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EDUCATION

- 2022-present Materials Science and Engineering, Postdoctoral Fellow, University of California, Los Angeles
- 2017-2021 Materials Science and Engineering, Ph.D., University of California, Los Angeles
- 2015-2017 Materials Science and Engineering, M.S., Carnegie Mellon University
- 2011-2015 Materials Physics, B.S., Nanjing University

RESEARCH FIELDS

- Perovskite Solar Cells and Organic Electronics
- Indium-Gallium-Zinc Oxide Thin Film Transistors (IGZO TFTs)
- Electric Double-Layer Capacitors (EDLC)

RESEARCH PROJECTS

12/2019-present

- **Project Leader**, “Smart Greenhouse”: Integrated Photovoltaics/Photosynthesis for Energy and Food
Sponsored by California Energy Commission (CEC), USA

- Anti-oxidizing interlayer for highly stable semitransparent organic photovoltaics (OPVs)
- Transparent electrodes with low contact resistance for semitransparent OPVs
- Conjugated small-molecular additives to prevent phase separation the OPV active layers

04/2019-06/2021

- **Project Leader**, Development of Highly Efficient and Stable Perovskite Solar Cells for Unmanned Aerial Vehicles

Sponsored by Office of Naval Research (ONR), USA

- Polymerization-assisted grain growth strategy for stable perovskite solar cells
- Hole transport materials for perovskite solar cells with high thermal stability
- Hermetic encapsulation via improved plasma enhanced atomic layer deposition

09/2019-present

- **Main Investigator**, Investigation of Defect Physics for Efficient, Durable and Ubiquitous Perovskite Solar Modules

Sponsored by Department of Energy (DOE), USA

- Investigation of surface states of photovoltaic perovskite thin film for key parameters of high-performance perovskite photovoltaics
- Reconfiguration of the band-edge states of photovoltaic perovskites by conjugated organic cations

05/2019-05/2021

- **Main Investigator**, Higher-Performance Flexible Organic Photovoltaics Based on Polymer Donor/Non-Fullerene Acceptor/Two-Dimensional Nanosheets

Sponsored by Air Force Office of Scientific Research (AFOSR), USA

- Robust noncovalent $\pi \cdots \pi$ interaction-stacked organic framework for high-efficient OPV devices
- High-performance OPV tandem device with balanced light distribution

05/2018-09/2019

- **Main Investigator**, Interface Engineering and Structural Design for High-performance and Metal-oxide Stability Thin-film Transistors (TFTs)

Sponsored by Hangzhou MOTech, Inc, China

- Acid modification strategy to minimize the contact resistance of IGZO TFTs
- Multilayered IGZO TFTs with high mobility and operational stability

01/2016-05/2017

- **Main Investigator**, Mechanics of Three-Dimensional Carbon Nanotube Aerogels with Tunable Junctions

Sponsored by National Science Foundation (NSF), USA

- Superelastic pseudocapacitors with graphene-coated carbon nanotube aerogels
- ZnO/carbon hybrids from polymer nanocomposite precursor materials

EXPERIENCE AND HONOR

- **UCLA Materials Science and Engineering Outstanding Ph.D. Award 2021-2022**, 06/2022
- **Gordon Research Conference Poster Award**, 06/2022
- **Research Scholar, Molecular Foundry, Lawrence Berkeley National Laboratory**, 05/2021- present
- **Summer Mentored Research Fellowship**, UCLA, USA, 05/2021
- Invited Reviewer of *Journal of American Chemistry Society*, *Advanced Functional Materials*, *Advanced Optical Materials*, *ACS Applied Materials and Interfaces*, *Journal of Electronic Materials*, *Tetrahedron Letters*, 05/2020-present
- **Guest Lecturer**, Department of Materials Science and Engineering, UCLA, 10/2021-12/2021
- **Teaching Associate**, Department of Materials Science and Engineering/Department of Chemical Engineering/ Department of Chemistry and Biochemistry/ Department of Mechanical Engineering, UCLA, 12/2017- 12/2021
- Member of **American Chemistry Society**, **Materials Research Society**, **The Electrochemistry**

Society, 05/2017-present

- **Conference Speaker, ECS Meeting**, Delignification Enhances Capacitance of Wood-Derived Electrodes, 05/2017
- **People's Scholarship**, Ministry of Education, People's Republic of China, 11/2014

PUBLICATIONS

1. **Y. Zhao**, I. Yavuz, M. Wang, M. Weber, J.-H. Lee, S. Tan, T. Huang, D. Meng, R. Wang, J. Xue, Sung-Joon Lee, S.-H. Bae, A. Zhang, T.-H. Han, Y. Zhou, J. Bian, N.-G. Park, J.-W. Lee, Y. Yang, Suppressing Ion Migration in Metal Halide Perovskites via Trace of Multivalent Interstitial Doping, *Nat. Mater.* 21, 1396–1402 (2022).
2. **Y. Zhao**, C. Deger, M. Wang, Z. Li, M. Peric, Y. Yin, D. Meng, W. Yang, X. Wang, Q. Xing, Y. Zhou, E. Zhang, R. Zheng, J. Bian, Y. Shi, I. Yavuz, K. Houk, Y. Yang, Reductive interlayer for high-efficiency and stable photovoltaics/photosynthesis integration, *Nat. Sustain.* accepted.
3. **Y. Zhao**, P. Cheng, H. Yang, M. Wang, D. Meng, Y. Zhu, R. Zheng, T. Li, A. Zhang, S. Tan, T. Huang, J. Bian, X. Zhan, Y. Yang, Towards High-Performance Semitransparent Organic Photovoltaics: Dual-Functional p-Type Soft Interlayer, *ACS Nano* 16, 1, 1231–1238 (2021).
4. **Y. Zhao**, Y. Zhu, H.-Wen Cheng, R. Zheng, D. Meng, Y. Yang, A review on semitransparent solar cells for agricultural application, *Mater. Today Energy* 22: 100852 (2021).
5. **Y. Zhao**, P. Zhu, S. Huang, S. Tan, M. Wang, R. Wang, J. Xue, T.-H. Han, S.-J. Lee, A. Zhang, T. Huang, P. Cheng, D. Meng, J.-W. Lee, J. Marian, Y. Yang, Molecular Interaction Regulates the Performance and Longevity of Defect Passivation for Metal Halide Perovskite Solar Cells. *J. Am. Chem. Soc.* 142(47), 20071-20079 (2020).
6. **Y. Zhao**, Z. Wang, Dr. G. Xu, L. Cai, T-H Han, A. Zhang, Q. Wu, R. Wang, T. Huang, P. Cheng, S.-Y. Chang, D. Bao, Z. Zhao, M. Wang, Y. Huang, Y. Yang, High Performance Indium-Gallium-Zinc Oxide Thin Film Transistor via Interface Engineering. *Adv. Funct. Mater.* 30(34): 2003285 (2020).
7. **Y. Zhao**, P. Zhu, M. Wang, S. Huang, Z. Zhao, S. Tan, T. Han, J. Lee, T. Huang, R. Wang, J. Xue, D. Meng, Y. Huang, J. Marian, J. Zhu, Y. Yang, A polymerization-assisted grain growth strategy for efficient and stable perovskite solar cells. *Adv. Mater.* 32, 1907769 (2020).
8. **Y. Zhao**, Z. Wang, R. Yuan, Y. Lin, J. Yan, J. Zhang, Z. Lu, D. Luo, J. Pietrasik, M. R. Bockstaller, K. Matyjaszewski, ZnO/carbon hybrids derived from polymer nanocomposite precursor materials for pseudocapacitor electrodes with high cycling stability. *Polymer* 137, 370-377 (2018).
9. **Y. Zhao**, M. P. Li, S. Liu, M. F. Islam, Superelastic pseudocapacitors from freestanding graphene-coated carbon nanotube aerogels. *ACS Appl. Mater. Interfaces* 9, 23810-23819 (2017).
10. D. Meng, J. Xue, **Y. Zhao** (co-first author), E. Zhang, R. Zheng, Y. Yang, Configurable Organic Charge

Carriers toward Stable Perovskite Photovoltaics, *Chem. Rev.* 122, 18, 14954–14986 (2022).

11. M. Wang, **Y. Zhao** (co-first author), X. Jiang, Y. Yin, I. Yavuz, P. Zhu, A. Zhang, G. S. Han, H. S. Jung, Y. Zhou, W. Yang, J. Bian, S. Jin, J.-W. Lee, Y. Yang, Rational selection of the polymeric structure for interface engineering of perovskite solar cells, *Joule* 6(5): 1032-1048 (2022).
12. T.-H. Han, **Y. Zhao** (co-first author), J. Yoon, J. Y. Woo, E.-H. Cho, W. D. Kim, C. Lee, J.-W. Lee, J.-M. Choi, J. Han, J.-S. Nam, K. Wang, S. Priya, M. Balaban, I. Jeon, Y. Yang, *Adv. Funct. Mater.* 32, 2207142 (2022).
13. D. Meng, R. Zheng, **Y. Zhao** (co-first author), E. Zhang, L. Dou, Y. Yang, Near - infrared Materials: The Turning Point of Organic Photovoltaics, *Adv. Mater.* 2107330 (2021).
14. R. Wang, J. Xue, **Y. Zhao** (co-first author), R. Zheng, Y. Yang, Tailored Key Parameters of Perovskite for High-Performance Photovoltaics, *Acc. Mater. Res.*, 2, 6, 447–457 (2021).
15. H. Wang, **Y. Zhao** (co-first author), Z. Wang, Y. Liu, Z. Zhao, G. Xu, T. Han, J. Lee, C. Chen, D. Bao, Y. Huang, Y. Duan, Y. Yang, Hermetic seal for perovskite solar cells: An improved plasma enhanced atomic layer deposition encapsulation. *Nano Energy* 69, 104375 (2020).
16. S. Tan, T. H., I. Yavuz, R. Wang, T. W. Yoon, M. Xu, Q. Xing, K. Park, D.-K. Lee, C.-H. Chen, R. Zheng, T. Yoon, **Y. Zhao**, H.-C. Wang, D. Meng, J. Xue, Y. J. Song, X. Pan, N.-G. Park, J.-W. Lee, Y. Yang, Stability-limiting heterointerfaces of perovskite photovoltaics, *Nature* 605(7909): 268-273 (2022).
17. J. Xue, R. Wang, X. Chen, C. Yao, X. Jin, K.-L. Wang, W. Huang, T. Huang, **Y. Zhao**, Y. Zhai, D. Meng, S. Tan, R. Liu, Z.-K. Wang, C. Zhu, K. Zhu, M. C. Beard, Y. Yan, Y. Yang, Reconfiguring the band-edge states of photovoltaic perovskites by conjugated organic cations. *Science* 371.6529, 636-640 (2021).
18. R. Wang, J. Xue, X. Chen, C. Yao, Z.-K. Wang, M. H. Weber, A. H. Rose, S. Nuryyeva, J. Zhu, T. Huang, **Y. Zhao**, S. Tan, M. C. Beard, Y. Yan, K. Zhu, Y. Yang, Unraveling the surface state of photovoltaic perovskite thin film, *Matter* 4, 7, 2417-2428 (2021).
19. S. Tan, T. Huang, I. Yavuz, R. Wang, M. H. Weber, **Y. Zhao**, M. Abdelsamie, M. E Liao, H.-C. Wang, K. Huynh, K.-H. Wei, J. Xue, F. Babbe, M. S. Goorsky, J.-W. Lee, C. M. Sutter-Fella, Y. Yang, Surface Reconstruction of Halide Perovskites During Post-treatment, *J. Am. Chem. Soc.* 143, 18, 6781–6786 (2021).
20. T. Huang, R. Wang, S. Nuryyeva, S. Tan, J. Xue, **Y. Zhao**, Q. Wu, M. H. Weber, P. Cheng, D. Meng, I. Yavuz, K. N. Houk, Y. Yang, Wide-Gap Perovskite via Synergetic Surface Passivation and Its Application toward Efficient Stacked Tandem Photovoltaics, *Small* 2103887 (2022).
21. D. Meng, R. Wang, J. B. Lin, J. L. Yang, S. Nuryyeva, Y.- C. Lin, S. Yuan, Z.-K. Wang, E. Zhang, C. Xiao, D. Zhu, L. Jiang, **Y. Zhao**, Z. Li, C. Zhu, K. N. Houk, Y. Yang, Chlorinated Spiroconjugated

- Fused Extended Aromatics for Multifunctional Organic Electronics, *Adv. Mater.* 33.12: 2006120 (2021).
22. M. Wang, S. Tan, **Y. Zhao**, P. Zhu, Y. Yin, Y. Feng, T. Huang, J. Xue, R. Wang, G. S. Han, H. S. Jung, J. Bian, J.-W. Lee, Y. Yang, Stable and Efficient Methylammonium-, Cesium-, and Bromide-Free Perovskite Solar Cells by In - Situ Interlayer Formation, *Adv. Funct. Mater.* 31.7:2007520 (2021).
 23. T. Huang, S. Tan, S. Nuryyeva, I. Yavuz, F. Babbe, **Y. Zhao**, M. Abdelsamie, M. H. Weber, R. Wang, K. N. Houk, C. M. Sutter-Fella, Y. Yang, Performance-limiting formation dynamics in mixed-halide perovskites, *Sci. Adv.* 7(46): eabj1799 (2021).
 24. Z. Li, S. Zhang, Y. Chen, H. Ling, L. Zhao, G. Luo, X. Wang, M. C. Hartel, H. Liu, Y. Xue, R. Haghniaz, K. Lee, W. Sun, H. Kim, J. Lee, Y. Zhao, **Y. Zhao**, S. Emaminejad, S. Ahadian, N. Ashammakhi, M. R. Dokmeci, Z. Jiang, A. Khademhosseini, Gelatin Methacryloyl-Based Tactile Sensors for Medical Wearables, *Adv. Funct. Mater.* 30(49): 2070326 (2021).
 25. H.-W. Cheng, **Y. Zhao**, Yang Yang, Toward High-Performance Semitransparent Organic Photovoltaics with Narrow-Bandgap Donors and Non-Fullerene Acceptors, *Adv. Ener. Mater.* 2102908 (2021).
 26. S. Tan, I. Yavuz, M. H. Weber, T. Huang, C.-H. Chen, R. Wang, H.-C. Wang, J. H. Ko, S. Nuryyeva, J. Xue, **Y. Zhao**, K.-H. Wei, J.-W. Lee, Y. Yang, Shallow iodine defects accelerate the degradation of α -phase formamidinium perovskite, *Joule*, 4(11): 2426-2442 (2020).
 27. P. Cheng, H.-C. Wang, Y. Zhu, R. Zheng, T. Li, C.-H. Chen, T. Huang, **Y. Zhao**, R. Wang, D. Meng, Y. Li, C. Zhu, K.-H. Wei, X. Zhan, Y. Yang, Transparent Hole - Transporting Frameworks: A Unique Strategy to Design High - Performance Semitransparent Organic Photovoltaics, *Adv. Mater.* 32(39): 2003891 (2020).
 28. P. Cheng, H.-C. Wang, R. Zheng, Y. Zhu, S. Dai, Z. Li, C.-H. Chen, **Y. Zhao**, R. Wang, D. Meng, C. Zhu, K.-H. Wei, X. Zhan, Y. Yang, Enabling High-Performance Tandem Organic Photovoltaic Cells by Balancing the Front and Rear Subcells, *Adv. Mater.* 32(38): 2002315 (2020).
 29. C. Chen, T.-H. Han, S. Tan, J. Xue, **Y. Zhao**, Y. Liu, H. Wang, W. Hu, C. Bao, M. Mazzeo, R. Wang, Y. Duan, Y. Yang, Efficient Flexible Inorganic Perovskite Light-Emitting Diodes Fabricated with CsPbBr₃ Emitters Prepared via Low-Temperature in Situ Dynamic Thermal Crystallization, *Nano Lett.* 20, 6, 4673–4680 (2020).
 30. S. Tan, I. Yavuz, N. D. Marco, T. Huang, S.-J. Lee, C. S. Choi, M. Wang, S. Nuryyeva, R. Wang, **Y. Zhao**, H.-C. Wang, T.-H. Han, B. Dunn, Y. Huang, J.-W. Lee, Y. Yang, Steric impediment of ion migration contributes to improved operational stability of perovskite solar cells, *Adv. Mater.* 2(11): 1906995 (2020).
 31. T. Han, J. Lee, Y. J. Choi, C. Choi, S. Tan, S. Lee, **Y. Zhao**, Y. Huang, D. Kim, Y. Yang, Surface-2D/Bulk-3D Heterophased Perovskite Nanograins for Long-Term-Stable Light-Emitting Diodes. *Adv.*

- Mater.* 32, 1905674 (2020).
32. R. Wang, J. Xue, K. Wang, Z. Wang, Y. Luo, D. Fenning, G. Xu, S. Nuryyeva, T. Huang, **Y. Zhao**, J. L. Yang, J. Zhu, M. Wang, S. Tan, I. Yavuz, K. N. Houk, Y. Yang, Constructive molecular configurations for surface-defect passivation of perovskite photovoltaics. *Science* 366, 1509-1513 (2019).
 33. Z. Wang, G. Xu, Z. Zhao, L. Cai, Q. Wu, P. Cheng, **Y. Zhao**, J. Xue, R. Wang, C. Liu, Y. Yang, Cluster Size Control toward High Performance Solution Processed InGaZnO Thin Film Transistors, *ACS Appl. Electron. Mater.* 1, 12, 2483–2488 (2019).
 34. G. Xu, L. Cai, Z. Wang, Q. Wu, C. Lu, Z. Zhao, **Y. Zhao**, D. Geng, L. Li, M. Liu, Y. Yang, Field-Dependent Mobility Enhancement and Contact Resistance in a-IGZO TFTs. *IEEE Trans. Electron Devices* 66, 5166-5169 (2019).
 35. Z. Li, R. Wang, J. Xue, X. Xing, C. Yu, T. Huang, J. Chu, K. Wang, C. Dong, Z. Wei, **Y. Zhao**, Z.-K. Wang, Y. Yang, Core–Shell ZnO@ SnO₂ Nanoparticles for Efficient Inorganic Perovskite Solar Cells. *J. Am. Chem. Soc.* 141, 17610-17616 (2019).
 36. T. Han, J. Lee, C. Choi, S. Tan, C. Lee, **Y. Zhao**, Z. Dai, N. D. Marco, S. Lee, S. Bae, Y. Yuan, H. M. Lee, Y. Huang, Y. Yang, Perovskite-polymer composite cross-linker approach for highly-stable and efficient perovskite solar cells. *Nat. Commun.* 10, 1-10 (2019).
 37. J. Zhang, Y. Song, **Y. Zhao**, S. Zhao, J. Yan, J. Lee, Z. Wang, S. Liu, R. Yuan, D. Luo, M. Kopeck, E. Gottlieb, T. Kowalewski, K. Matyjaszewski, M. R. Bockstaller, Organosilica with grafted polyacrylonitrile brushes for high surface area nitrogen-enriched nanoporous carbons, *Chem. Mater.*, 30, 7, 2208–2212 (2018).
 38. J. Zhang, R. Yuan, S. Natesakhawat, Z. Wang, **Y. Zhao**, J. Yan, S. Liu, J. Lee, D. Luo, E. Gottlieb, T. Kowalewski, M. R. Bockstaller, K. Matyjaszewski, Individual nanoporous carbon spheres with high nitrogen content from polyacrylonitrile nanoparticles with sacrificial protective layers, *ACS Appl. Mater. Interfaces* 9, 43, 37804–37812 (2017).
 39. Z. Wang, S. Liu, J. Zhang, J. Yan, **Y. Zhao**, C. Mahoney, R. Ferebee, D. Luo, J. Pietrasik, M. R. Bockstaller, K. Matyjaszewski, Photocatalytic active mesoporous carbon/ZnO hybrid materials from block copolymer tethered ZnO nanocrystals, *Langmuir* 33, 43, 12276–12284 (2017).

PATENT

1. Y. Yang, L. Cal, G. Xu, Z. Wang, **Y. Zhao**, J. Yang, Oxide semiconductor thin films with content gradient, *US Patent*, US20200303555A1 (2020).

REFERENCES

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