

Zhe Ji

Email: jizhe@pku.edu.cn

RESEARCH EXPERIENCE

Jul 2023 – **Assistant Professor, Chemical Biology**

College of Chemistry and Molecular Engineering, Peking University, Beijing, China

Jan 2020 – **Postdoctoral Fellow, Biophysical Chemistry**

Jun 2023 Department of Chemistry, Stanford University, Stanford, CA

Faculty Advisor: Steven G. Boxer, Camille Dreyfus Professor of Chemistry

Projects: Protein electric fields enable faster and longer covalent inhibition of β -lactamases
 β -Lactamases evolve against antibiotics by acquiring large electric fields
Metal-replaced liver alcohol dehydrogenase outperforms wild type

EDUCATION

Dec 2019 **Ph.D. in Chemistry**

University of California, Berkeley, Berkeley, CA

Thesis: Metal-organic frameworks interfaced with biological systems

Faculty Advisor: Omar M. Yaghi, James and Neeltje Tretter Chair Professor of Chemistry

Projects: Linking molybdenum-sulfur clusters for hydrogen evolution
Cytoprotective metal-organic frameworks for anaerobic bacteria
Sequencing of metal in multivariate metal-organic frameworks

Jun 2014 **B.A. in Chemical Biology**

Tsinghua University, Beijing, China

Faculty Advisor: Gaoquan Shi, Professor of Chemistry

Projects: Aryl-modified photoluminescent graphene quantum dots
Production of graphene via reversible covalent chemistry

PUBLICATIONS

(#denotes equal contribution; *denotes corresponding authorship)

Selected Publications

1. C. Zheng[#], **Z. Ji**[#], I. I. Mathews, S. G. Boxer, Enhanced active-site electric fields accelerate enzyme catalysis. *Nat. Chem.*, 2023, DOI: 10.1038/s41557-023-01287-x.
2. **Z. Ji**^{*}, S. G. Boxer^{*}, β -Lactamases evolve against antibiotics by acquiring large active-site electric fields. *J. Am. Chem. Soc.*, 2022, *144*, 22289-22294.
3. **Z. Ji**, J. Kozuch, I. I. Mathews, C. S. Diercks, Y. Shamsudin, M. A. Schultz, S. G. Boxer, Protein electric fields enable faster and longer-lasting covalent inhibition of β -lactamases. *J. Am. Chem. Soc.*, 2022, *144*, 20947-20954.
4. **Z. Ji**, T. Li, O. M. Yaghi, Sequencing of metals in multivariate metal-organic frameworks. *Science*, 2020, *369*, 674-680.
5. **Z. Ji**[#], H. Zhang[#], H. Liu, O. M. Yaghi, P. Yang, Cytoprotective metal-organic frameworks for anaerobic bacteria. *Proc. Natl. Acad. Sci. U.S.A.*, 2018, *115*, 10582-10587.
6. **Z. Ji**, C. A. Trickett, X. Pei, O. M. Yaghi, Linking molybdenum-sulfur clusters for electrocatalytic hydrogen evolution. *J. Am. Chem. Soc.*, 2018, *140*, 13618-13622.
7. N. A. Danaf, W. Schrimpf, P. Hirschle, D. C. Lamb, **Z. Ji**^{*}, S. Wuttke^{*}, Linker exchange via migration along the backbone in metal-organic frameworks. *J. Am. Chem. Soc.*, 2021, *143*, 10541-10546.

Additional Published Research

8. A. Fuchs, F. Knechtel, H. Wang, **Z. Ji**, S. Wuttke, O. M. Yaghi, E. Ploetz, Water harvesting at the single-crystal level. *J. Am. Chem. Soc.*, 2023, *145*, 14324-14334.
9. S. Canossa, **Z. Ji**, C. Gropp, Z. Rong, E. Ploetz, S. Wuttke, O. M. Yaghi, Systems of sequences in multivariate reticular structures. *Nat. Rev. Mater.* 2023, *8*, 331-340.
10. C. Zheng, Y. Mao, J. Kozuch, A. Atsango, **Z. Ji**, T. Markland, S. G. Boxer, A two-directional vibrational probe reveals different electric field orientations in solution and an enzyme active site. *Nat. Chem.*, 2022, *14*, 891-897.
11. A. Fuchs, P. Mannhardt, P. Hirschle, H. Wang, I. Zaytseva, **Z. Ji**, O. M. Yaghi, S. Wuttke, E. Ploetz, Single crystal heterogeneity impacts the intrinsic and extrinsic properties of metal-organic frameworks. *Adv. Mater.*, 2021, 2104530.
12. **Z. Ji**, R. Freund, C. S. Diercks, P. Hirschle, O. M. Yaghi, S. Wuttke, From molecules to frameworks to superframework crystals. *Adv. Mater.*, 2021, *33*, 2103808.
13. J. Kozuch, S. H. Schneider, C. Zheng, **Z. Ji**, R. T. Bradshaw, S. G. Boxer, Testing the limitations of MD-based local electric fields using the vibrational Stark effect in solution: penicillin G as a test case. *J. Phys. Chem. B*, 2021, *125*, 4415-4427.
14. R. Freund, S. Canossa, S. M. Cohen, W. Yan, H. Deng, V. Guillermin, M. Eddaoudi, D. G. Madden, D. Fairen-Jimenez, H. Lyu, L. K. Macreadie, **Z. Ji**, Y. Zhang, B. Wang, F. Haase, C. Wöll, O. Zaremba, J. Andreo, S. Wuttke, C. S. Diercks, 25 years of reticular chemistry. *Angew. Chem. Int. Ed.*, 2021, *60*, 23946-23974.
15. F. Haase, P. Hirschle, R. Freund, S. Furukawa, **Z. Ji**^{*}, S. Wuttke^{*}, Beyond frameworks: structuring reticular materials across nano, meso, and bulk regimes. *Angew. Chem. Int. Ed.*, 2020, *59*, 22350-22370.
16. **Z. Ji**^{*}, H. Wang, S. Canossa, S. Wuttke^{*}, O. M. Yaghi^{*}, Pore chemistry of metal-organic frameworks.

Adv. Funct. Mater., 2020, 30, 2000238.

17. S. Canossa*, **Z. Ji***, S. Wuttke*, Circumventing wear and tear of adaptive porous materials. *Adv. Funct. Mater.* 2020, 30, 1908547.
18. H. Lyu, **Z. Ji**, S. Wuttke, O. M. Yaghi, Digital reticular chemistry. *Chem*, 2020, 6, 2219-2241.
19. C. Zhao, H. Lyu, **Z. Ji**, C. Zhu, O. M. Yaghi, Ester-linked crystalline covalent organic frameworks. *J. Am. Chem. Soc.*, 2020, 142, 14450-14454.
20. S. Chen, X. Liu, J. Jin, M. Gao, C. Chen, Q. Kong, **Z. Ji**, G. A. Somorjai, O. M. Yaghi, P. Yang, Individually encapsulated frame-in-frame structure. *ACS Mater. Lett.*, 2020, 2, 685-690.
21. W. Xu, X. Pei, C. S. Diercks, H. Lyu, **Z. Ji**, O. M. Yaghi, A metal-organic framework of organic vertices and polyoxometalate linkers as a solid-state electrolyte. *J. Am. Chem. Soc.*, 2019, 141, 17522-17526.
22. **Z. Ji**, O. M. Yaghi, Parallel worlds meet at designed interfaces with a vast number of potential frameworks. *Biochemistry*, 2019, 58, 3823-3824.
23. W. Schrimpf, J. Jiang, **Z. Ji**, P. Hirschle, D. C. Lamb, O. M. Yaghi, S. Wuttke, Chemical diversity in a metal-organic framework revealed by fluorescence lifetime imaging. *Nat. Commun.*, 2018, 9, 1647.
24. A. Schoedel, **Z. Ji**, O. M. Yaghi, The role of metal-organic frameworks in a carbon-neutral energy cycle. *Nat. Energy*, 2016, 1, 16034.
25. **Z. Ji**, J. Chen, L. Huang, G. Shi, High-yield production of highly conductive graphene via reversible covalent chemistry. *Chem. Commun.*, 2015, 51, 2806-2809.
26. P. Luo#, **Z. Ji**#, C. Li, G. Shi, Aryl-modified graphene quantum dots with enhanced photoluminescence and improved pH tolerance. *Nanoscale*, 2013, 5, 7361-7367.

Patents

Enzymes and metal-organic frameworks (MOFs). WO 2021/154629.

Photo-enzymatic printing. WO 2023/102558.

PRESENTATIONS

Media Exposure

Science Commentary: Electric Fields Make The Enzyme

EurekAlert! (AAAS): Advance in programmable synthetic materials

ChemistryWorld: Hidden atomic patterns discovered in mixed-metal MOFs

EurekAlert! (AAAS): 'Spacesuits' protect microbes destined to live in space

Invited Talk

Electric field: a unifying language for molecular positioning, interaction, and catalysis, 21st Century Materials Symposium, online, 2021.

Conferences

Protein electric fields regulate covalent inhibition of β -lactamases, *BPS Annual Meeting*, San Francisco, CA 2022.

Linking molybdenum-sulfur clusters for electrocatalytic hydrogen evolution, *ACS National Meeting*, Orlando, FL, 2019.

Encapsulating enzymes in metal-organic frameworks for storage stability in laundry detergents, *BASF CARA Review*, Santa Barbara, CA, 2018. *Awarded the best presentation.*

Crystallizing one-dimensional metal-organic sulfide as cathode material of lithium-ion battery (Poster), *ACS National Meeting*, San Francisco, CA, 2017.

Aryl-modified graphene quantum dots with enhanced photoluminescence, *China National Undergraduate Chemists Forum*, Chengdu, China, 2013.

TEACHING EXPERIENCE

Teaching Assistant

Chem 3BL Organic Chemistry Laboratory, Spring 2017
University of California, Berkeley
28 undergraduate students

Chem 3B Organic Chemistry, Spring 2017
University of California, Berkeley
475 undergraduate students

Chem 3AL Organic Chemistry Laboratory, Spring 2016
University of California, Berkeley
27 undergraduate students

Chem 3A Organic Chemistry, Spring 2016
University of California, Berkeley
483 undergraduate students

Chem 3BL Organic Chemistry Laboratory, Fall 2014
University of California, Berkeley
26 undergraduate students

Chem 3B Organic Chemistry, Fall 2014
University of California, Berkeley
496 undergraduate students

Instructor

Laboratory Research Experience Program, July 2019
Berkeley Global Science Institute, University of California, Berkeley
32 international undergraduate students