BILAWAL KHAN

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

RESEARCH INTEREST

Electrochemistry, Photoelectrochemistry, CO_2 Reduction, Hydrogen Production, Artificial Photosynthesis, Solar Energy Conversion, Electrolyzer Engineering, Photoelectrode Designs, Wastewater Treatment

RESEARCH EXPERTISE

Membrance 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

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

PhD in Materials Science and Engineering 2020 - 2024
Department of Materials Science and Engineering, **City University of Hong Kong**
Thesis: Integrated Photoelectrochemical CO_2 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_2 Reduction Systems for Liquid-Fuels. **Advisor:** **Prof. Kuo-Wei Huang**

Masters in Physics 2017 - 2019
School of Physics, **University of Electronic Science and Technology of China**
Thesis: Synthesis of Low-dimensional Materials for Artificial Photosynthesis

TEACHING EXPERIENCE

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

- **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_2-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_{OC} 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 $CsPbBr_3$ 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_2 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_2 towards Exceptional Visible-light Photocatalytic CO_2 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_2-to-Formate Conversion. **Joule (2025): Manuscript ID: nz-2025-009169. Under Review**
- **B. Khan**, M. B. Faheem, Q. Qiao, J-H. He. "Photoelectrochemical CO_2 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_2 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. Makhlouf, 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_3N_4 by using Ionic Liquids and Subsequently Coupled with Au-TiO_2 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_2S 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 MoS2/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_xOH_y Films. *Materials Chemistry and Physics*, **2020**, 239, 122026.

REFERENCES

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  Mechanical and Aerospace Engineering, Syracuse University, United States