

**QIYANG LU, Ph.D.**

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**PROFESSIONAL APPOINTMENTS**

- 09/2020 – Present    Assistant Professor  
School of Engineering, Westlake University  
Principal Investigator (PI) of [Solid State Ionics \(SSI\) Laboratory](http://ssi-westlake.com)
- 04/2019 – 07/2020    Joint Advanced Light Source (ALS) Postdoctoral Research Fellow  
Stanford University/ Advanced Light Source, Lawrence Berkeley  
National Laboratory  
Advisors: Prof. William C. Chueh (Stanford)/Dr. Slavomír Nemšák (ALS)
- 02/2018 – 04/2019    Postdoctoral Research Associate  
Materials Science and Technology Division  
Oak Ridge National Laboratory  
Advisor: Dr. Ho Nyung Lee (ORNL Corporate Fellow)

**EDUCATION**

- 08/2012 – 02/2018    Ph.D. in Materials Science and Engineering  
Massachusetts Institute of Technology, Cambridge, MA, USA  
Department of Materials Science and Engineering (DMSE)  
Advisor: Prof. Bilge Yildiz  
Thesis: *Controlling Properties of Functional Oxides by Tuning Oxygen Defect Chemistry* (awarded Best PhD Thesis 2018)
- 07/2008 – 07/2012    Bachelor of Science in Materials Science and Engineering  
Tsinghua University, Beijing, China  
Department of Materials Science and Engineering

**HONORS & AWARDS**

- 2024    Finalist, Young Scientist Award (YSA), International Society of Solid State Ionics (ISSI)
- 2023    Faculty Award for Excellence in Teaching, School of Engineering, Westlake University
- 2021    Faculty Award for Excellence in Services, School of Engineering, Westlake University
- 2018    Ross Coffin Purdy Award, the American Ceramic Society (ACerS), “*Given to the author or authors who made the most valuable contribution to ceramic technical literature.*”
- 2018    Best PhD Thesis Award, Department of Materials Science and Engineering,  
Massachusetts Institute of Technology
- 2017    Graduate Student Gold Award (GSA Gold), Materials Research Society (MRS)
- 2016    Award for Outstanding Student Abroad, China Scholarship Council (CSC)

## PUBLICATIONS

Total citations: 2135, h-index = 21 (based on [Google Scholar](#)).

**Key contributor as SSI Lab student/postdoc.**

#Equally contributing first author \*Corresponding author.

### *Peer-reviewed Journal Articles*

1. **Luhan Wei**, Yang Hu, Yiwei Huang, Ying Lu, Zihan Xu, Nian Zhang and **Qiyang Lu\***, Deconvoluting Surface and Bulk Charge Storage Processes in Redox-Active Oxides by Integrating Electrochemical and Optical Insights, **Journal of the American Chemical Society** 146 (2024), 24167–24176 [Link](#)
2. **Haowen Chen**#, **Zihan Xu**#, Luhan Wei, Mingdong Dong, Yang Hu, Ying Lu, Nian Zhang, Jie Wu and **Qiyang Lu\***, Manipulating Protons and Oxygen Vacancies in Nickelate Oxides via Thermochemical Dehydration, **Journal of Materials Chemistry A** (2024) [Link](#)
3. **Kaichuang Yang**, Ying Lu, Yang Hu, Zihan Xu, Jieping Zheng, Haowen Chen, Jingle Wang, Yi Yu, Hui Zhang, Zhi Liu, and **Qiyang Lu\***, Differentiating Oxygen Exchange Reaction Mechanisms across Phase Boundaries, **Journal of the American Chemical Society**, 145 (2023), 25806–25814 [Link](#)
4. Liyang Ma, Jing Wu, **Yiwei Huang**, **Qiyang Lu**, and Shi Liu\*, Ultrahigh Oxygen Ion Mobility in Ferroelectric Hafnia, **Physical Review Letters**, 131 (2023), 256801 [Link](#)
5. **Ying Lu**, Yiwei Huang, Zihan Xu, Kaichuang Yang, Weichao Bao, **Qiyang Lu\***, Quantifying Electrochemical Driving Force for Exsolution in Perovskite Oxides by Designing Graded Oxygen Chemical Potential, **ACS Nano**, 17 (2023), 14005–14013 [Link](#)
6. Ellen M. Kiens, Minju Choi, **Luhan Wei**, **Qiyang Lu\***, Le Wang\*, Christoph Baeumer\*, Deeper Mechanistic Insights into Epitaxial Nickelate Electrocatalysts for the Oxygen Evolution Reaction, **Chemical Communications**, 59 (2023), 4562–4577 [Link](#)
7. **Haowen Chen**#, Mingdong Dong#, Yang Hu, Ting Lin, Qinghua Zhang, Er-Jia Guo, Lin Gu, Jie Wu, **Qiyang Lu\***, Protonation-Induced Colossal Chemical Expansion and Property Tuning in NdNiO<sub>3</sub> Revealed by Proton Concentration Gradient Thin Films, **Nano Letters**, 22 (2022), 8983–8990 [Link](#)
8. Xin Yu#, **Yang Hu**#, Haoyuan Shi#, Ziyang Sun, Jinghang Li, Haoran Liu, Hao Lyu, Jiujie Xia, Jingda Meng, Xingyu Lu, Jingjie Yeo\*, **Qiyang Lu\***, and Chengchen Guo\*, Molecular Design and Preparation of Protein-Based Soft Ionic Conductors with Tunable Properties, **ACS Applied Materials & Interfaces**, 14 (2022), 48061–48071 [Link](#)
9. **Kaichuang Yang**#, Jiapeng Liu#, Yuhao Wang#, Xiangcheng Shi, Jingle Wang, **Qiyang Lu\***, Francesco Ciucci\*, and Zhibin Yang\*, Machine-learning-assisted Prediction of Long-term Performance Degradation on Solid Oxide Fuel Cell Cathodes Induced by Chromium Poisoning, **Journal of Materials Chemistry A**, 10 (2022), 23683–23690 [Link](#)
10. **Yang Hu**, Haowen Chen and **Qiyang Lu\***, Understanding the Phase Equilibrium and Kinetics of Electrochemically Driven Phase Transition in CoO<sub>x</sub>H<sub>y</sub> during Electrocatalytic

Reactions, **Journal of Physical Chemistry C**, 126 (2022), 18198-18207 (Featured as Cover Article of Volume 126, Issue 43, November 2022) [Link](#)

11. Alessandro R Mazza<sup>#</sup>, **Qiyang Lu<sup>#</sup>**, Guoxiang Hu, Panchapakesan Ganesh, Thomas Zac Ward, Ho Nyung Lee, Gyula Eres<sup>\*</sup> *et al.*, Reversible Hydrogen-Induced Phase Transformations in  $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$  Thin Films Characterized by In Situ Neutron Reflectometry, **ACS Applied Materials & Interfaces**, 14 (2022), 10898-10906 [Link](#)
12. **Qiyang Lu<sup>\*</sup>**, Henrique Martins, Juhan Matthias Kahk, William C Chueh, Johannes Lischner<sup>\*</sup>, Slavomir Nemsak<sup>\*</sup> *et al.*, Layer-Resolved Many-Electron Interactions in Delafossite  $\text{PdCoO}_2$  from Standing-Wave Photoemission Spectroscopy, **Communications Physics**, 4 (2021), 143 [Link](#)
13. Christoph Baeumer, Jiang Li, **Qiyang Lu**, Michal Bajdich<sup>\*</sup>, Slavomír Nemšák<sup>\*</sup>, J. Tyler Mefford<sup>\*</sup>, William C. Chueh *et al.*, Tuning Electrochemically Driven Surface Transformation in Atomically Flat  $\text{LaNiO}_3$  Thin Films for Enhanced Water Electrolysis, **Nature Materials**, 20 (2021), 674-682 [Link](#)

*\* Selected Publications Prior to joining Westlake University \**

14. **Qiyang Lu<sup>#</sup>**, Samuel Huberman<sup>#</sup>, Hantao Zhang, Qichen Song, Jiayue Wang, Gulin Vardar, Adrian Hunt, Iradwikanari Waluyo, Gang Chen<sup>\*</sup>, Bilge Yildiz<sup>\*</sup>, Bi-directional Tuning of Thermal Transport in  $\text{SrCoO}_x$  with Electrochemically Induced Phase Transitions, **Nature Materials**, 19 (2020) 655-662 [Link](#)
15. **Qiyang Lu**, Gulin Vardar, Sean Bishop, Iradwikanari Waluyo, Harry Tuller and Bilge Yildiz<sup>\*</sup>, Surface Defect Chemistry and Electronic Structure of  $\text{Pr}_{0.1}\text{Ce}_{0.9}\text{O}_{2-\delta}$  Revealed *in operando*, **Chemistry of Materials**, 30 (2018), 2600-2606 [Link](#)
16. **Qiyang Lu**, Sean Bishop, Dongkyu Lee, Hendrik Bluhm, Ho Nyunge Lee, Harry Tuller and Bilge Yildiz<sup>\*</sup>, Electrochemically Triggered Metal-Insulator-Transition between  $\text{VO}_2$  and  $\text{V}_2\text{O}_5$ , **Advanced Functional Materials**, 28 (2018), 1803024 [Link](#)
17. **Qiyang Lu**, Yan Chen, Hendrik Bluhm, and Bilge Yildiz<sup>\*</sup>, Electronic Structure Evolution of  $\text{SrCoO}_x$  Probed by X-ray Absorption Spectroscopy during Electrochemically Driven Topotactic Phase transition, **Journal of Physical Chemistry C**, 120 (2016), 24148-24157 [Link](#)
18. Nikolay Tsvetkov<sup>#</sup>, **Qiyang Lu<sup>#</sup>**, Lixin Sun, Ethan Crumlin, and Bilge Yildiz<sup>\*</sup>, Improved Chemical and Electrochemical Stability of Perovskite Oxides by Oxidizing Cations at the Surface, **Nature Materials**, 15 (2016) 1010-1016 [Link](#)
19. **Qiyang Lu** and Bilge Yildiz<sup>\*</sup>, Voltage-controlled Topotactic Phase Transition in Thin film  $\text{SrCoO}_x$  Monitored by *in situ* X-ray Diffraction, **Nano Letters**, 16 (2016), 1186-1193 [Link](#)

Invited Review and Perspective Articles

1. **Qiyang Lu<sup>\*</sup>**. How to Correctly Analyze the X-ray Photoelectron Spectra of 3d Transition Metal Oxides (Nano Focus Article). **ACS Nano**. 18 (2024) 13973–13982 [Link](#)

## PATENTS

1. Bilge Yildiz, Nikolai Tsvetkov, **Qiyang Lu**, Segregation Resistant Perovskite Oxides with Surface Modification, US Patent 11,179,682, 2021 (Issued)

## INVITED SEMINARS AND CONFERENCE TALKS

1. “Navigating Complexity: Harnessing Ionic Defects for Tailored Oxide Thin Film Properties”, University of Twente, July 22, 2024
2. “Navigating Complexity: Harnessing Ionic Defects for Tailored Oxide Thin Film Properties”, Young Scientist Award (YSA) session, 24<sup>th</sup> International Conference on Solid State Ionics (SSI-24), July 18<sup>th</sup>, 2024
3. “Understanding the Role of Ionic Point Defects in Functional Oxide Electrocatalysts”. School of Energy and Environment, City University of Hong Kong, November 10, 2023
4. “Differentiating Oxygen Exchange Reaction Mechanisms across Phase Boundaries”. the 15th Pacific Rim Conference of Ceramic Societies (PACRIM15), Shenzhen, China, November 8, 2023
5. “Understanding the Role of Ionic Point Defects in Oxide Electrocatalysts”. The 10<sup>th</sup> International Conference on Electroceramics, Changsha, China, September 9, 2023
6. “Understanding the Role of Ionic Point Defects in Functional Perovskite Oxides: from High-temperature Solid/Gas Equilibrium to Room-temperature Solid/Liquid Dynamics”, Hong Kong University of Science and Technology (HKUST), February 2, 2023
7. “Controlling Properties of Perovskite Oxides via Turning Oxygen and Proton Defect Chemistry”, 12th International Conference on High-Performance Ceramics (CICC-12), Suzhou, China, August 16, 2022
8. “Controlling Properties of Functional Perovskite Oxides by Tuning Oxygen Defect Chemistry”, Westlake International Symposium in Engineering, Hangzhou, China, October 27, 2021
9. “Controlling Properties of Perovskite Oxides by Tuning Oxygen Defect Chemistry”, 2021 Electronic Materials and Applications (EMA 2021), online, January 20, 2021

## TEACHING

MSE 5007 Solid State Ionics (Ongoing graduate course, developed by Qiyang Lu)

- Offered in Spring 2022 and Spring 2023 (continuing).
- Course materials available at <https://ssi-westlake.com/teaching/>. Total downloads > 3000 since launching in December 2022.
- Tutorial articles based on the course materials posted on WeChat (in Chinese), with >10,000 views in total.
- Established a Wechat account (Westlake Solid State Ionics) which posts tutorial articles regularly and attracted more than 5,000 subscribers.

## MENTORING AND STUDENTS

### Current group members

Name	Year joined	Role	Project
Ying Lu	2021	Research Scientist	Metal nanoparticle exsolution
Haowen Chen	2020	PhD Student	Ionotronics of nickelate thin films
Yang Hu	2021	PhD Student	Ionic defects in electrocatalysts
Kaichuang Yang	2021	PhD Student	Model electrodes of solid oxide cells
Luhan Wei	2021	PhD Student	Optical-electrochemical methods
Jieping Zheng	2022	PhD Student	High-temperature ionotronics
Song Mao	2022	PhD Student	Molten salt electrochemistry (Co-advised with Prof. Xiao Yang)
Zihan Xu	2023	PhD Student	Protonic defects in oxides

### Former group members

Name	Years	Role	Current position
Jingle Wang	2021-2023	Postdoc	Postdoc, Chinese Academy of Sciences
Yiwei Huang	2021-2023	Master Student	Master student, HKUST
Xinyuan He	2024	Summer Intern	Undergrad, Central South University
Yuxin Qiu	2024	Summer Intern	Undergrad, Xi'an Jiaotong University
Yuanqin Yun	2022	Summer Intern	PhD student, Brown University
Haodong Wu	2021	Summer Intern	PhD student, University of St. Andrews
Kaiyuan Fan	2021	Summer Intern	PhD student, USTC
Peng Tang	2020-2021	Research Associate	Industry

## STUDENT HONORS & AWARDS

- 2023 China Scholarship Council (CSC) Exchange Student Scholarship to PhD student **Kaichuang Yang** (Financial support for visiting Prof. Jürgen Fleig's group at Technology University of Vienna (TU Wien) during 08/2024~08/2025)
- 2023 China Scholarship Council (CSC) Exchange Student Scholarship to PhD student **Yang Hu** (Financial support for visiting Prof. Christopher Baeumer's group at University of Twente during 11/2023~11/2024)

## SERVICE

### Service within School of Engineering, Westlake University

- Founding co-chair, PhD Student Seminar Committee, 2021-present
  - Started weekly PhD Student Seminar Series; Featured >100 PhD student presenters;
  - Started annual 3-minute research presentation contest “**WE**stlake **S**tudent **T**alk (**WEST**)”. Highly acclaimed by students and colleagues & featured on University News.

- Initiated the first 3-minute research presentation contest of engineering graduate students in the Yangtze-river-delta region and served as the competition chair.
- Undergraduate curriculum committee member, 2023-present
- Graduate student admission and curriculum committee member, 2020-2022

#### Services outside Westlake University

- Member, Executive committee of the Chinese Society for Solid State Ionics (CSSI), 2023-present.
- Peer Review for scientific journals: Nano Letters, Chemistry of Materials, Journal of Physical Chemistry C, ACS Applied Materials & Interfaces, ChemSusChem, Journal of Materials Chemistry A, Applied Surface Science, Solid State Ionics, Advanced Energy Materials, Advanced Functional Materials, Journal of the American Chemical Society.
- Reviewer for Department of Energy (DOE) Energy Frontier Research Centers (EFRCs) proposals (2022).

## **GRANTS**

#### Current (External)

1. NSFC, Excellent Young Scientists Fund (overseas), “Solid state ionics of complex oxide thin films”. 1/1/2023-12/31/2025.
2. NSFC, Young Scientists Fund, “Tuning properties of oxide thin films by using spatially varied ion defect concentration”. 1/1/2023-12/31/2025.

#### Current (Internal)

1. Research Center for Industries of the Future, Westlake University, “Data-driven development of key materials for reversible solid oxide cells”. 1/1/2022-12/31/2024.
2. School of Engineering Dean Special Projects Fund, Westlake University, “Map phase boundaries electrochemically”. 1/1/2022-12/31/2024.