

# BILAWAL KHAN

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Address: B2550, Department of Materials Science and Engineering, City University of Hong Kong

## RESEARCH INTEREST

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Electrochemistry, Photoelectrochemistry, CO<sub>2</sub> Reduction, Hydrogen Production, Artificial Photosynthesis, Solar Energy Conversion, Electrolyzer Engineering, Photoelectrode Designs, Wastewater Treatment

## RESEARCH EXPERTISE

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Membrane Electrode Assembly Implementations, Photoelectrochemical Devices Integration under Concentrated Sunlight, Photoelectrodes Design, Materials Synthesis, Materials Characterizations, Activity Measurements (Gas-Chromotography, Ion-Chromotography, Nuclear Magnetic Resonance, High-Performance Liquid Chromatography)

## WORK EXPERIENCE

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### Postdoctoral Fellow (Short-term)

December 2024 -to- Present

Department of Materials Science and Engineering, **City University of Hong Kong**

Advisor: [Prof. Jr-Hau HE](#)

## EDUCATION

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### PhD in Materials Science and Engineering

2020 - 2024

Department of Materials Science and Engineering, **City University of Hong Kong**

**Thesis:** Integrated Photoelectrochemical CO<sub>2</sub> Reduction Systems for Sustainable Fuel Production

Advisor: [Prof. Jr-Hau HE](#)

### Visiting PhD Scholar

August 2021 - July 2022

KAUST Catalysis Center, **King Abdullah University of Science and Technology**

**Project:** Photoelectrochemical CO<sub>2</sub> Reduction Systems for Liquid-Fuels. **Advisor:** [Prof. Kuo-Wei Huang](#)

### Master in Physics

2017 - 2019

School of Physics, **University of Electronic Science and Technology of China**

**Thesis:** Synthesis of Low-dimensional Materials for Artificial Photosynthesis

### Bachelor in Physics ([Distinction](#))

2009 - 2013

Department of Physics and Electronics, **Shah Abdul Latif University Khairpur**

**Final Year Project:** Photocatalytic Hydrogen Evolution

## TEACHING EXPERIENCE

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### Teaching Assistant

Department of Materials Science and Engineering, City University of Hong Kong

- [MSE4178](#) Nanostructure and Nanotechnology ([Best Teaching Assistant Award](#)) Fall 2023
- [MSE2108](#) Materials Chemistry Spring 2023
- [MSE3101-MSE4101](#) Materials Engineer in Society Fall 2022

## SELECTED PUBLICATIONS

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- **B. Khan**, M. B. Faheem, K. Peramaiah, J. Nie, H. Huang, Z. Li, C. Liu, K.-W. Huang and J.H. He. Unassisted Photoelectrochemical CO<sub>2</sub>-to-liquid Fuel Splitting over 12% Solar Conversion Efficiency. *Nature Communications*, **2024**, 15, 6990.
- M. B. Faheem, **B. Khan**, Y. Zhang, H. Li, M. Saud, H. Lin, H. Zhang, S. B. Ahmed, V. Vanshika, R. Qiao, P. Kasweaker, Y. Wang, W. Zheng, J. H. He, Q. Qiao. Synergistic Solvent and Surface Engineering to Reduce V<sub>OC</sub> Loss in Tin Halide Perovskite Solar Cells. *ACS Energy Letters*, **2025**, 10, 33373348.

- M.S. Hassan, P. Basera, **B. Khan**, A.S. Portniagin, K. Vighnesh, Y. Wu, D.A. Rusanov, M. Babak, J.-H. He, M. Bajdich and A.L. Rogach. Bidentate Lewis Base Ligand-Mediated Surface Stabilization and Modulation of the Electronic Structure of CsPbBr<sub>3</sub> Perovskite Nanocrystals. *Journal of the American Chemical Society*, **2024**, *115*, 862-873.
- K. Peramaiah, P. Varadhan, V. Ramalingam, **B. Khan**, P.K Das, H. Huang, H-C Fu, X. Yang, V. Tung, K-W. Huang and J.H. He. Unassisted photoelectrochemical CO<sub>2</sub> reduction by employing III–V photoelectrode with 15% solar-to-fuel efficiency. *Carbon Energy*, **2024**, e669.
- H. Huang, Z. Li, Z. Li, **B. Khan**, K-W. Huang, Z. Lai and J.-H. He. Photoelectrochemical Lithium Extraction. *Nano Energy*, **2023**, *115*, 108683.
- Z. Li, Z. Li, H. Huang, Y. Yao, **B. Khan**, Y. Zhu, K.-W. Huang, Z. Lai and J.-H. He. Green Lithium: Photoelectrochemical Extraction. *Photonix*, **2023**, *4*, 23.
- **B. Khan**, F. Raziq, M. B. Faheem, M. U. Farooq, S. Hussain, F. Ali, A. Ullah, A. Mavlonov, Y. Zhao and Z. Liu, H. Tian, H. Shen, X. Zu, S. Li, H. Xiao, X. Xiang, L. Qiao. Electronic and Nanostructure Engineering of Bifunctional MoS<sub>2</sub> towards Exceptional Visible-light Photocatalytic CO<sub>2</sub> Reduction and Pollutant Degradation. *Journal of Hazardous Materials*, **2020**, *381*, 120972.
- M. B. Faheem, **B. Khan**, Y. Zhang, H. Li, M. Saud, H. Lin, H. Zhang, S. Ahmed, V. Vanshika, R. Qiao, P. Kaswekar, Y. Wang, W. Zheng, J. He, Q. Qiao. Integrated Perovskite/Silicon Tandem Photoelectrochemical Devices for Water-Splitting and CO<sub>2</sub>-to-Formate Conversion. **Joule (2025): Manuscript ID: nz-2025-009169. Under Review**
- **B. Khan**, M. B. Faheem, Q. Qiao, J-H. He. "Photoelectrochemical CO<sub>2</sub> to Liquid Fuel Conversions: Device Assembly, Photoelectrode Designs, and Scalability Challenges **Nature Review Clean Technology (2025): Manuscript ID: NRCT-24-120V1. Under Review**
- **B. Khan**, M. B. Faheem, P. Karthik, J-H. He. Solar-Driven Selective CO<sub>2</sub> Hydrogenation over Carbon Nitride Nanocomposites with Extended Light Absorption. **Nano-Micro Letters (2025): Manuscript ID: NML-2025-18724. Under Review.**
- B. Khan, M. Elhousseini, S. B. Ahmed, R. Ahmad, L. Lyu, H. Chen, **B. Khan**, I. Gunasekaran, F. Chuhan S. Liu Z. Yang, B. L Khoo. Enhanced core-shell nano-conductive piezoelectric sensor via self-oriented beta phase nanocrystals for real-time monitoring of physiological signals. *Chemical Engineering Journal*, **2025**, *513*, 162384.
- B. Khan, W. Khan, M. H. Masrur, R. T. Khalid, M. Awais, **B. Khan**, B. L Khoo, S. Abdullah. EHybrid sensor integration in wearable devices for improved cardiovascular health monitoring. *Journal of Science: Advanced Materials and Devices*, **2025**, *10*, 100889.
- M. B. Faheem, **B. Khan**, C. Feng, W. S. Subhani, S. Mabrouk, M. H. Sayyad, A. Yildiz, W. H. Zhang and Q. Qiao. Van der Waals Epitaxial Growth for High Performance Organic-Free Perovskite Solar Cell: Experimental and Theoretical Insights. *Advanced Materials Interfaces*, **2022**, *9*, 2200421.
- M. B. Faheem, **B. Khan**, C. Feng, S. B. Ahmed, J. Jiang, M.-U. Rehman, W. Subhani, M. Farooq, J. Nie and M. Makhoulouf, Q. Qiao. Synergistic Approach toward Erbium-Passivated Triple-Anion Organic-Free Perovskite Solar Cells with Excellent Performance for Agrivoltaics Application. *ACS Applied Materials and Interfaces*, **2022**, *14*, 6894-6905.
- M. B. Faheem, **B. Khan**, J. Z. Hashmi, A. Baniya, W. Subhani, R. S. Bobba, A. Yildiz and Q. Qiao , et al. Insights from Scalable Fabrication to Operational Stability and Industrial Opportunities for Perovskite Solar Cells and Modules. *Cell Report Physical Science*, **2022**, *3*, 100827.
- Y. Ahmed, **B. Khan**, M. B. Faheem, K. Huang, Y. Gao and J. Yang. Organic Additives in All-inorganic Perovskite Solar Cells and Modules: from Moisture Endurance to Enhanced Efficiency and Operational Stability. *Journal of Energy Chemistry*, **2022**, *67*, 361-390.
- M. B. Faheem, **B. Khan**, C. Feng, M. U. Farooq, F. Raziq, Y. Xiao and Y. Li. All-inorganic Perovskite Solar Cells: Energetics, Key Challenges and Strategies Towards Commercialization. *ACS Energy Lett.*, **2020**, *5*, 290-320.
- F. Raziq, M. Humayun, A. Ali, T. Wang, A. Khan, Q. Fu, W. Luo, H. Zeng, Z. Zheng and **B. Khan**, H. Shen, X. Zu, S. Li, L. Qiao. "Synthesis of S-Doped porous g-C<sub>3</sub>N<sub>4</sub> by using Ionic Liquids and Subsequently Coupled with

Au-TiO<sub>2</sub> for Exceptional Cocatalyst-free Visible-light Catalytic Activities. *Applied Catalysis B: Environmental*, **2018**, 237, 1082-1090.

- D. Li, X. Zu, D. Ao, Q. Tang, Y. Fu, Y. Guo, **B. Khan**, M. B. Faheem, L. Li and S. Li. High Humidity Enhanced Surface Acoustic Wave (SAW) H<sub>2</sub>S Sensors based on Sol-gel CuO Films. *Sensors and Actuators B: Chemical*, **2019**, 294, 55-61.
- C. Tian, X. Xiang, J. Wu, B. Li, C. Cai, **B. Khan**, H. Chen, Y. Yuan and X. Zu. "Facile Synthesis of MoS<sub>2</sub>/CuS Nanosheet Composites as an Efficient and Ultrafast Absorbent for Water-soluble Dyes. *Journal of Chemical and Engineering Data*, **2018**, 63, 3966-3974.
- Y. Tang, D. Li, D. Ao, Y. Guo, M. B. Faheem, **B. Khan**, X. Zu and S. Li. Highly Sensitive Surface Acoustic Wave HCl Gas Sensors based on Hydroxyl-rich Sol-gel AlO<sub>x</sub>OH<sub>y</sub> Films. *Materials Chemistry and Physics*, **2020**, 239, 122026.

## REFERENCES

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