

Xun Guan

Assistant Professor

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PROFESSIONAL PREPARATION

Stanford University, Stanford, CA, USA 2023 - Present

Postdoctoral fellow. Advisor: Prof. Yi Cui

University of California Los Angeles, Los Angeles, CA, USA

Ph. D. in Chemistry. Advisor: Prof. Chong Liu 2019 - 2022

M. S. in Chemistry. Advisor: Prof. Chong Liu 2017 - 2019

University of Science and Technology Beijing, Beijing, China

B. S. in Material Chemistry. Advisor: Prof. Yue Zhang 2013 - 2017

RESEARCH INTEREST

Building on my cross-disciplinary training in chemistry, materials science, microbiology, photocatalysis, and electrocatalysis, my research interest focuses on unraveling the intricacies of charge and matter transfer at advanced material interfaces, including material-biological interfaces. By integrating artificial intelligence for data-driven modeling and predictive design, I aim to control and harness these processes to accelerate innovations in green synthesis, environmental remediation, and energy storage devices, paving the way for a more sustainable and efficient future.

PUBLICATIONS

1. Li, J[†], **Guan, X[†]** (*equal contribution*), Wang, J., Zhng, G., Holoubek, J., Cui, Y., Li, Y., Wang, H., Chiu, W. & Cui, Y.* Three-dimensional and nanoscale resolved hierarchical structure of electroplated zinc complex in aqueous zinc battery. *Accepted by National Science Review*.
2. Holoubek, J., Lin, K.-Y., **Guan, X.**, Wang, J., Ai, H., Qin, J.* & Cui, Y.* Double-layer design enables independent kinetic modulations in CO₂ electrolysis. *ACS Eng. Letter.*, **11**, 726-732 (2026).
3. Feng, G., Liu, Z., Holoubek, J., Greenburg, L. C., Zhang, G., Li, Y., **Guan, X.**, Cui, Y., Zhang, P., Brest, A., Zheng, X. & Cui, Y.* Hydrotrope-enabled high concentration aqueous electrolytes for reversible and sustainable iron metal anodes. *Nat. Commun.* **16**, 110055 (2025).
4. Holoubek, J., Zhang, P., Serrao, C., Ai, H., Choi, I. R., Greenburg, L. C., **Guan, X.**, Cai, A., Zhang, W., Cui, Y.* A solvation-driven reevaluation of organic electrolytes for zinc batteries. *Energy Environ. Sci.*, **18**, 8608-8617 (2025).
5. Shi, Y., Zhang, K., Chen, J., Zhang, B., **Guan, X.**, Wang, X., Zhang, T., Song, H., Zou, L., Duan, X., Guo, H., & Lin, Z.* Long-term autotrophic growth and solar-to-chemical conversion in *Shewanella Oneidensis* MR-1 through light-driven electron transfer. *Angew. Chem. Int. Ed.* **63**, e202412072 (2024).
6. **Guan, X.**, Zhang, G., Li, J., Kim, S.C., Feng, G., Li, Y., Cui, T., Brest, A. & Cui, Y.* Seawater alkalization via an energy-efficient electrochemical process for CO₂ capture. *Proc.*

- Natl. Acad. Sci. U. S. A.* **121**, e2410841121 (2024).
7. Zhang, G., Li, Y., **Guan, X.**, Hu, G., Su, H., Xu, X., Feng, G., Shuchi, S. B., Kim, S. C., Zhou, J., Xu, R., Xiao, X., Wu, A. & Cui, Y.* Spontaneous lithium extraction and enrichment from brine with net energy output driven by counter-ion gradients. *Nat. Water*, **2**, 1091-1101 (2024).
 8. Li, Y., Zheng, X., Carlson, E. Z., Xiao, X., Chi, X., Cui, Y., Greenburg, L. C., Zhang, G., Zhang, E., Liu, C., Yang, Y., Kim, M. S., Feng, G., Zhang, P., Su, H., **Guan, X.**, Zhou, J., Wu, Y., Xue, Z., Li, M., Bajdich, M. & Cui, Y.* *In situ* formation of liquid crystal interphase in electrolytes with soft templating effects for aqueous dual-electrode-free batteries. *Nat. Energy*, **9**, 1350-1359 (2024).
 9. Shuman, Z., Xie, Y., O’Keeffe, S., **Guan, X.**, Sha, J., Sun, J., Wohlschelegel, J. A., Park, J. O. & Liu, C.* Integrated proteomics and metabolomics reveal altered metabolic regulation of *Xanthobacter autotrophicus* under electrochemical water-splitting conditions. *ACS Appl. Mater. Interfaces*, **16**, 40973-40979 (2024).
 10. **Guan, X.**, Ersan, S., Xie, Y., Park, J. O. & Liu, C.* Redox and energy homeostasis enabled by photocatalytic material-microbial interfaces. *ACS Nano*, **18**, 20567-20575 (2024).
 11. Che, S.[†], **Guan, X.**[†] (*equal contribution*), Rodrigues, R. M., Yu, Y., Xie, Y., Liu, C.* & Men, Y.* Synergistic material-microbe interface toward deeper anaerobic defluorination. *Proc. Natl. Acad. Sci. U. S. A.* **121**, e2400525121 (2024).
 12. **Guan, X.**[†], Xie, Y.[†] & Liu, C.* Performance evaluation and multidisciplinary analysis of catalytic fixation reactions by material-microbe hybrids. *Nat. Catal.* **7**, 475-482 (2024).
 13. Xie, Y., Ersan, S., **Guan, X.**, Wang, J., Sha, J., Xu, S. & Liu, C.* Unexpected metabolic rewiring of CO₂ fixation in H₂-mediated materials-biology hybrids. *Proc. Natl. Acad. Sci. U. S. A.* **120**, e2308373120 (2023).
 14. **Guan, X.**, Ersan, S., Hu, X., Atallah, T. L., Xie, Y., Lv, S., Cao, B., Sun, J., Wu, K., Huang, Y., Duan, X., Caram, J. R., Yi, Y., Park, J. O. & Liu, C.* Maximizing light-driven CO₂ and N₂ fixation efficiency in quantum dot - bacteria hybrids. *Nat. Catal.* **5**, 1019-1029 (2022).
 15. Cao, B., Zhao, Z., Peng, L., Shui, H., Ding, M., Song, F., **Guan, X.**, Lee, C., Huang, J., Zhu, D., Fu, X., Wong, G. L., Liu, C., Neilson, K., Weiss, P., Duan, X.* & Huang, Y.* Silver nanoparticles boost charge-extraction efficiency in *Shewanella* microbial fuel cells. *Science*, **373**, 1336-1340 (2021).
 16. Sheng, T., **Guan, X.**, Liu, C. & Su, Y.* *De novo* approach to encapsulating biocatalysts into synthetic matrixes: from enzymes to microbial electrocatalysts. *ACS Appl. Mater. Interfaces*, **13**, 52234-52249 (2021).
 17. Xiang, D., Iniguez, J. A., Deng, J., **Guan, X.**, Martinez, A. & Liu, C.* Ag^{II}-mediated electrocatalytic ambient CH₄ functionalization inspired by HSAB theory. *Angew. Chem. Int. Ed.* **60**, 18152-18161 (2021).
 18. Lv, S., Rodrigues, R. M., Huang, S., Chapman, J. O., **Guan, X.**, Sletten, E. M. & Liu, C.* Perfluorocarbon nanoemulsions create a beneficial O₂ environment in N₂-fixing biological | inorganic hybrid. *Chem. Catal.* **1**, 704-720 (2021).
 19. Lv, S., **Guan, X.** & Liu, C.* Electricity-powered artificial root nodule. *Nat. Commun.* **11**, 1505 (2020).
 20. Rodrigues, R. M., **Guan, X.**, Iniguez, J. A., Estabrook, D. A., Chapman, J. O., Huang, S., Sletten, E. M. & Liu, C.* Perfluorocarbon nanoemulsion promotes the delivery of reducing

- equivalents for electricity-driven microbial CO₂ reduction. *Nat. Catal.* **2**, 407-414 (2019).
21. Li, J., **Guan, X.**, Cheng, H., Wang, C., Duan, X* & Duan, X.* Synthesis of two-dimensional layered BiI₃ nanosheets, WSe₂/BiI₃ van der Waals heterostructures and their electronic, optoelectronic properties. *Small*, **13**, 1701034 (2017).
 22. Ai, L., Li, J., **Guan, X.**, Li, J., Yao, K., Chen, P., Zhang, Z., Duan, X* & Duan, X.* Growth of single-crystalline cadmium iodide nanoplates, CdI₂/MoS₂ (WS₂, WSe₂) van der Waals heterostructures, and patterned arrays. *ACS Nano*, **11**, 3413-3419 (2017).
 23. Wang, Y., **Guan, X.**, Li, D., Cheng, H., Duan, X., Lin, Z. & Duan, X.* Chemical vapor deposition growth of single-crystalline cesium lead halide microplatelets and heterostructures for optoelectronic applications. *Nano Res.* **10**, 1223-1233 (2017).

PATENTS

1. Cui, Y., **Guan, X.**, Zhang, G., “Energy efficient electro dialysis enabled by symmetric reaction couples for lithium extraction and alkalization”, filed Aug. 20, 2024, Provisional Patent Application No. 63/685151.
2. Liu, C., Iniguez, J., Xiang, D., Deng, J., **Guan, X.**, “Hydrocarbon functionalization by continuous electrogenerated d⁹ metalloradicals”, filed Jun. 9, 2021, Provisional Patent Application No. 63/208701.

INVITED PRESENTATIONS

1. “Advanced material-biology interfaces for challenges in energy-chemical-environment nexus”, Global Institute of Future Technology, Department of Applied Chemistry, *University of Science and Technology of China*, Hefei, Anhui, China, February 2026.
2. “Advanced material-biology interfaces for challenges in energy-chemical-environment nexus”, Global Institute of Future Technology, *Shanghai Jiao Tong University*, Shanghai, China, May 2025.
3. “Advanced material interfaces for challenges in energy-chemical-environment nexus”, Department of Chemistry, *The University of Hong Kong*, Hong Kong, China, May 2025.
4. “Advanced material interfaces for challenges in energy-chemical-environment nexus”, Materials Science and Engineering Webinar, *City University of Hong Kong*, Webinar, April 2025.
5. “Advanced material interfaces for challenges in energy-chemical-environment nexus”, College of Chemistry and Chemical Engineering, *Hunan University*, Changsha, Hunan, China, December 2023.
6. “A microbial-semiconductor hybrid system for light-driven N₂ and CO₂ fixation”, Inorganic Chemistry Seminar, *University of California Los Angeles*, Los Angeles, CA, USA, June 2022.
7. “A microbial-semiconductor hybrid system for photocatalytic nitrogen fixation with high quantum efficiency”, *American Chemistry Society Spring*, San Diego, CA, USA, March 2022.
8. “A microbial-semiconductor hybrid system for photocatalytic nitrogen fixation with high quantum efficiency”, *Materials Research Society Fall Meeting*, Boston, MA, USA, December 2021.
9. “A microbial-semiconductor hybrid system for photocatalytic nitrogen fixation with high quantum efficiency”, *North American Meeting of The International Society of Microbial*

Electrochemistry and Technology, Los Angeles, CA, USA, November 2021.

SELECTED HONORS AND REWARDS

- 2024 Carbon Future Young Investigator Honorable Mention Award 2024
- Summer Mentored Research Fellowship, University of California Los Angeles 2021
- First-class Award in the Student Research Training Program of Beijing 2016

SYNERGISTIC ACTIVITIES

- Journal reviewer for *Nat. Commun.*, *Sci. Adv.*, *Proc. Natl. Acad. Sci. U.S.A.*, *ACS Appl. Mater. Interfaces*, *ACS Precision Chemistry* Since 2024
- Student Mentor, Research Experience for Undergraduate (REU) program, Stanford University 2024
- Student Mentor, Cross-disciplinary Scholars in Science and Technology (CSST) program, University of California Los Angeles 2018-2019

TEACHING EXPERIENCE

- Graduate teaching assistant, University of California Los Angeles** Fall 2017 – Spring 2021
- Chemistry 172/272 Advanced Inorganic Chemistry Spring 2021
 - Chemistry 14CL General & Organic Chemistry Lab Summer 2020
 - Chemistry 14CL General & Organic Chemistry Lab 2 Spring 2020
 - Chemistry 20L General Chemistry Lab Winter 2020
 - Chemistry 14CL General & Organic Chemistry Lab 2 Fall 2019
 - Chemistry 14B General Chemistry – Life science 2 Spring 2019
 - Chemistry 20L General Chemistry Lab Winter 2019
 - Chemistry 14BL General & Organic Chemistry Lab 1 Fall 2018
 - Chemistry 14BL General & Organic Chemistry Lab 1 Spring 2018
 - Chemistry 14BL General & Organic Chemistry Lab 1 Winter 2018
 - Chemistry 30AL General Chemistry Lab 2 Fall 2017