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Associate Professor, Priti and Mukesh Chatter '82 Career Development Chair

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Education

Ph.D. Chemical Engineering, University of Maryland College Park, 2018

Advisor: Dr. Chunsheng Wang, **Thesis:** Revisiting the Electrochemical Stability Window of Solid Electrolytes for the Development of Bulk-Type All-Solid-State Lithium Batteries

MS Materials Science and Engineering, Shandong University, 2012

BS Materials Science and Engineering, Shandong University, 2009

Research and Professional Experience

08/16/2019 – present Priti and Mukesh Chatter '82 Career Development Chair, Rensselaer Polytechnic Institute

07/01/2025 – present Associate Professor, Department of Mechanical, Aerospace, and Nuclear Engineering, Rensselaer Polytechnic Institute

01/01/2026 – present Associate Professor, Department of Materials Science and Engineering, Rensselaer Polytechnic Institute

08/16/2019 – 06/30/2025 Assistant Professor, Department of Mechanical, Aerospace, and Nuclear Engineering, Rensselaer Polytechnic Institute

03/20/2019 – 08/15/2019 Guest Scientist, Materials for Energy and Sustainable Development Group, National Institute of Standards and Technology

05/21/2018 – 08/15/2019 Postdoctoral Associate, Department of Chemical and Biomolecular Engineering, University of Maryland College Park, Advisor: Dr. Chunsheng Wang

08/17/2012 – 05/20/2018 Graduate Student, Department of Chemical and Biomolecular Engineering, University of Maryland College Park, Advisor: Dr. Chunsheng Wang

Research Interests

Materials, Sustainability, Batteries, Electrochemistry, Neutron Techniques

Awards and Honors

- 17) ASME Journal of Electrochemical Energy Conversion and Storage Emerging Investigator, 2025
- 16) Highly Cited Researcher in Cross-Field by Clarivate, 2022, 2023, 2024, 2025
- 15) Materials Research Society Nelson “Buck” Robinson Science and Technology Award for Renewable Energy, 2024
- 14) School of Engineering Research Excellence Award, Rensselaer Polytechnic Institute, 2024
- 13) ARPA-E IGNIITE Award, 2024
- 12) NSF CAREER Award, 2023
- 11) Journal of Materials Chemistry A – Emerging Investigator, 2023
- 10) Electrochemical Society Electrodeposition Division Early Career Investigator Award, 2022
- 9) International Society for Solid State Ionics Young Scientist Award Finalist, 2022
- 8) Electrochemical Society Battery Division Student Research Award, 2018
- 7) Dean’s Doctoral Research Award, A. James Clark School of Engineering, 2018
- 6) Materials Research Society Graduate Student Gold Award, 2017
- 5) NASA Tech Brief Certificate, 2016
- 4) All-S.T.A.R. Fellowship, University of Maryland College Park, 2016
- 3) Harry K. Wells Fellowship, A. James Clark School of Engineering, 2016
- 2) Future Faculty Fellow, A. James Clark School of Engineering, 2016
- 1) TA of the Year, Department of Chemical and Biomolecular Engineering, 2014

Book:

- 1, J. Ouyang, A. Roytburd, F. Han, Thermodynamics of Crystals, Springer Nature, In Press

Book Chapters:

2, Y. Huang, B. Shao, F. Han, Solid State Batteries – An Introduction, in “Solid State Batteries: Emerging Materials and Applications”, Chapter 1, pp 1-20, 2022, American Chemical Society Symposium Series Vol. 1413.

1, B. Shao, Y. Huang, F. Han, Lithium-Sulfur Solid-State Batteries, in “Solid State Batteries: Emerging Materials and Applications”, Chapter 12, pp 267-288, 2022, American Chemical Society Symposium Series Vol. 1414.

Publications (Citations: 25,414, H-index = 62, data from Google Scholar:

<https://scholar.google.com/citations?user=TSWDzy4AAAAJ&hl=en>)

90. R. Deng, R. Wu, R. Xiao, K. Xu, T. Cao, C. Yang, Y. Chen, F. Han, Single Crystalline O3-Type Na_{0.9}Cu_{0.22}Fe_{0.30}Mn_{0.48}O₂ Layered Oxide Cathode for Long Life Na-Ion Batteries, Submitted.

89. K. Xu, K. Xia, R. Xiao, R. Grant, R. Deng, R. Wu, R. Das, B. Shao, E. Hu, F. Han, Revealing the Roles of Cu/Ni Incorporation in the Electrochemical Performance of FeF₃ Cathodes in Solid-State Batteries, Submitted.

88. R. Wu, S. Liu, R. Deng, R. Xiao, K. Xu, C. Fu, A. Ingenito, F. Han, Multifunctional Mg-C Bilayer Interphase for Anode-Free Solid-State Batteries, *ACS Applied Materials & Interfaces*, 2026, DOI: 0.1021/acsami.6c01094.

87. R. Wu, R. Deng, C. Nogueira, R. Xiao, K. Xu, X. Xu, F. Han, Lithium–Carbon Composite Anodes for Solid-State Lithium Metal Batteries, *ACS Energy Letters*, 2026, DOI: 10.1021/acsenergylett.5c04190.

86. R. Deng, R. Wu, F. Han, Critical Role of Mixing for Dry Processing Sodium Ion Cathodes, *ASME Journal of Electrochemical Energy Conversion and Storage*, 2026, 23, 021104. Featured in the "2025 Emerging Investigators in Electrochemical Energy Conversion and Storage" special issue.

85. R. Deng, R. Das, R. Wu, K. Xu, B. Shao, F. Han, Understanding Calendar Aging of Thiophosphate-Based Solid-State Batteries, *Journal of the Electrochemical Society*, 2025, 172, 100519.

84. Y. Huang, Y. Zhang, R. Wu, B. Shao, R. Deng, R. Das, F. Han, Hydride-Based Interlayer for Solid-State Anode-Free Battery, *ACS Energy Letters*, 9, (2024), 3409.

83. S. T. Fuller, Y. Huang, R. Wu, F. Han, J. X. K. Zheng, N. Vasiljevic, Engineering Electrodeposition for Next-Generation Batteries, *The Electrochemical Society Interface*, 33, (2024) 55.

82. B. Shao, R. Das, Y. Huang, R. Deng, S. Seelman, F. Han, Structural Evolution During Solution-Based Synthesis of Li₇P₃S₁₁ Solid Electrolyte by Synchrotron X-ray Total Scattering,

Journal of Materials Chemistry A, 11 (2023) 17035. Featured in "Journal of Materials Chemistry A Emerging Investigators" Themed Collection.

81. B. Shao, Y. Huang, F. Han, Electronic Conductivity of Lithium Solid Electrolytes, *Advanced Energy Materials*, 13 (2023) 2204098.

80. Y. Huang, B. Shao, Y. Wang, F. Han, Solid-State Silicon Anode with Extremely High Initial Coulombic Efficiency, *Energy & Environmental Science*, 16 (2023) 1569.

79. D. Zhao, M. T. Benson, K. Yang, Y. Huang, F. G. Di Lemma, B. Gong, F. Han, J. Lian, Grain Growth Kinetics of the Gamma Phase Metallic Uranium, *Journal of Nuclear Materials*, 574 (2023) 154185.

78. B. Shao, S. Tan, Y. Huang, L. Zhang, J. Shi, X.-Q. Yang, E. Hu, F. Han, Enabling Conversion-Type Iron Fluoride Cathode by Halide-Based Solid Electrolyte, *Advanced Functional Materials*, 32 (2022) 2206845.

77. Y. Huang, B. Shao, F. Han, Li Alloy Anodes for High-Rate and High-Areal-Capacity Solid-State Batteries, *Journal of Materials Chemistry A*, 10 (2022) 12350.

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73. R. Jain, Y. Yuan, Y. Singh, S. Basu, D. Wang, A. Yang, X. Wang, M. Rong, H. J. Lee, D. Frey, R. Khadka, P. Hundekar, S. O. Kim, F. Han, L.-W. Wang, D. Mitlin, R. Shahbazian-Yassar, N. Koratkar, Alloying of Alkali Metals with Tellurene, *Advanced Energy Materials*, 11 (2020) 2003248.

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65. S. Liu, X. Ji, J. Yue, S. Hou, P. F. Wang, C. Cui, J. Chen, B. Shao, J. Li, F. Han, J. Tu, C. Wang, High Interfacial-Energy Interphase Promoting Safe Lithium Metal Batteries, *Journal of the American Chemical Society*, 142 (2020) 2438.
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59. R. Xu, J. Yue, S. Liu, J. Tu, F. Han, P. Liu, C. Wang, Cathode-Supported All-Solid-State Lithium-Sulfur Batteries with High Cell-Level Energy Density, *ACS Energy Letters*, 4 (2019) 1073.
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21. Y. Zhu, Y. Wen, X. Fan, T. Gao, F. Han, C. Luo, S. Liou, C. Wang, Red Phosphorus-Single-Walled Carbon Nanotube Composite as a Superior Anode for Sodium Ion Batteries. *ACS Nano*, 9 (2015) 3254.
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18. J. Hu, M. Noked, E. Gillette, F. Han, Z. Gui, C. Wang, S. B. Lee, Dual-Template Synthesis of Ordered Mesoporous Carbon/Fe₂O₃ Nanowires: High Porosity and Structural Stability for Supercapacitor, *Journal of Materials Chemistry A*, 3 (2015), 21501.
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5. H. Zhu, N. Lun, Z. Zhang, R. Liu, X. Meng, B. Zhang, F. Han, Y. Bai, J. Bi, R. Fan, A Catalyst-Free Method to Silicon Nanowires at Relative Low Temperature, *Journal of Crystal Growth*, 312 (2010) 3579.
4. H. Zhu, F. Han, N. Lun, Y. Qi, Y. Bai, J. Bi, X. Meng, B. Zhang, Y. Wang, J. Liu, R. Fan, Rapid, Low-Temperature Synthesis of β -SiC Nanowires from Si and Graphite, *Journal of the American Ceramic Society*, 93 (2010), 2415.
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2. H. Zhu, F. Han, J. Bi, Y. Bai, Y. Qi, L. Pang, C. Wang, S. Li, C. Lu, Facile Synthesis of Si₃N₄ Nanocrystals via an Organic-Inorganic Reaction Route, *Journal of the American Ceramic Society*, 92 (2009) 535.
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Presentations

29. F. Han, “Enabling Iron Fluoride Cathodes by Solid Electrolytes”, 2025 MRS Fall Meeting, Boston, MA, 12/02/2025.
28. F. Han, “Materials Design for Next-Generation Solid-State and Sodium Ion Batteries”, Syracuse University, Syracuse, NY, 11/14/2025.
27. F. Han, “Development of Electrolyte and Electrode Materials for Solid State Batteries”, Materials Science & Technology 2025, Columbus, Ohio, 09/29/2025.
26. F. Han, “Understanding Calendaring Decay of Bulk-Type Solid-State Batteries”, Electronic Materials and Applications 2025, Denver, Colorado, 02/28/2025.
25. F. Han, “Solidifying Batteries for Safe and Reliable Energy Storage”, 2024 MRS Fall Meeting, Boston, MA, 12/04/2024.
24. F. Han, “Understanding (Electro)chemical Stability and Electronic transport of Solid Electrolytes for Solid-State Battery Development”, *International Battery Material Association Conference (IBA 2024)*, Halifax, Canada, 09/09/2024.
23. F. Han, Developing Low Cost and High Energy Density Solid-State Batteries, *2024 Solid State Battery Summit*, Chicago, IL, 08/13/2024.
22. F. Han, Electronic Transport in Lithium Solid Electrolytes, *The American Ceramic Society Electronic Materials and Applications (EMA-2024)*, Denver, CO, 02/15/2024.

21. F. Han, Ceramic Electrolytes for Solid-State Batteries: Fundamental Challenges and Design Strategies, *2023 NSF Professional Development Workshop in Ceramics*, Boston, MA, 11/26/2023.
20. F. Han, Lithium Thiophosphate Glass and Glass-Ceramic Electrolytes for Safe, Energy-Dense Batteries, *10th International Conference on Borate Glasses, Crystals, and Melts* and *3rd International Conference on Phosphate Materials*, Corning, NY, 07/17/2023 - 07/21/2023.
19. F. Han, Solidifying Batteries for Safe Energy Storage, *3M Tech Forum of Automotive Electrification*, 3M, 11/08/2022.
18. F. Han, Electronic Transport in Lithium Solid Electrolytes, *23rd International Conference on Solid State Ionics*, Boston, US, 07/20/2022.
17. F. Han, Electronic Conduction Induced Dendrite Formation in Solid Electrolytes, *23rd International Conference on Solid State Ionics*, Boston, US, 07/19/2022.
16. F. Han, Solidifying Batteries for Safe Energy Storage, *Department of Physics & Atmospheric Science, Dalhousie University*, Halifax, Canada, 01/13/2022.
15. F. Han, Mechanistic Understanding of Dendrite Formation in Solid Electrolytes, *2021 MRS Fall Meeting*, Boston, 12/01/2021
14. F. Han, “All-Solid-State Battery”, *Department of Physics, Applied Physics & Astronomy Colloquium, Rensselaer Polytechnic Institute*, 10/28/2020
13. F. Han, Solid Electrolyte for Safe and Energy-Dense Batteries, *Department of Mechanical and Aerospace Engineering, Syracuse University*, Syracuse, NY, Oct. 23, 2020.
12. F. Han, T. Yi, R. G. Downing, R. Briber, C. Wang, H. Wang, Visualization and Quantification of Spatial Distribution of Dendrites in Polymer Electrolytes for Lithium Metal Batteries, *ACNS 2020*, Virtual, Jul. 13–Jul. 16, 2020.
11. F. Han, “Solidifying Batteries for Safe Energy Storage”, *Department of Materials Science and Engineering, Rensselaer Polytechnic Institute*, 02/05/2020
10. F. Han, “On the Route to Solid State Batteries”, *Department of Mechanical, Aerospace and Nuclear Engineering, Rensselaer Polytechnic Institute*, 11/20/2019
9. F. Han, T. Yi, R. G. Downing, R. Briber, C. Wang, H. Wang, Structure of Lithium Dendrites in Polymer Electrolytes, *2019 APS March Meeting*, Boston, MA, Mar. 4–Mar. 8, 2019.
8. F. Han, Revisiting the Electrochemical Stability of Solid Electrolytes for Safe Energy Storage, *Department of Chemical Engineering, University of California Davis, Davis, CA*, Jan. 24, 2019.
7. F. Han, All-Solid-State Batteries for Next-Generation Electrochemical Energy Storage, *2018 AIChE Annual Meeting*, Pittsburgh, PA, Oct. 28–Nov. 2, 2018.

6. F. Han, Revisiting the Electrochemical Stability Window of Solid Electrolytes, *2018 AiMES Meeting*, Cancun, Mexico, Sep. 30–Oct. 4, 2018.
5. F. Han, J. Yue, X. Zhu, C. Wang, Lithium Dendrite Suppression in Solid Electrolytes, *2017 MRS Fall Meeting & Exhibit*, Boston, MA, Nov. 26–Dec. 1, 2017.
4. F. Han, J. Yue, C. Wang, Improved Cathode/Electrolyte Interfaces in All-Solid-State Batteries, *2017 MRS Fall Meeting & Exhibit*, Boston, MA, Nov. 26–Dec. 1, 2017.
3. F. Han, J. Yue, X. Fan, Z. Ma, T. Gao, C. Wang, Cathode/Electrolyte Interface: Revisiting the Electrochemical Stability of Solid Electrolytes, *2017 MRS Spring Meeting & Exhibit*, Phoenix, AZ, Apr. 17-21, 2017.
2. F. Han, T. Gao, Y. Zhu, J. Yue, Y. Zhu, Y. Mo and C. Wang, Electrochemical Stability of $\text{Li}_{10}\text{GeP}_2\text{S}_{12}$ and $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$ Solid Electrolytes, *18th International Meeting on Lithium Batteries*, Chicago, IL, Jun. 19-24, 2016.
1. F. Han, T. Gao, Y. Zhu, K. J. Gaskell, and C. Wang, A Battery Made from a Single Material, *20th International Conference on Solid State Ionics*, Keystone, CO, Jun. 14-19, 2015.

Patents and Patent Applications

1. C. Wang, F. Han, Battery Made from a Single Material, US 2017/0317382 A1.

Work as Reviewer of other works

I have reviewed >100 papers in a number of journals, including *Nature Energy*, *Nature Materials*, *Nature Communications*, *Nature Sustainability*, *Chemical Reviews*, *Materials Today*, *Advanced Materials*, *Advanced Energy Materials*, *Nano Energy*, *Energy Storage Materials*, *Chemistry of Materials*, *Journal of Power Sources*, *ACS Applied Materials & Interfaces*, *ACS Applied Energy Materials*, *Carbon*, *Chemical Engineering Journal*, *Journal of Materials Chemistry A*, *Nanotechnology*, *Vacuum*, *Ionics*, *Journal of Nanoparticle Research*, *Journal of Physics D Applied Physics*, *Materials Research Express*, *Journal of Crystal Growth*, *Ceramics International*, *Electrochimica Acta*, and *Energy & Environmental Materials*.

Editorial Boards

Electrochem (ISSN 0008-0008)

Batteries (ISSN 2313-0105)

Professional Society Committee

3. Materials Research Society Award Committee, Member, 01/2026 to present

2. Materials Research Society Early Career Professional Subcommittee, Member, 2/2022 to present

1. Electrochemical Society Electrodeposition Division Early Career Forum Organizing Committee, Member, 9/2022 to present

Conference Organization

4. Organizer of the “Electronic and Ionic Materials for Energy Storage and Conversion System” symposium of the American Ceramic Society Electronic Materials and Applications 2025: at Denver Colorado, 02/25/2025 to 02/28/2025.

3. Organizer of the “Solid State Batteries – Materials, Interfaces, and Cell Integration” symposium of the 2024 American Chemical Society Spring meeting at New Orleans, 03/17/2024 to 03/21/2024.

2. Organizer of the “Energy Storage Beyond Li-ion Batteries” symposium of the 2022 American Chemical Society Fall meeting at Chicago, 08/21/2022 to 08/25/2022.

1. Lead Organizer of the “Solid State Batteries: Electrodes, Electrolytes, and Interphases” Symposium of the 2021 Materials Research Society Fall Meeting at Boston, MA, 11/29/2021 to 12/02/2021.

Institutional Administrative Responsibilities

1. Secretary of Faculty, Rensselaer Polytechnic Institute, 9/2023 to present

2. Secretary of Faculty Senate, Rensselaer Polytechnic Institute, 9/2022 to 8/2023

3. Faculty Senate Recording Secretary, Rensselaer Polytechnic Institute, 9/2021 to 8/2022

4. MANE Doctoral Qualifying Exam Committee for Solid Mechanics, 9/2019 to present

5. MANE Doctoral Qualifying Exam Committee Heat Transfer/Thermodynamics, 9/2019 to present

6. MANE Technical Committee for Thermal & Fluids, 1/2024 to present

7. MANE Technical Committee for Mechanics, 1/2024 to present

Professional Memberships

1) Electrochemical Society

- 2) Materials Research Society
- 3) International Society of Electrochemistry
- 4) American Chemistry Society
- 5) American Institute of Chemical Engineers
- 6) American Society of Mechanical Engineers
- 7) American Physics Society
- 8) The Minerals, Metals & Materials Society