

# YAYUAN LIU

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Assistant Professor (Jan. 2022)  
Department of Chemical and Biomolecular Engineering  
Johns Hopkins University

## Education and Training

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**Massachusetts Institute of Technology**, Cambridge, MA 2019-2021  
Postdoctoral Associate, Department of Chemical Engineering  
Advisor: Prof. T. Alan Hatton  
Research: Electrochemically-mediated carbon capture and stimuli-responsive gas gating membranes

**Stanford University**, Stanford, CA 2014-2019  
**Ph.D.** Materials Science and Engineering  
Advisor: Prof. Yi Cui  
Thesis: Materials design and fundamental understandings of lithium metal anode for next-generation batteries

**Nanyang Technological University**, Singapore 2010-2014  
**B.Eng.** Materials Science and Engineering

## Awards and Honors

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Scialog Fellow – Negative Emissions Science 2021  
Forbes 30 under 30 Honoree – Science 2021  
Distinguished Young Scholars Seminar Winner, University of Washington 2020  
Rising Stars in Chemical Engineering 2019  
MIT Chemical Engineering Postdoc Grant-Writing Contest Winner 2019  
Division of Inorganic Chemistry Young Investigator Award, American Chemical Society 2019  
Graduate Student Gold Award, Materials Research Society 2018  
Stanford Graduate Fellowship 2017-2019  
O. Cutler Shepard Award, Stanford University 2017  
Best Poster Award, Department of Energy Battery500 Consortium 2017  
Lee Kuan Yew Gold Medal, Nanyang Technological University 2014  
Chen-Ning Yang Scholars Research Gold Award, Nanyang Technological University 2013  
Dean's List, Nanyang Technological University 2010-2014  
Chen-Ning Yang Scholarship, Nanyang Technological University 2010-2014  
PRC Undergraduate Scholarship, Singapore Ministry of Education 2009-2014

## Selected Publications

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‡ Denotes equal contribution \* Denotes corresponding author

(70 peer-reviewed journal publications in total; h-index: 54; 17,000+ citations / Google Scholar)

17. Towards solvent-free continuous-flow electrochemically mediated carbon capture with high concentration liquid quinone chemistry. **Y. Liu**\*‡, K. M. Diederichsen‡, N. Ozbek, H. Seo, T. A. Hatton\* *Joule in press.*
16. Electrochemically-mediated gating membrane with dynamically-controllable gas transport. **Y. Liu**, C.-M. Chow, K. R. Phillips, M. Wang, S. Voskian, T. A. Hatton\* *Science Advances* 6, eabc1741(2020).

15. Electrochemically-mediated carbon dioxide separation with quinone chemistry in salt-concentrated aqueous media. **Y. Liu**, H.-Z. Ye, K. M. Diederichsen, T. Van Voorhis, T. A. Hatton\* *Nature Communications* 11, 2278 (2020).
14. Challenges and opportunities towards fast charging battery materials. **Y. Liu**, Y. Zhu, Y. Cui\* *Nature Energy* 4, 540-550 (2019).
13. Fast galvanic lithium corrosion involving a Kirkendall-type mechanism. D. Lin†, **Y. Liu**†, Y. Li, Y. Li, A. Pei, J. Xie, W. Huang, Y. Cui\* *Nature Chemistry* 11, 382-389 (2019).
12. Solubility-mediated sustained release enabling nitrate additive in carbonate electrolytes for stable lithium metal anode. **Y. Liu**, D. Lin, Y. Li, G. Chen, A. Pei, O. Nix, Y. Li, Y. Cui\* *Nature Communications* 9, 3656 (2018).
11. An ultrastrong double-layer nanodiamond interface for stable lithium metal anodes. **Y. Liu**†, Y. -K. Tzeng†, D. Lin, A. Pei, H. Lu, N. A. Melosh, Z. -X. Shen, S. Chu\*, Y. Cui\* *Joule* 2, 1595-1609 (2018).
10. Design of complex nanomaterials for energy storage: past success and future opportunity. **Y. Liu**, G. Zhou, K. Liu, Y. Cui\* *Accounts of Chemical Research* 50, 2895-2905 (2017).
9. Transforming from planar to three-dimensional lithium with flowable interphase for solid lithium metal batteries. **Y. Liu**, D. Lin, Y. Jin, K. Liu, X. Tao, Q. Zhang, X. Zhang, Y. Cui\* *Science Advances* 3, eaao0713 (2017).
8. Reviving the lithium metal anode for high-energy batteries. D. Lin†, **Y. Liu**†, Y. Cui\* *Nature Nanotechnology* 12, 194-206 (2017).
7. An artificial solid electrolyte interphase with high Li-ion conductivity, mechanical strength, and flexibility for stable lithium metal anodes. **Y. Liu**, D. Lin, P. Y. Yuen, K. Liu, J. Xie, R. H. Dauskardt, Y. Cui\* *Advanced Materials* 29, 1605531 (2017).
6. A Prussian blue route to nitrogen-doped graphene aerogels as efficient electrocatalysts for oxygen reduction with enhanced active site accessibility. **Y. Liu**, H. Wang, D. Lin, J. Zhao, C. Liu, J. Xie, Y. Cui\* *Nano Research* 10, 1213-1222 (2017).
5. Layered reduced graphene oxide with nanoscale interlayer gaps as a stable host for lithium metal anodes. D. Lin†, **Y. Liu**†, Z. Liang, H. W. Lee, J. Sun, H. Wang, K. Yan, J. Xie, Y. Cui\* *Nature Nanotechnology* 11, 626-632 (2016).
4. Lithium-coated polymeric matrix as a minimum volume-change and dendrite-free lithium metal anode. **Y. Liu**†, D. Lin†, Z. Liang, J. Zhao, K. Yan, Y. Cui\* *Nature Communications* 7, 10992 (2016).
3. Electrochemical tuning of olivine-type lithium transition-metal phosphates as efficient water oxidation catalysts. **Y. Liu**, H. Wang, D. Lin, C. Liu, P. C. Hsu, W. Liu, W. Chen, Y. Cui\* *Energy & Environmental Science* 8, 1719-1724 (2015).
2. Dual-phase spinel MnCo<sub>2</sub>O<sub>4</sub> and spinel MnCo<sub>2</sub>O<sub>4</sub>/nanocarbon hybrids for electrocatalytic oxygen reduction and evolution. X. Ge†, **Y. Liu**†, F. T. Goh, T. A. Hor\*, Y. Zong, P. Xiao, Z. Zhang, S. H. Lim, B. Li, X. Wang, Z. Liu\* *ACS Applied Materials & Interfaces* 6, 12684-12691 (2014).
1. Designable yolk-shell nanoparticle@MOF petalous heterostructures. **Y. Liu**, W. Zhang, S. Li, C. Cui, J. Wu, H. Chen, F. Huo\* *Chemistry of Materials* 26, 1119-1125 (2014).

## Patents

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1. Composite lithium metal anodes for lithium batteries with reduced volumetric fluctuation during cycling and dendrite suppression. US Patent 15/348,884.
2. Solid-state lithium metal battery based on three-dimensional electrode design. US Patent App. 16/616,910.

3. Porous medium with adjustable fluid permeability and associated systems and methods. US Provisional App. 63/002,490.

## **Trainees**

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Dr. Xing Li (Postdoctoral Researcher)	Nov. 2021 – present
Mr. Anmol Mathur (Ph.D. student)	Sept. 2021 - present
Mr. James Clarke (M.S. student)	Sept. 2021 - present
Mr. Lingyu Zhang (M.S. student)	Sept. 2021 - present
Mr. Jerry Jiayi Zhang (M.S. student)	Sept. 2021 - present
Ms. Yu Xu (M.S. student)	Sept. 2021 - present