

# Stanford

---



## Maha Yusuf

Ph.D. Student in Chemical Engineering, admitted Autumn 2015

### CONTACT INFORMATION

- **Address**

Department of Electrical Engineering - 420 Via Palo Mall, Paul  
G. Allen 202X

**Tel** 5108214047

### Bio

---

#### BIO

I'm a PhD candidate in Chemical Engineering at Stanford University with support from Schlumberger Faculty for the Future Award (2018-2023), Stanford DARE (Diversifying Academia, Recruiting Excellence) Fellowship Award (2020-2022), and 2022 Edward G. Weston Fellowship Award from the Electrochemical Society (ECS). Advised by Prof. Michael F. Toney and Dr. Johanna Nelson Weker at SLAC, my research uses advanced imaging diagnostic tools to understand the failure mechanisms of lithium-ion batteries during extreme fast charging (XFC). Specifically, I use high-resolution neutron and X-ray imaging to investigate Li plating characteristics on graphite anodes during XFC. For my research, I have won awards including the 2022 American Chemical Society CAS Future Leader; 2020 Stanford Distinguished Student Energy Lecturer; and 2020 and 2021 ECS and American Institute of Chemical Engineers Travel Grants. I hold an M.S. in chemical engineering from Stanford (2017) and a B.E. from the National University of Sciences and Technology, Pakistan (2013). Prior to Stanford, I worked on oil and gas rigs as a drilling engineer in amazon rainforests in Colombia. To date, I have published seven journal articles and hold two patents.

#### HONORS AND AWARDS

- Presidential Postdoctoral Fellowship, Princeton University (2023)
- ACS CAS Future Leader Fellow, American Chemical Society (ACS) (2022)
- Edward G. Weston Summer Fellowship, The Electrochemical Society (2022)
- AIChE Women in Chemical Engineering (WIC) travel award, American Institute of Chemical Engineers (AIChE) (2021)
- ECS Battery division's travel award, The Electrochemical Society (2021)
- DARE fellowship Award, Stanford Office of the Vice Provost for Graduate Education (2020-2022)
- AIChE Women in Chemical Engineering (WIC) travel award, American Institute of Chemical Engineers (AIChE) (2020)
- ECS PRiME Battery division's travel award, The Electrochemical Society (2020)
- Stanford Energy Distinguished Student Lecturer, Precourt Institute of Energy (2020)
- Accel Innovation Scholar, Stanford Technology Ventures Program (STVP) (2019-2020)
- Grand Prize Winner, Micrograph Contest, Electron, Ion, and Photon Beam Technology and Nanofabrication (EIPBN) (2019)
- Faculty for the Future Fellowship, Schlumberger Foundation (2018-2023)
- Token of Appreciation for my work as the Lab Safety Coordinator, Stanford School of Engineering (2018)

- Stanford Graduate Fellowship, Stanford University (2015-2016)
- Fulbright Scholarship (Awarded), United States Education Foundation Pakistan (USEFP) (2014)
- Rhodes Scholarship Finalist, Rhodes Trust (Pakistan) (2014)
- Emerging Leader Award, U.S. Embassy Islamabad (2013)
- Global Shaper, World Economic Forum (2013)
- Invited Panelist, United Nations Pakistan (2013)
- Global Undergraduate Exchange Scholarship, U.S. Department of State (2012)
- Scholarship for Global Summit on Entrepreneurship and Innovation (GES) in Turkey, U.S. Department of State's GIST Initiative (2011)
- Dean's Honor List, National University of Sciences and Technology (NUST), Islamabad (2009-2013)
- First Place in National Chemistry Talent Contest Pakistan, Karachi University (2008)

### **PROFESSIONAL AFFILIATIONS AND ACTIVITIES**

- Advisor, Stanford WEE (Women in Electrical Engineering) (2021 - 2022)
- Co-President, Stanford WEE (Women in Electrical Engineering) (2020 - 2021)
- Vice-President, Stanford WEE (Women in Electrical Engineering) (2019 - 2020)
- Industry Liaison Officer, Stanford WEE (Women in Electrical Engineering) (2018 - 2019)
- Member, Stanford GradSWE (Society of Women Engineers - Graduate Women) (2018 - 2019)
- Member, Stanford WISE (Women in Science and Engineering) (2018 - 2019)
- Member, The Optical Society (OSA) (2017 - 2019)
- Member, Stanford Photonics Research Center (SPRC) (2017 - 2019)
- Member, Stanford SUNCAT Center for Interface Science and Catalysis (2016 - 2017)
- Member, American Institute of Chemical Engineers (AIChE) (2015 - present)
- Member, Pakistani Students at Stanford (PAS) Association (2015 - 2018)
- Member, Engineers Without Borders (EWB), University of Mississippi (2012 - 2012)

### **EDUCATION AND CERTIFICATIONS**

- Master of Science, Stanford University , Chemical Engineering (2017)
- Bachelor of Engineering, National University of Sciences and Technology (NUST), Islamabad, Pakistan , Chemical Engineering (2013)

### **SERVICE, VOLUNTEER, AND COMMUNITY WORK**

- Stanford Visit by NUST Delegation (Facilitator) (10/2017)
- Research Collaboration (Initiator) (11/2012 - 6/2013)
- Founder/Teacher (6/2010 - August 2011)

### **PATENTS**

- Friedrich B. Prinz, Shicheng Xu, Yongmin Kim, Thomas Jaramillo, Drew C. Higgins, Maha Yusuf, Zhaoxuan Wang, Kate Lee, Marat Orazov, Daniel Lee, Tanja Graf, Thomas Schladt, Gerold Huebner, Hanna-Lena Wittern, Jonathan Edward Mueller. "United States Patent 62/519,056 Electrochemical Catalysts with Enhanced Catalytic Activity", The Board of Trustees of the Leland Stanford Junior University, Volkswagen Aktiengesellschaft, Jun 13, 2018
- Friedrich B. Prinz, Thomas Francisco Jaramillo, Tanja Graf Thomas Schladt, Gerold Huebner, Shicheng Xu, Yongmin Kim, Maha Yusuf, Drew Christopher Higgins. "United States Patent 62/385,135 Atomic Layer Deposition of Electrochemical Catalysts", The Board of Trustees of the Leland Stanford Junior University, Volkswagen Aktiengesellschaft, Sep 7, 2017

### **PERSONAL INTERESTS**

Writing

Reading

Travel

Yoga

Cooking

## Research & Scholarship

---

### CURRENT RESEARCH AND SCHOLARLY INTERESTS

Long charging times of lithium-ion batteries (LIBs) is a major bottleneck in the widespread deployment of electric vehicles (EVs). There is a global push to enable extreme fast charging (XFC) of EV batteries to reduce their charging times to 10-15 minutes. But existing LIBs cannot achieve this goal without significantly reducing battery performance. This is mainly attributed to a phenomenon, known as “Li plating,” as the battery is charged fast. In this thesis, I use neutron and X-ray-based imaging to visualize the battery electrode to investigate Li plating at elevated charging rates.

### Publications

---

#### PUBLICATIONS

- **Conformal Pressure and Fast-Charging Li-Ion Batteries** *JOURNAL OF THE ELECTROCHEMICAL SOCIETY*  
Cao, C., Steinrueck, H., Paul, P. P., Dunlop, A. R., Trask, S. E., Jansen, A. N., Kasse, R. M., Thampy, V., Yusuf, M., Weker, J., Shyam, B., Subbaraman, R., Davis, et al  
2022; 169 (4)
- **Simultaneous neutron and X-ray tomography for visualization of graphite electrode degradation in fast-charged lithium-ion batteries** *Cell Reports Physical Science*  
Yusuf, M., LaManna, J. M., Paul, P. P., Agyeman-Budu, D. N., Cao, C., Dunlop, A. R., Jansen, A. N., Polzin, B. J., Trask, S. E., Tanim, T. R., Dufek, E. J., Thampy, V., Steinrück, et al  
2022
- **The In-situ Characterization of Fast-charging Degradation Modes in Li-ion Batteries Using High-resolution Neutron Imaging** *The Electrochemical Society Interface*  
Yusuf, M.  
2022
- **Optimized Deep Reactive-Ion Etching of Nanostructured Black Silicon for High-Contrast Optical Alignment Marks** *ACS APPLIED NANO MATERIALS*  
Yusuf, M., Herring, G. K., Neustock, L., Zaman, M., Raghuram, U., Narasimhan, V. K., Chia, C., Howe, R. T.  
2021; 4 (7): 7047-7061
- **A Review of Existing and Emerging Methods for Lithium Detection and Characterization in Li-Ion and Li-Metal Batteries** *ADVANCED ENERGY MATERIALS*  
Paul, P. P., McShane, E. J., Colclasure, A. M., Balsara, N., Brown, D. E., Cao, C., Chen, B., Chinnam, P. R., Cui, Y., Dufek, E. J., Finegan, D. P., Gillard, S., Huang, et al  
2021
- **Ex-situ Li plating detection on graphite anodes in extremely fast-charged lithium-ion batteries using simultaneous neutron and X-ray tomography** *Microscopy and Microanalysis*  
Yusuf, M., LaManna, J., Paul, P., Agyeman-Budu, D., Toney, M., Weker, J. N.  
2021; 27
- **Holographic fiducial marks: A system for precise alignment of x-ray optics** *Applied Physics Letters*  
Herring, G. K., Yusuf, M., Thorben, L. T., Hesselink, L.  
2020; 116 (3)
- **Building upon the Koutecky-Levich Equation for Evaluation of Next-Generation Oxygen Reduction Reaction Catalysts** *ELECTROCHIMICA ACTA*  
Xu, S., Kim, Y., Higgins, D., Yusuf, M., Jaramillo, T., Prinz, F. B.  
2017; 255: 99–108