous Electrocatalytic Films." *Sci. Adv.* **2015**, *1* (2), e1400215.
DOI: 10.1126/sciadv.1400215

Smith, R. D. L.; Prevot, M. S.; Fagan, R.; Zhang, Z.; Sedach, P. A.; Siu, M. K. J.; Berlinguette, C. P.* "Photochemical Route for Accessing Amorphous Metal-Oxide Materials for Heterogeneous Water Oxidation Catalysis." *Science* **2013**, *340* (6128), 60-63. (Featured in >500 international media outlets)
DOI: 10.1126/science.1233638

Wasylenko, D. W.; Ganesamoorthy, C.; Borau-Garcia, J; Berlinguette, C. P.* "Electrochemical Evidence for Catalytic Water Oxidation Mediated by a High-Valent Cobalt Complex." *Chem. Commun*. **2011**, *47* (14), 4249-4251.
DOI: 10.1039/C0CC05522K

Wasylenko, D. W.; Koivisto, B. D.; Ganesamoorthy, C.; Henderson, M.; Berlinguette, C. P.* "Insight into Water Oxidation by Mononuclear Polypyridyl Ru Catalysts." *Inorg. Chem*. **2010**, *49* (5), 2202-2209.
DOI: 10.1021/ic902024s

Wasylenko, D. W.; Ganesamoorthy, C.; Henderson, M.; Koivisto, B. D.; Berlinguette, C. P.* "Electronic Modification of the $[Ru^{II}(tpy)(bpy)OH_2]^{2+}$ Scaffold: Effects on Catalytic Water Oxidation." *J. Am. Chem. Soc*. **2010**, *132* (45), 16094-16106.
DOI: 10.1021/ja106108y

Bomben, P. G.; Robson, K. C. D.; Sedach, P.; Berlinguette, C. P.* "On the Viability of Cyclometalated Ru(II) Complexes for Light-Harvesting Applications." *Inorg. Chem*. **2009** *48* (20), 9631-9643.
DOI: 10.1021/ic900653q