

Zeeshan Ahmad, Ph.D.

Assistant Professor, Mechanical Engineering, Texas Tech University

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Employment

Texas Tech University	Assistant Professor	Sept 2022 - present
The University of Chicago,	Postdoctoral Scholar	Sept 2020 - Sept 2022
Pritzker School of Molecular Engineering	Advisor: Dr. Giulia Galli	

Education

Carnegie Mellon University	M.S. & Ph.D. in Mechanical Engineering	2015-20
Thesis: “Electrolytes for Enabling Rechargeable Lithium Metal Batteries”		
Advisor: Dr. Venkat Viswanathan.		
Indian Institute of Technology Delhi	B.Tech. in Mechanical Engineering	2011-15
Thesis: “Droplet formation in a T-junction microfluidic device under electrical actuation”		
Advisors: Dr. Amit Gupta & Dr. Supreet S. Bahga. Dept. Rank 1		

Publications

Google Scholar Link: Citations: 700, h-index: 11 (as of Sept 7, 2022)

Peer Reviewed Journal Publications

† denotes equally contributing authors

- [J16] M. Babar, H. Hafiz, **Z. Ahmad**, B. Barbiellini, A. Bansil, V. Viswanathan, “Effect of disorder and doping on electronic structure and diffusion properties of $\text{Li}_3\text{V}_2\text{O}_5$ ”
J. Phys. Chem. C, accepted. arXiv:2205.03885
- [J15] **Z. Ahmad**, R. A. Scheidt, M. P. Hautzinger, K. Zhu, M. C. Beard, G. Galli, “Understanding the Effect of Lead Iodide Excess on the Performance of Methylammonium Lead Iodide Perovskite Solar Cells”
ACS Energy Lett. 7, 1912 (2022).
- [J14] **Z. Ahmad**, V. Venturi, S. Sripad, V. Viswanathan, “Chemomechanics: friend or foe of the “AND problem” of solid-state batteries?”
Curr. Opin. Solid State Mater. Sci. 26, 101002 (2022).
- [J13] 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 $\text{CH}_3\text{NH}_3\text{PbBr}_3$ Single Crystals”
Appl. Phys. Rev. 8, 031408 (2021). *Featured Article*
- [J12] **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).
- [J11] A. Mistry ... **Z. Ahmad** ... V. Viswanathan, “A Minimal Information Set to Enable Verifiable Theoretical Battery Research”
ACS Energy Lett. 6, 3831 (2021). *Battery Modeling Community Article*
- [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

- [PP1] S. Zhu, Z. Hong, **Z. Ahmad**, V. Viswanathan, “Activity-Modulated Localized Recrystallization during Lithium Stripping at the Electrode-Electrolyte Interface”
ChemRxiv, 2022.

Peer Reviewed Conference Papers

- [C2] Y. A. Farrukh, **Z. Ahmad**, I. Khan, R. M. Elavarasan, “A Sequential Supervised Machine Learning Approach for Cyber Attack Detection in a Smart Grid System”
53rd North American Power Symposium, *accepted*. arXiv:2108.00476 (2021).
- [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).

Patents

- [PT2] V. Viswanathan, **Z. Ahmad**, S. Zhu, “Fast Charging and Discharging Rechargeable Metal Electrode by Isotope Control”
US Patent Application no. 63/054,090 (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 no. 15/480,235, granted (2017).

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).

Poster Presentations

- [PS4] **Z. Ahmad**, V. Viswanathan, “Development of solid ion conductors for stable electrodeposition at electrolyte-Li metal anode interfaces”
Batteries Gordon Research Conference (2018).
- [PS3] **Z. Ahmad**, V. Viswanathan, “Solid-Solid Interfaces for Suppression of Dendrites in Metal Anode Based Batteries”
Materials Research Society Fall Meeting (2017).
- [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, for doctoral research in nanotechnology, 2018.

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

Institute Silver Medal at IIT Delhi, for graduating at the top of the department batch, 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 for excellent academic record, 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

Instructor	Engineering Thermodynamics I, Texas Tech University	Fall 2022
Teaching Assistant	Fluid Mechanics, Carnegie Mellon University	Spring 2018 & 2019

Training, Mentoring & Advising Experience

As PI

Md Salam Limon, Ph.D. student, TTU 2022-

As Postdoc and Ph.D. student

Mohd Babar, Ph.D. student, CMU 2021-2022

Shang Zhu, Ph.D. student, CMU 2019-2022

Victor Venturi, Ph.D. student, CMU 2017-2020

Chinmay Maheshwari, undergrad intern, CMU Post-grad: Ph.D. student, UC Berkeley 2017

Ashwini Gupta, undergrad intern, CMU Post-grad: Ph.D. student, Johns Hopkins 2016

Academic Service

- Reviewer
 - Journals: Physical Review Letters, Journal of the American Chemical Society, Physical Review X, Physical Review B, Physical Review Materials, Journal of Physics: Condensed Matter, Journal of Applied Physics, Computational Materials Science, Machine Learning: Science and Technology, Scientific Data
 - Conferences: NeurIPS (Machine Learning & the Physical Sciences Workshop, 2019 & 2020)
 - Poster Judge for Pittsburgh Quantum Institute
- University
 - Graduate Student Representative, Carnegie Mellon Graduate Student Assembly (2018 - 2019).
 - Member, Campus Affairs Committee (2018 - 2019). Working group focused on mental health, workplace bullying & graduate student housing
 - Logistics Secretary, Mechanical Engineering Society, Indian Institute of Technology Delhi (2013-14).

Selected Media Coverage

- Phys.org: The surprising strength of liquid crystals, Nov 3, 2020 (<https://phys.org/news/2020-11-strength-liquid-crystals.html>).
- CleanTechnica: The Key To Better Batteries Is Soft Solid Electrolytes, Say Researchers, July 22, 2020 (<https://cleantechnica.com/2020/07/22/the-key-to-better-batteries-is-soft-solid-electrolytes-say-researchers>)
- 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-xse-de-allocated-resources-to-simulate-improved-battery-components/>).
- Techxplore: Machine learning to develop safer batteries, Dec 18, 2018 (<https://techxplore.com/news/2018-12-machine-safer-batteries.html>).
- Techxplore: Building better batteries, Dec 20, 2016 (<https://techxplore.com/news/2016-12-batteries.html>).