Huan BI (1994-11)

School: The University of Electro-Communications (Japan)

Major: Materials and Physics

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Native place: Yuncheng City, Shanxi Province

Website: https://happy-bi.github.io/

Membership: Chinese Chemical Society (CCS); Japan Society of Applied Physics (JSAP).

EDUCATION EXPERIENCE

2013.09~2017.06	*Luliang University*	Material Chemistry
2017.09~2020.06	*Changchun University of Technology*	Materials Science
2021.07~2022.05	*Shanxi University*	Institute of Molecular Sciences (Co-research Fellow)
2021.10~	*The University of Electro-Communications*	Materials and 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 and GIGS/perovskite tandem solar cell.

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~ **Fabrication of High-Efficiency Lead-Free All-Perovskite Tandem Solar Cells and GIGS/perovskite Tandem Solar Cell**

SELF-EVALUATION

- 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 solar cell processes and efficiency, positioning us at the forefront of global advancements in solar cell technology.

RESEARCH ACHIEVEMENTS

Research Papers (Only as First Author or Corresponding Author (#) are listed)

1) **H. Bi#,** J. Liu, Z. Zhang, et. al, 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.***, ***Accepted***. (IF: 17.5)
2) **H. Bi#,** J. Liu, Z. Zhang, et. al, All-perovskite tandem solar cells approach 26.5% efficiency by employing wide bandgap lead perovskite solar cells with new monomolecular hole transport layer. ***ACS Energy Lett.***, 2023. 8(9): p. 3852. (IF: 24.0)
3) **H. Bi,** Y. Fujiwara, G. Kapil, et. al, 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)
4) **H. Bi,** J. Liu, R. Beresneviciute, et. al, 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: 10.4)
5) **H. Bi,** M. Guo, C. Ding, et. al, 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)
6) **H. Bi,** Y. Guo, M. Guo, et. al, Reduced interfacial recombination losses and lead leakage in lead-based perovskite solar cells using 2D/3D perovskite engineering. ***J. Power Sources***, 2023. 563. (IF: 9.8)
7) Su, P., **H. Bi,#** D. Ran, et. al, Multifunctional and multi-site interfacial buffer layer for efficient and stable perovskite solar cells. ***Chem. Eng. J.***, 2023. 472: p. 145077. (IF: 16.7)
8) Kang, J., **H. Bi,#** M. Guo, et. al, Modifying the buried interface with azodicarbonamide for high-efficiency

MA-free perovskite solar cells. ***Mater. Today Energy***, 2023. 31: p. 101227. (IF: 9.3)

9) Zou, H., **H. Bi,#** Y. Chen, et. al, Functionalized polymer modified buried interface for enhanced efficiency and stability of perovskite solar cells. ***Nanoscale***, 2023. 15(5): p. 2054-2060. (IF: 8.3)
10) **H. Bi,** M. Chen, L. Wang, et. al, 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: 2.8)
11) Hou, W., M. Guo, Y. Chang, S. Zhu, **H. Bi,#** Q. Shen, et. al, In situ lead oxysalt passivation layer for stable and efficient perovskite solar cells. ***Chem. Commun.***, 2022. 58(91): p. 12708-12711. (IF: 6.1)
12) **H. Bi,** Y. Guo, M. Guo, C. Ding, et. al, 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: 16.7)
13) **H. Bi,** G. Han, M. Guo, et. al, Multistrategy preparation of efficient and stable environment-friendly lead-based perovskite solar cells. ***ACS Appl. Mater. Interfaces***, 2022. 14(31): p. 35513-35521. (IF: 10.4)
14) **H. Bi,** G.Y. Han, M. Guo, et. al, Top-contacts-interface engineering for high-performance perovskite solar cell with reducing lead leakage. ***Sol. RRL***, 2022. 6(9): p. 2200352. (IF: 9.2)
15) **H. Bi,** B. Liu, D. He, et. al, Interfacial defect passivation and stress release by multifunctional KPF_6 modification for planar perovskite solar cells with enhanced efficiency and stability. ***Chem. Eng. J.***, 2021. 418: p. 129375. (IF:16.7)
16) **H. Bi,** X. Zuo, B. Liu, et. al, Multifunctional organic ammonium salt-modified SnO_2 nanoparticles toward efficient and stable planar perovskite solar cells. ***J. Mater. Chem. A***, 2021. 9(7): p. 3940-3951. (IF: 14.5)
17) **H. Bi,** F. Liu, M. Wang, et. al, 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)

Patent

[1] **H. Bi,** W. Hou, G. Han, An interface modification molecule for lead-based perovskite solar cells. 2022-05. (*Granted*, **NO.: ZL 202210501227.9**)
[2] J. Chen, **H. Bi,** Application of organic ammonium salt-modified metal oxide nanoparticles in upright perovskite solar cells and device preparation methods 2021-06. (*Granted*, **NO.: ZL 202110169284.7**)
[3] S. Wang, **H. Bi,** L. Gao, Method for preparing organic-inorganic hybrid perovskite photoelectric thin film sensor. 2018-11. (*Granted*, **NO.: ZL 201811306851.3**)
[4] **H. Bi,** W. Hou, G. Han, Application of an organic molecule in upright perovskite solar cells. 2022-01. (**NO.: CN114400291A)**
[5] **H. Bi,** W. Hou, G. Han, Application of an interfacial molecule with multifunctional active sites. 2022-01. **(NO.: CN114497385A)**
[6] **H. Bi,** W. Hou, G. Han, A lithium salt solvent for preparing organic-inorganic hybrid titanium solar cells. 2022-05. (**NO.: CN202210502823.9)**
[7] W. Hou, **H. Bi,** G. Han, A kind of perovskite solar cell doped with hydrazide passivator and its preparation

method. 2022-05. (**NO.: CN202210502825.8**)

Conference

1. **H. Bi,** S. Grigalevičius, H. Segawa, Q. Shen, and S. Hayase. in ***The 34th International Photovoltaic Science and Engineering Conference (PVSEC-34).*** 2023-11-06. Shenzhen, China.
2. **H. Bi,** G. Kapil, H. Segawa, S. Grigalevicius, Q. Shen, and S. Hayase. in ***The 84th Autumn Meeting (JASP).*** 2023-09-19. Kumamoto, Japan.
3. **H. Bi,** Gaurav Kapil, Hiroshi Segawa, Saulius Grigalevicius, Qing Shen, and Shuzi Hayase. in ***The 9th International Symposium on Organic and Inorganic Electronic Materials and Related Nanotechnologies (EM-NANO 2023).*** 2023-06-05. Kanazawa Japan.
4. **H. Bi,** Q. Shen, S. Hayase. in ***The 70th Spring Meeting (JASP).*** 2023-3-15. Tokyo, Japan.
5. **H. Bi,** Q. Shen, S. Hayase. in ***Asia-Pacific International Conference on Perovskite, Organic Photovoltaics and Optoelectronics (IPEROP23).*** 2023-1-23. Kobe, Japan.
6. **H. Bi,** Q. Shen, S. Hayase. in ***The 33rd International Photovoltaic Science and Engineering Conference (PVSEC-33).*** 2022-11-13. Nagoya, Japan.
7. **H. Bi,** S. Hayase, Q. Shen. in ***The 83rd Autumn Meeting (JASP).*** 2022-9-20. Tokyo, Japan.
8. **H. Bi,** Q. Shen, S. Hayase. in **第 2 回日本太陽光発電学会学術講演会.** 2022. Kanazawa, Japan.
9. **H. Bi,** Q. Shen, G. Han, and W. Hou. in ***The 9th Conference on Science and Technology of Emerging Solar Energy Materials.*** 2022. Beijing, China.

PRACTICAL/WORK EXPERIENCE

2020.06-2021.07 Chongqing University-**Research Assistant**

2023.05- Joined the **Chongqing Outstanding Engineer Project**.

PROFESSIONAL SKILL

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.