Hongchang Hao

Male I China I March 22, 1995

Postdoctoral Scholar at SLAC-Stanford Battery Center

(Supervisors: Jagjit Nanda, Xueli Zheng)

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EDUCATION

08/2019 – 05/2024 **Doctor of Philosophy**: Clean Energy

The University of Texas at Austin (UT-Austin) I Texas Materials Institute I Austin, Texas, United States

07/2016 – 07/2019 **Master of Science**: Materials Chemistry and Physics

University of Chinese Academy of Sciences (UCAS) I Shanghai Institute of Ceramics I Shanghai, China

09/2012 – 07/2016 **Bachelor of Engineering**: Functional Materials

Tianjin University (TJU) I School of Materials Science and Engineering I Tianjin, China

LEADING RESEARCH PROJECTS

09/2019 – 05/2024 **Tuned Reaction Kinetics at Electrode-Electrolyte Interphases for Stable Alkali Metal Batteries**

- Fabricated molybdenum carbides electrocatalysts for promoting sulfur redox kinetics in **RT Na–S batteries**; *Publication [1]*.
- Tuned reactivity at Li–Li_6PS_5Cl solid-state electrolyte interphase in **all-solid-state lithium metal batteries**; *Publication [2]*.
- Tuned reaction heterogeneity & kinetics at Li–Li_6PS_5Cl interphase in **all-solid-state lithium metal batteries**; *Publication [3]*.
- Designed functional separators & **artificial SEI layers** for **alkali (Li, Na, and K) metal–sulfur batteries**; *Publications [4 & 5]*.
- Developing effective current collector for stable **anode-free lithium metal all-solid-state batteries**; Achieved an average CE of **99.0%** for 400 cycles, *to be continued at SLAC.*
- Designed a **polymer electrolyte** and **artificial SEI layer** for dendrite-free **potassium metal batteries**; *to be submitted.*

06/2017 – 07/2019 **Design of Efficient Photocatalysts for Hydrogen Production and Selective Organic Synthesis**

- Designed solar-driven system for simultaneous H_2 production and selective benzyl alcohol oxidation; *Publications [6 & 8]*.
- Modified titania with nickel sulfide and sulfate species for facilitating cellulose photoreformation; *Publications [7]*.

PUBLICATIONS (* CORRESPONDING AUTHOR)

1. **Hao, H.***, Wang, Y., Katyal, N., Yang, G., Dong, H., Liu, P., Hwang, S., Mantha, J., Mitlin. D.* *et al*., Molybdenum carbide electrocatalyst in-situ embedded in porous nitrogen–rich carbon nanotubes promotes rapid kinetics in sodium metal – sulfur batteries. ***Adv. Mater.***, 2022, 2106572. (**Back Cover**) link
2. **Hao, H.***, Liu, Y.*, Greene, S. M., Yang, G., Naik, K. G., Vishnugopi, B. S., Mitlin, D* *et al*., Tuned reactivity at the lithium metal – argyrodite solid state electrolyte interphase. ***Adv. Energy Mater.***, 2301338. link
3. Wang, Y.*, **Hao, H.***, Naik, K. G., Vishnugopi, B. S., Fincher, C. D., Yan, Q., Mitlin, D* *et al*., Mechanical milling – induced microstructure changes in argyrodite LPSCl solid-state electrolyte critically affect electrochemical stability. ***Adv. Energy Mater.***, 2304530. link
4. **Hao, H.***, Hutter, T., Boyce, B. L., Watt, J., Liu, P., Mitlin, D.*, Review of multifunctional separators: stabilizing the cathode

and the anode for alkali (Li, Na, and K) metal – sulfur and selenium batteries. ***Chem. Rev.***, 2022, 122, 8053. (**Front Cover**) link

5. Liu, P.*, **Hao, H.***, Singla, A., Vishnugopi, B. S., Watt, J., Mukherjee, P. P., Mitlin, D.*, Alumina - stabilized SEI and CEI in potassium metal batteries. ***Angew. Chem.***, 2024, e202402214. link
6. **Hao, H.**, Zhang, L.*, Wang, W.*, Qiao, S., Liu, X., Photocatalytic hydrogen evolution coupled with efficient selective benzaldehyde production from benzyl alcohol aqueous solution over ZnS-Ni_xS_y composites. ***ACS Sustain***. ***Chem. Eng.***, 2019 7, 10501. link
7. **Hao, H.**, Zhang, L.*, Wang, W.* Zeng, S., Facile modification of titania with nickel sulfide and sulfate species for the photoreformation of cellulose into hydrogen. ***ChemSusChem***, 2018, 11, 2810. link
8. **Hao, H.**, Zhang, L.*, Wang, W.* Zeng, S., Modification of heterogeneous photocatalysts for selective organic synthesis. ***Catal. Sci. Technol.***, 2018, 8, 1229. link
9. Liu, P.*, **Hao, H.**, Celio, H., Cui, J., Ren, M., Wang, Mitlin, D.*, *et al*., Multifunctional separator allows stable cycling of potassium metal anodes and of potassium metal batteries. ***Adv. Mater.***, 2022, 2105855. (**Back Cover**) link
10. Wang, Y.*, **Hao, H**., Hwang, S., Liu, P., Xu, Y., Boscoboinik, J.A., Datta, D., Mitlin, D.*, Selenium infiltrated hierarchical hollow carbon spheres display rapid kinetics and extended cycling as lithium metal battery (LMB) cathodes. ***J. Mater. Chem. A***, 2021, 9, 18582. link
11. Liu, P.*, Wang, Y., **Hao, H.**, Basu, S., Feng, X., Xu, Y., Boscoboinik, J.A., Nanda, J., Watt, J., Mitlin, D.*, Stable potassium metal anodes with an all–aluminum current collector through improved electrolyte wetting. ***Adv. Mater.***, 2020, 2002908. link
12. Xiao, C., Zhang, L.*, **Hao, H.**, Wang, W.*, High selective oxidation of benzyl alcohol to benzylaldehyde and benzoic acid with surface oxygen vacancies on $W_{18}O_{49}$/holey ultrathin g–C_3N_4 nanosheets. ***ACS Sustain***. ***Chem. Eng.***, 2019, 7, 7268. link
13. Wang, Y., Dong, H.*, Katyal, N., **Hao, H.**, Liu, P., Celio, H., Mitlin, D.*, *et al*., A Sodium–antimony–telluride intermetallic allows sodium–metal cycling at 100% depth of discharge and as an anode–free metal Battery. ***Adv. Mater.***, 2022, 2106005. (**Front Cover**) link
14. Tao, L., Yang, Y., Wang, H.*, Zheng, Y., **Hao, H.**, Song, W., Shi, J., Huang, M., Mitlin, D.*, Sulfur-nitrogen rich carbon as stable high capacity potassium ion battery anode: Performance and storage mechanisms. ***Energy Stor. Mater.***, 2020, 27 212. link
15. Wang, Y., Liu, Y.*, Nguyen, M., Cho, J., Katyal, N., **Hao, H.**, Mitlin, D.*, *et al*., Stable anode–free all–solid–state lithium battery through tuned metal wetting on the copper current collector. ***Adv. Mater.*** link
16. Wang, Y.*, Dong, H., Katyal, N., Vishnugopi, B. S., Singh, M. K., **Hao, H.**, Liu, Y., Liu, P., Mitlin, D.*, *et al*., Intermetallics based on sodium chalcogenides promote stable electrodeposition–electrodissolution of sodium metal anodes. ***Adv. Energy Mater.***, 2023, 22204402. link

(*More publications are listed in Google Scholar page;* ***Accumulated citations: 1121***

TECHNICAL SKILLS

- **Experimental Experiences:** Nanomaterials synthesis (hydro-thermal method, photodeposition, thermal polymerization, microwave method), **film fabrication (spin coating, polymer synthesis)**, catalyst design for chemical reactions (Li−S, Na−S, K−S reactions, H_2/NH_3/NH_4^+ production, benzyl alcohol selective oxidation), battery assembling and testing (liquid- & solid-state batteries), and so forth.
- **Scientific Instruments: Cryo−stage focused ion beam electron microscopy (Cryo−FIB EM)**, **XAS,** TGA, BET, X-ray

powder diffraction, BioLogic, UV−vis diffuse-reflectance spectrometer, Fluorescence spectrophotometer, Gas chromatography, High-performance liquid chromatography (HPLC), Raman spectrometer, Optical microscopy.

AWARDS/HONORS

- **University Graduate Continuing Fellowship (Top 2%), UT-Austin, academic year of 2023-2024**;
- Professional Development Award, UT-Austin, academic year of 2023-2024;
- **National Scholarship for Graduate Students (Top 2%), UCAS, academic year of 2018-2019**;
- Outstanding Graduate of UCAS, UCAS, academic year of 2018-2019;
- Outstanding Graduate of Beijing, UCAS, academic year of 2018-2019;
- Award for First Class Scholarship for Master Student, UCAS, academic year of 2017-2018;
- National Encouragement Scholarship (Top 5%, twice), TJU, academic years of 2013-2015
- SHKP-Kwoks' Foundation Scholarship, TJU, academic years of 2012-2016
- Award for Excellent Student, UCAS, academic year of 2017-2018;
- Award for Excellent Student, TJU, academic years of 2012-2015 (Thrice);
- Award for Advanced individuals in Scientific and Technological Innovation, TJU, academic year of 2014-2015
- Award for Advanced individuals in Self-motivation, TJU, academic year of 2012-2013

ACADEMIC REFEREES

- David Mitlin, Professor (Ph. D Supervisor)
  The University of Texas at Austin, Materials Science and Engineering Program & Texas Materials Institute (TMI), U.S.
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- Jagjit Nanda, Professor (Postdoctoral Supervisor & Ph.D. Committee Member)
  Stanford University, SLAC National Accelerator Laboratory & Department of Materials Science and Engineering, U.S.
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- John Watt, Staff Scientist (Collaborator)
  Los Alamos National Laboratory, Center for Integrated Nanotechnologies, U.S.
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- Guang Yang, R&D Staff (Collaborator)
  Oak Ridge National Laboratory, Chemical Sciences Division, U.S.
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- Wenzhong Wang, Professor (Master Supervisor)
  University of Chinese Academy of Sciences, Shanghai Institute of Ceramics, China
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