

# Chun Yuen Kwok, Ph.D.

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## Education

- Doctor of Philosophy, Chemistry (Nanotechnology)** **2014 –2021**  
Department of Chemistry, University of Waterloo Waterloo, Canada  
Advisor: Prof. Linda F. Nazar  
Thesis title: Next Generation Li-S and Li-O<sub>2</sub> Batteries based on Electrode and Electrolyte Design
- Bachelor of Applied Science, Nanotechnology Engineering** **2009 –2014**  
Department of Chemical Engineering, University of Waterloo Waterloo, Canada  
➤ Graduation with distinction; minor in East Asian Studies

## Experience

- Postdoctoral Research Associate** **2022 - Present**  
Oak Ridge National Laboratory Oak Ridge, USA  
Supervisor: Dr. Mahalingam Balasubramanian
- Postdoctoral Research Associate** **2022 –2022**  
Department of Chemistry, University of Waterloo Waterloo, Canada  
Supervisor: Prof. Linda F. Nazar
- PhD Student/Research Assistant** **2014 – 2021**  
Department of Chemistry, University of Waterloo Waterloo, Canada  
Supervisor: Prof. Linda F. Nazar  
➤ Research and development of Li-S and Li-O<sub>2</sub> batteries
- Undergraduate Research Assistant** **2013 – 2014**  
Department of Chemistry, University of Waterloo Waterloo, Canada  
Supervisor: Prof. Eric Prouzet
- Engineer Assistant** **2013 –2013**  
United Controls Limited Hong Kong

## Publication

1. **C. Y. Kwok**, S. Xu, I. Kochetkov, L. Zhou, L. F. Nazar. High-performance all-solid-state Li<sub>2</sub>S batteries using an interfacial redox mediator. *Energy Environ. Sci.* **2023**, 16, 610.
2. Q. Pang, J. Meng, S. Gupta, X. Hong, **C. Y. Kwok**, J. Zhao, Y. Jin, L. Xu, O. Karahan, Z. Wang, S. Toll, L. Mai, L. F. Nazar, M. Balasubramanian, B. Narayanan, D. R. Sadoway. Fast-charging aluminum-chalcogen batteries resistant to dendritic shorting. *Nature* **2022**, 608, 704.
3. C. Li, A. Shyamsunder, A. G. Hoane, D. M. Long, **C. Y. Kwok**, P. G. Kotula, K. R. Zavadil, A. A. Gewirth, L. F. Nazar. Highly reversible Zn anode with a practical areal capacity enabled by a sustainable electrolyte and superacid interfacial chemistry. *Joule* **2022**, 5, 1103.

4. L. Zhou, T.-T. Zuo, **C. Y. Kwok**, S. Y. Kim, A. Assoud, Q. Zhang, J. Janek, L. F. Nazar. High areal capacity, long cycle life 4 V ceramic all-solid-state Li-ion batteries enabled by chloride solid electrolytes. *Nat. Energy* **2022**, *7*, 83.
5. S. Xu, **C. Y. Kwok**, L. Zhou, Z. Zheng, I. Kochetkov, L. F. Nazar. A high capacity all solid-state Li-sulfur battery enabled by conversion-intercalation hybrid cathode architecture. *Adv. Funct. Mater.* **2021**, *31*, 200439.
6. L. Zhou, **C. Y. Kwok**, A. Shyamsunder, Q. Zhang, X. Wu, L. F. Nazar. A new halospinel superionic conductor for high-voltage all solid state lithium batteries. *Energy Environ. Sci.* **2020**, *13*, 2056-2063.
7. **C. Y. Kwok**, Q. Pang, A. Worku, X. Liang, M. Guathier, L. F. Nazar. Impact of the mechanical properties of a functionalized cross-linked binder on the longevity of Li-S batteries. *ACS Appl. Mater. Interfaces* **2019**, *11*, 22481.
8. M. S. Islam, J. P. K. Tan, **C. Y. Kwok**, K. C. Tam. Drug release kinetics of pH-responsive microgels of different glass-transition temperatures. *J. Appl. Polym. Sci.* **2019**, *136*, 47284.
9. Q. Pang, **C. Y. Kwok**, D. Kundu, X. Liang, L. F. Nazar. Lightweight metallic MgB<sub>2</sub> mediates polysulfide redox and promises high-energy-density lithium-sulfur batteries. *Joule*, 2019, *3*, 136.
10. Q. Pang, A. Shyamsunder, B. Narayanan, C. Y. Kwok, L. A. Curtiss, L. F. Nazar. Tuning the electrolyte network structure to invoke quasi-solid state sulfur conversion and suppress lithium dendrite formation in Li-S batteries. *Nat. Energy* **2018**, *3*, 783.
11. C. Xia, **C. Y. Kwok**, L. F. Nazar. A high-energy-density lithium-oxygen battery based on a reversible four-electron conversion to lithium oxide. *Science* **2018**, *361*, 777.
12. Q. Pang, X. Liang, **C. Y. Kwok**, L. F. Nazar. A comprehensive approach toward stable lithium-sulfur batteries with high volumetric energy density. *Adv. Energy Mater.* **2017**, *7*, 1601630.
13. X. Liang, Y. Rangom, **C. Y. Kwok**, Q. Pang, L. F. Nazar. Interwoven MXene nanosheet/carbon-nanotube composites as Li-S cathode hosts. *Adv. Mater.* **2017**, *29*, 1603040.
14. Q. Pang, X. Liang, **C. Y. Kwok**, L. F. Nazar. Advances in lithium-sulfur batteries based on multifunctional cathodes and electrolytes. *Nat. Energy* **2016**, *1*, 16132.
15. M. Safari, **C. Y. Kwok**, L. F. Nazar. Transport properties of polysulfides species in lithium-sulfur battery electrolytes: coupling of experiment and theory. *ACS Cent. Sci.* **2016**, *2*, 560.
16. X. Liang, **C. Y. Kwok**, F. Lodi-Marzano, Q. Pang, M. Cuisinier, H. Huang, C. J. Hart, D. Houtarde, K. Kaup, H. Sommer, T. Brezesinski, J. Janek, L. F. Nazar. Tuning transition metal oxide-sulfur interactions for long life lithium sulfur batteries: the “Goldilocks” principle. *Adv. Energy Mater.* **2016**, *6*, 1501636.

17. Q. Pang, X. Liang, **C. Y. Kwok**, L. F. Nazar. Review – the importance of chemical interactions between sulfur host materials and lithium polysulfides for advanced lithium-sulfur batteries. *J. Electrochem. Soc.* **2015**, *162*, A2567.
18. Z.-M. Liu, N.-K. Li, X.-F. Huang, B. Wu, N. Li, **C. Y. Kwok**, Y. Wang, X.-W. Wang. Asymmetric organocatalytic conjugate addition of dialkyl phosphites to N-protected isatylidene malononitriles: access to 3-phospho-2-oxindoles with chiral quaternary stereocenters. *Tetrahedron*, **2014**, *70*, 2406.
19. X.-F. Huang, S.-Y. Zhang, Z.-C. Geng, **C.-Y. Kwok**, P. Liu, H.-Y. Li, X.-W. Wang. Asymmetric hydrogenation of  $\beta$ -keto sulfonamides and  $\beta$ -keto sulfones with a chiral cationic ruthenium diamine catalyst. *Adv. Synth. Catal.* **2013**, *11*, 2860.

## Patent

1. L. F. Nazar, S. Xu, **C. Y. Kwok**, Vanadium Sulfide/Sulfur Composite Battery Materials. July 24, 2020. USPTO #18/006,674.
2. L. F. Nazar, **C. Y. Kwok**, M. Gauthier, Multifunctional Cross-linked Binders for Lithium-Sulfur Battery Cathodes, May 24, 2019. USPTO #17/595,720.

## Awards

Finalist in Energy for the 2018 World Technology Network	2019
Waterloo Institute for Nanotechnology Fellowship	2018
NSERC-PGSD	2017-2019
Teaching Assistant Excellence Award	2016
Ontario Graduate Scholarship	2015-2017
University of Waterloo President's Graduate Scholarship	2015-2019

## Summary of Technical Skills

**Spectroscopy.** X-ray photoelectron spectroscopy, X-ray absorption spectroscopy, Raman spectroscopy, infrared spectroscopy, and UV-Vis spectroscopy

**Spectrometry.** Mass-spectrometry and online electrochemical mass spectrometry

**Microscopy.** Scanning electron microscopy

**Electrochemical techniques.** Cyclic/linear sweep voltammetry, pulse voltammetry, galvanostatic intermittent titration technique, and electrochemical impedance spectroscopy

**Physio-chemical characterization techniques.** Gas chromatography, X-ray diffraction, and N<sub>2</sub> adsorption isotherm

**Analytical chemical analysis.** Karl-Fischer titration, elemental analysis, thermogravimetric analysis, and chemical titration methods

**Electrode thin-film preparation techniques.** Doc-blade casting, spray casting, dip coating, and spin coating

**Chemical synthesis.** Solid-state reaction, solvothermal/hydrothermal synthesis, co-precipitation, and impregnation

**Laboratory management/maintenance.** Glovebox, FTIR, vacuum pumps, computer technical services, general electrical and machinal components troubleshooting, general safety

**Software.** Origin, CorelDraw, AutoCAD, SolidWorks, Microsoft Office suite