Zeeshan Ahmad

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Academic Positions

Postdoctoral Scholar, Pritzker School of Molecular Engineering, University of Chicago Sept 2020 -
Advisor: Prof. Giulia Galli

Education

M.S. & Ph.D. in Mechanical Engineering Carnegie Mellon University 2015-20
Thesis: *Electrolytes for Enabling Rechargeable Lithium Metal Batteries*, Advisor: Prof. Venkat Viswanathan

B.Tech. in Mechanical Engineering Indian Institute of Technology Delhi 2011-15

Publications

Google Scholar Link: Citations: 437, h-index: 9

Journal Publications

† denotes equally contributing authors

[J12] Z. Huang†, S. R. Vardeny†, T. Wang†, **Z. Ahmad†**, A. Chanana, E. Vetter, S. Yang, X. Liu, G. Galli, A. Amassian Z. V. Vardeny, D. Sun, "Observation of Spatially-Resolved Rashba States on the Surface of $CH_3NH_3PbBr_3$ Single Crystals"
Applied Physics Reviews 8, 031408 (2021).

[J11] **Z. Ahmad**, V. Venturi, H. Hafiz, V. Viswanathan, "Interfaces in Solid Electrolyte Interphase: Implications for Lithium-ion Batteries"
J. Phys. Chem. C 125, 11301 (2021).

[J10] **Z. Ahmad**, Z. Hong, V. Viswanathan, "Design rules for liquid crystalline electrolytes for enabling dendrite-free lithium metal batteries"
Proc. Natl. Acad. Sci. U.S.A. 117, 26672 (2020).

[J9] Z. Hong, **Z. Ahmad**, V. Viswanathan, "Design principles for dendrite suppression with porous polymer/aqueous solution hybrid electrolyte for Zn metal anodes"
ACS Energy Lett. 5, 2466 (2020).

[J8] V. Venturi, H. Parks, **Z. Ahmad**, V. Viswanathan, "Machine learning enabled discovery of application dependent design principles for two-dimensional materials"
Mach. Learn.: Sci. Technol. 1, 035015 (2020).

[J7] C. Fu, V. Venturi, J. Kim, **Z. Ahmad**, A. W. Ells, V. Viswanathan, B. A. Helms, "Universal Chemomechanical Design Rules for Solid-Ion Conductors to Prevent Dendrite Formation in Lithium Metal Batteries"
Nat. Mater. 19, 758 (2020).

[J6] **Z. Ahmad**, T. Xie, C. Maheshwari, J. C. Grossman, V. Viswanathan, "Machine Learning Enabled Computational Screening of Inorganic Solid Electrolytes for Suppression of Dendrite Formation in Lithium Metal Anodes"
ACS Cent. Sci. 4, 996 (2018). Among *10 Ionizing Papers* (August 2018) in Research Interfaces.

[J5] **Z. Ahmad**, V. Viswanathan, "Role of anisotropy in determining stability of electrodeposition at solid-solid interfaces"
Phys. Rev. Materials 1, 055403 (2017).

[J4] **Z. Ahmad**, V. Viswanathan, "Stability of electrodeposition at solid-solid interfaces and implications for metal anodes"
Phys. Rev. Lett. 119, 056401 (2017).

[J3] L. Klosterman, **Z. Ahmad**, V. Viswanathan, C. J. Bettinger, "Synthesis and Measurement of Cohesive Mechanics in Polydopamine Nanomembranes"
Adv. Mater. Interfaces 4, 170041 (2017).

[J2] C. Xu, **Z. Ahmad**, A. Aryanfar, V. Viswanathan, J. R. Greer, "Enhanced strength and temperature dependence of mechanical properties of Li at small length scales and its implications for Li metal anodes"
Proc. Natl. Acad. Sci. U.S.A. 114, 57 (2017).

[J1] **Z. Ahmad**, V. Viswanathan, "Quantification of uncertainty in first-principles predicted mechanical properties of solids: Application to solid ion conductors"
Phys. Rev. B 94, 064105 (2016).

Preprints

[PP2] Y. A. Farrukh, I. Khan, **Z. Ahmad**, R. M. Elavarasan, "A Sequential Supervised Machine Learning Approach for Cyber Attack Detection in a Smart Grid System"
arXiv:2108.00476 (2021).

[PP1] **Z. Ahmad**, V. Venturi, S. Sripad, V. Viswanathan, "Chemomechanics: friend or foe of the 'AND problem' of solid-state batteries?"
arXiv:2108.10150 (2021).

Patents

[PT2] V. Viswanathan, **Z. Ahmad**, S. Zhu, "Fast Charging and Discharging Rechargeable Metal Electrode by Isotope Control"
US Patent Application number 63/054090 (2020).

[PT1] Y.-M. Chiang, V. Viswanathan, L. Li, V. Pande, D. Krishnamurthy, **Z. Ahmad**, W. H. Woodford, "Lithium metal electrodes and batteries thereof"
US Patent Application number 15/480235 (2017).

Refereed Conference Proceedings

[C1] **Z. Ahmad**, R. Singh, S. S. Bahga, A. Gupta, "Droplet Formation in a T-Junction Microfluidic Device in the Presence of an Electric Field"
ASME 13th International Conference on Nanochannels, Microchannels and Minichannels (ICNMM) (2015).

Selected Talks

[T7] (Invited) **Z. Ahmad**, "Solid State Electrolytes for Rechargeable Lithium Metal Batteries"
Battery Modeling Webinar Series, (2020).

[T6] **Z. Ahmad**, Z. Hong, V. Viswanathan, "Dendrite Suppression for Metal Anodes Using Liquid Crystalline Electrolytes"
Materials Research Society Fall Meeting (2019).

[T5] **Z. Ahmad**, H. Hafiz, V. Viswanathan, "Design principles for multicomponent solid electrolytes for lithium metal anodes"
American Physical Society March Meeting (2019).

[T4] **Z. Ahmad**, V. Viswanathan, "Solid electrolytes for stable electrodeposition in Li metal anode based batteries"
American Physical Society March Meeting (2018).

[T3] (Invited) **Z. Ahmad**, V. Viswanathan, "Data Science on Inorganic Crystals"
4th Annual Electrochemical Energy Symposium, Carnegie Mellon University (2018).

[T2] **Z Ahmad**, C. Maheshwari, V. Viswanathan, "Machine Learning-Driven Prediction of Electrodeposition Stability of Inorganic Solid Electrolytes with Li-Metal Anode"
Materials Research Society Fall Meeting (2017).

[T1] **Z. Ahmad**, V. Viswanathan, "New Approach of Dendrite Suppression Using Solid Electrolyte to Enable Li Metal Anodes"
Electrochemical Society Fall Meeting (2017).

Selected Poster Presentations

[PS3] **Z. Ahmad**, V. Viswanathan, "Development of solid ion conductors for stable electrodeposition at electrolyte-Li metal anode interfaces"
Batteries Gordon Research Conference (2018).

[PS2] **Z. Ahmad**, V. Viswanathan, "Data-driven Computational Screening of Stable Solid Ion Conductors for Li Anode-based Batteries"
Science 2017 Conference, University of Pittsburgh (2017). **Best Poster Award**

[PS1] **Z. Ahmad**, V. Viswanathan, "Tin as Anode Material for Lithium-ion batteries"
1st Annual Electrochemical Energy Symposium, Carnegie Mellon University (2015). **Best Poster Award**

Awards and Fellowships

American Physical Society Energy Research Workshop Travel Award, 2019.

Bushnell Fellowship in Engineering, Carnegie Mellon University, 2018.

Phillips and Huang Family Fellowship in Energy, Carnegie Mellon University, 2016.

Institute Silver Medal at IIT Delhi, awarded for graduating at the top of the class, 2015.

Nayyar Perwez Shahabuddin Medal at IIT Delhi, awarded for research record and potential, 2015.

Institute Semester Merit Prize (six times) at IIT Delhi, 2012-2015.

IIT Delhi Alumni Association Scholarship, 2013 & 2014.

Jagdishwar & Maya Jaluria Scholarship at IIT Delhi, 2013 & 2014.

S.C. Mehrotra's Award at IIT Delhi, 2013.

Kishore Vaigyanik Protsahan Yojana (KVPY) Fellowship by Govt. of India, 2011.

Teaching Experience

2018	Teaching Assistant	Carnegie Mellon University 24-231: Fluid Mechanics (undergraduate)
2019	Teaching Assistant	Carnegie Mellon University 24-231: Fluid Mechanics (undergraduate)

Training, Mentoring & Advising Experience

2019-	Shang Zhu, Ph.D. student	
2017-2020	Victor Venturi, Ph.D. student	
2017	Chinmay Maheshwari, undergraduate intern	Post-grad: Ph.D. student, UC Berkeley
2016	Ashwini Gupta, undergraduate intern	Post-grad: Ph.D. student, Johns Hopkins

Academic Service

- Reviewer:
  - Journals: Physical Review Letters, Physical Review X, Physical Review B, Journal of Physics: Condensed Matter, Computational Materials Science, Machine Learning: Science and Technology, Scientific Data
  - Conferences: NeurIPS (Machine Learning & the Physical Sciences Workshop, 2019 & 2020)
- University Committees:
  - Graduate Student Representative, Carnegie Mellon Graduate Student Assembly (2018 - 2019).
  - Member, Campus Affairs Committee (2018 - 2019).

Schools/Workshops Attended

- Advancing Chemical and Materials Science through Machine Learning Symposium, virtual, June 2021.
- Artificial Intelligence for Materials Science (AIMS) Workshop, National Insitute of Standards and Technology, Gaithersburg, MD, 2019.
- International Summer School on Computational Quantum Materials, University of Sherbrooke, Quebec, Canada, 2018.
- SUNCAT Summer Institute: Fundamentals and Applications of Heterogeneous Catalysis, Stanford University, 2017.

Selected Media Coverage

- Phys.org: The surprising strength of liquid crystals, November 3, 2020 (`https://phys.org/news/2020-11-strength-liquid-crystals.html`).
- Berkeley Lab News Center: Battery Breakthrough Gives Boost to Electric Flight and Long-Range Electric Cars, July 20, 2020 (`https://newscenter.lbl.gov/2020/07/20/battery-electric-planes-cars/`).
- HPC Wire: CMU Scientists Use XSEDE-Allocated Resources to Simulate Improved Battery Components, July 11, 2019 (`https://www.hpcwire.com/off-the-wire/cmu-scientists-use-xsede-allocated-resources-to-simulate-improved-battery-components/`).
- Techxplore: Machine learning to develop safer batteries, December 18, 2018 (`https://techxplore.com/news/2018-12-machine-safer-batteries.html`).
- Techxplore: Building better batteries, December 20, 2016 (`https://techxplore.com/news/2016-12-batteries.html`).