

# Huan BI (1994-11)

Graduated School: The University of Electro-Communications (Japan)

Major: Photo Physics

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## EDUCATION

2013.09~2017.06	<i>Lyliang University</i>	material chemistry
2017.09~2020.06	<i>Changchun University of Technology</i>	Materials science
2020.07~2021.06	<i>Chongqing University</i>	Optoelectronic Engineering
2021.07~2022.05	<i>Shanxi University</i>	Institute of Molecular Sciences (joint training)
2021.10~	<i>The University of Electro-Communications</i>	Photo Physics

## PROFESSIONAL EXPERIENCE

**Research direction (Ph.D.): Preparation of high-efficiency tin-based (narrow and wide bandgap) and lead-based single-junction perovskite solar cells; Preparation of high-efficiency all-perovskite non-toxic tandem perovskite solar cells.**

### 2021.10~2022.05 Preparation of high-efficiency single junction lead-based perovskite solar cells

- ✧ I was the **leading project participant** in collaboration with **Professor Gaoyi Han at the Institute of Molecular Science**, Shanxi University, focusing on advanced research in commercially viable single-junction perovskite solar cells. Our research encompassed the synthesis of perovskite materials, the development of novel functional layers, and interface control. Ultimately, we achieved a photovoltaic conversion efficiency exceeding 23% in single-junction perovskite solar cells.

### 2022.05~2022.12 Preparation of High-Efficiency Tin/Germanium-Based Perovskite Solar Cells

- ✧ I was the **leading project participant**, primarily focusing on preparing tin/germanium-based perovskite thin films with extended charge carrier lifetimes and low defect densities. This involved solvent modulation strategies, additive strategies, and subsequent fabrication of corresponding solar cell devices. Ultimately, we achieved a remarkable solar cell efficiency exceeding 2%, **marking a significant milestone as the first high-germanium content perovskite solar cell fabricated via solution processing.**

### 2022.05~2023.08 Preparation of High-Efficiency All-Perovskite Tandem Solar Cells & High-Efficiency Wide-Bandgap Perovskite

- ✧ I served as the **leading project participant**, primarily focusing on preparing high-performance all-perovskite tandem solar devices. My responsibilities included meticulous interface engineering, precise composition control, etc. Our efforts culminated in achieving all-perovskite tandem solar devices with an exceptional photovoltaic efficiency exceeding 27%.

### 2023.05~2024.09 Fabrication of High-Efficiency Lead-Free All-Perovskite Tandem Solar Cells

- ✧ 担任项目**主要负责人**，集中于制备高性能全钙钛矿太阳能叠层器件。包括界面调控，组分调控等。最终获得了超过 27%的全钙钛矿叠层器件。

## SELF-EVALUATION

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- I possess an outgoing personality characterized by friendliness and strong resilience in high-pressure situations. I approach my work with a deep sense of dedication, enthusiasm, and responsibility. I have a keen aptitude for learning and continually strive to enhance my organizational and management skills and proficiency in written communication. I am highly motivated and willingly embrace challenges that come my way. During my doctoral studies, I actively collaborated with various domestic institutions, including **Chongqing University, Southwest University of Science and Technology, Shanxi University, and Yangtze Normal University**. Additionally, I fostered international partnerships with institutions such as the **University of Tokyo, Chung-Ang University, and Kaunas University of Technology**. These collaborations extended to the corporate sector, where I worked alongside **Toshiba** on cutting-edge battery processes and efficiency, positioning us at the forefront of global advancements in battery technology.

## RESEARCH ACHIEVEMENTS

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### Research Papers (Only first author or corresponding author (#) are listed)

- 1) **Bi, H.**, J. Liu, Z. Zhang, L. Wang, G. Kapil, Y. Wei, A.K. Baranwal, S.R. Sahamir, Y. Sanehira, D. Wang, Y., K. Takeshi, R. Beresneviute, S. Grigalevicius, Q. Shen, and S. Hayase, Ferrocene derivatives for improving the efficiency and stability of MA-free perovskite solar cells from the perspective of inhibiting ion migration and releasing film stress. *Adv. Sci.*, Accpeted. (IF: 17.5)
- 2) **Bi, H.**, Y. Fujiwara, G. Kapil, D. Tavgeniene, Z. Zhang, L. Wang, C. Ding, S.R. Sahamir, A.K. Baranwal, Y. Sanehira, K. Takeshi, G. Shi, T. Bessho, H. Segawa, S. Grigalevicius, Q. Shen, and S. Hayase, Perovskite Solar Cells Consisting of PTAA Modified with Monomolecular Layer and Application to All-Perovskite Tandem Solar Cells with Efficiency over 25%. *Adv. Funct. Mater.*, 2023. 33: p. 2300089. (IF: 19.0)
- 3) **Bi, H.**, M. Guo, C. Ding, S. Hayase, Q. Shen, G. Han, and W. Hou, A multifunctional additive strategy to stabilize the precursor solution and passivate film defects for MA-free perovskite solar cells with an efficiency of 22.75%. *Mater. Today Energy*, 2023. 33: p. 101269. (IF: 9.3)
- 4) **Bi, H.**, Y. Guo, M. Guo, C. Ding, S. Hayase, H. Zou, Q. Shen, G. Han, and W. Hou, Reduced interfacial recombination losses and lead leakage in lead-based perovskite solar cells using 2D/3D perovskite engineering. *J. Power Sources*, 2023. 563. (IF: 9.2)
- 5) Su, P., **H. Bi, #** D. Ran, L. Liu, W. Hou, G. Wang, and W. Shi, Multifunctional and multi-site interfacial buffer layer for efficient and stable perovskite solar cells. *Chem. Eng. J.*, 2023. 472: p. 145077. (IF: 15.1)
- 6) Kang, J., **H. Bi, #** M. Guo, Y. Guo, H. Zou, G. Han, and W. Hou, Modifying the buried interface with azodicarbonamide for high-efficiency MA-free perovskite solar cells. *Mater. Today Energy*, 2023. 31: p. 101227. (IF: 9.3)
- 7) Zou, H., **H. Bi, #** Y. Chen, M. Guo, W. Hou, P. Su, K. Zhou, C. Yang, X. Gong, L. Xiao, and L. Liu, Functionalized polymer modified buried interface for enhanced efficiency and stability of perovskite solar cells. *Nanoscale*, 2023. 15(5): p. 2054-2060. (IF: 6.7)

- 8) **Bi, H.**, J. Liu, R. Beresnevičiute, D. Tavgeniene, Z. Zhang, L. Wang, G. Kapil, C. Ding, S.R. Sahamir, Y. Sanehira, A.K. Baranwal, T. Kitamura, D. Wang, Y. Wei, Y. Yang, D.-W. Kang, S. Grigalevicius, Q. Shen, and S. Hayase, Efficiency Enhancement of Wide Bandgap Lead Perovskite Solar Cells with PTAA Surface-Passivated with Monomolecular Layer from the Viewpoint of PTAA Band Bending. *ACS Appl. Mater. Interfaces*, 2023. (IF: 9.5)
- 9) **Bi, H.**, M. Chen, L. Wang, Z. Zhang, C. Ding, G. Kapil, S.R. Sahamir, Y. Sanehira, A.K. Baranwal, T. Kitamura, G. Shi, Q. Shen, and S. Hayase, Pb-free perovskite solar cells composed of Sn/Ge(1:1) alloyed perovskite layer prepared by spin-coating. *Appl. Phys. Express*, 2023. 16(3): p. 036501. (IF: 2.3)
- 10) Hou, W., M. Guo, Y. Chang, S. Zhu, **H. Bi.**,# Q. Shen, Y. Xiao, and G. Han, In situ lead oxysalt passivation layer for stable and efficient perovskite solar cells. *Chem. Commun.*, 2022. 58(91): p. 12708-12711. (IF: 4.9)
- 11) **Bi, H.**, Y. Guo, M. Guo, C. Ding, S. Hayase, T. Mou, Q. Shen, G. Han, and W. Hou, Highly efficient and low hysteresis methylammonium-free perovskite solar cells based on multifunctional oteracil potassium interface modification. *Chem. Eng. J.*, 2022. 439: p. 135671. (IF: 15.1)
- 12) **Bi, H.**, G. Han, M. Guo, C. Ding, H. Zou, Q. Shen, S. Hayase, and W. Hou, Multistrategy Preparation of Efficient and Stable Environment-Friendly Lead-Based Perovskite Solar Cells. *ACS Appl. Mater. Interfaces*, 2022. 14(31): p. 35513-35521. (IF: 9.5)
- 13) **Bi, H.**, G.Y. Han, M.N. Guo, C. Ding, S. Hayase, H.J. Zou, Q. Shen, Y. Guo, and W.J. Hou, Top-Contacts-Interface Engineering for High-Performance Perovskite Solar Cell With Reducing Lead Leakage. *Sol. RRL*, 2022. 6(9): p. 2200352. (IF: 7.9)
- 14) **Bi, H.**, B. Liu, D. He, L. Bai, W. Wang, Z. Zang, and J. Chen, Interfacial defect passivation and stress release by multifunctional KPF<sub>6</sub> modification for planar perovskite solar cells with enhanced efficiency and stability. *Chem. Eng. J.*, 2021. 418: p. 129375. (IF:15.1)
- 15) **Bi, H.**, X. Zuo, B. Liu, D. He, L. Bai, W. Wang, X. Li, Z. Xiao, K. Sun, Q. Song, Z. Zang, and J. Chen, Multifunctional organic ammonium salt-modified SnO<sub>2</sub> nanoparticles toward efficient and stable planar perovskite solar cells. *J. Mater. Chem. A*, 2021. 9(7): p. 3940-3951. (IF: 11.9)
- 16) **Bi, H.**, F. Liu, M. Wang, Z. Mao, Y. Zhai, W. Li, S. Wang, and M. Zhang, Construction of ultra-stable perovskite-polymer fibre membranes by electrospinning technology and its application to light-emitting diodes. *Polym. Int.*, 2020. 70(1): p. 90-95. (IF: 3.2)
- 17) **Bi, H.**, F. Liu, W. Li, M. Wang, S. Yan, M. Zhang, and S. Wang, Preparation of organic metal halide perovskite and its electrospun polystyrene composite fiber film by electric field induction. *J. Mol. Sci.*, 2019. 35(05): p. 417-421.

#### Patent

- [1] J.Z. Chen, **H. Bi.**, Application of organic ammonium salt-modified metal oxide nanoparticles in upright perovskite solar cells and device preparation methods 2021-06-18. (NO.: ZL 202110169284.7)
- [2] **H. Bi.**, W.J. Hou, G.Y. Han, An interface modification molecule for lead-based perovskite solar cells. 2022-

05. (NO.:ZL 202210501227.9)

- [3] **H. Bi**, W.J. Hou, G.Y. Han, Application of an organic molecule in upright perovskite solar cells. 2022-01. (NO.:CN114400291A)
- [4] **H. Bi**, W.J. Hou, G.Y. Han, Application of an interfacial molecule with multifunctional active sites. 2022-01. (NO.:CN114497385A)
- [5] **H. Bi**, W.J. Hou, G.Y. Han, A lithium salt solvent for preparing organic-inorganic hybrid titanium solar cells. 2022-05. (NO.:CN202210502823.9)
- [6] W.J. Hou, **H. Bi**, G.Y. Han, A kind of perovskite solar cell doped with hydrazide passivator and its preparation method. 2022-05. (NO.:CN202210502825.8)

#### Conference

- Huan Bi**, Saulius Grigalevičius, Hiroshi Segawa, Qing Shen, and Shuzi Hayase. in *The 34<sup>th</sup> International Photovoltaic Science and Engineering Conference (PVSEC-34)*. 2023-11-06. Shenzhen, China.
- Huan Bi**, Gaurav Kapil, Hiroshi Segawa, Saulius Grigalevicius, Qing Shen, and Shuzi Hayase. in *The 84<sup>th</sup> Autumn Meeting (JASP)*. 2023-09-19. Kumamoto, Japan.
- Huan Bi**, Gaurav Kapil, Hiroshi Segawa, Saulius Grigalevicius, Qing Shen, and Shuzi Hayase. in *The 9<sup>th</sup> International Symposium on Organic and Inorganic Electronic Materials and Related Nanotechnologies (EM-NANO 2023)*. 2023-06-05. Kanazawa Japan.
- Huan Bi**, Qing Shen, Shuzi Hayase. in *The 70<sup>th</sup> Spring Meeting (JASP)*. 2023-3-15. Tokyo, Japan.
- Huan Bi**, Qing Shen, Shuzi Hayase. in *Asia-Pacific International Conference on Perovskite, Organic Photovoltaics and Optoelectronics (IPEROP23)*. 2023-1-23. Kobe, Japan.
- Huan Bi**, Qing Shen, Shuzi Hayase. in *The 33<sup>rd</sup> International Photovoltaic Science and Engineering Conference (PVSEC-33)*. 2022-11-13. Nagoya, Japan.
- Huan Bi**, Shuzi Hayase, Qing Shen. in *The 83<sup>rd</sup> Autumn Meeting (JASP)*. 2022-9-20. Tokyo, Japan.
- Huan Bi**, Qing Shen, Shuzi Hayase. in 第2回日本太陽光発電学会学術講演会. 2022. Kanazawa, Japan.
- Bi, Huan**, Qing Shen, Gaoyi Han, and Wenjing Hou. in *The 9<sup>th</sup> Conference on Science and Technology of Emerging Solar Energy Materials*. 2022. Beijing, China.
- Bi, Huan**, Fangyiv Liu, Mian Wang, Su Yan, Yuehui Zhai. in *The 6<sup>th</sup> Conference on Science and Technology of Emerging Solar Cells*. 2019. Beijing, China.
- Bi, Huan**, Wei Li, Qi Wei, Su Yan, Tingyu Song. in *The 5<sup>th</sup> Conference on New Generation Solar Cells*. 2018. Beijing, China.

## PRACTICAL/WORK EXPERIENCE

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2020.06-2021.07	Chongqing University-Research Assistant
2023.05-	Joined the <b>Chongqing Outstanding Engineer Project</b> . I joined the <b>large-scale instrument and equipment function development project at Chongqing University</b> .

## PROFESSIONAL SKILL

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1. Have good English reading and writing skills and can write English papers proficiently.
2. Proficient in using office software such as Office. Proficient in drawing software such as origin and mastering XRD, SEM, XPS, AFM, and other equipment.
3. Proficient in using **first theory and quantum calculation software** such as Gaussian, VASP, CP2K, Quantum Espresso, etc.