Dr. Muhammad Zubair Khan

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EDUCATION

- **PhD (2018):** Advanced Energy and System Technology, Korea University of Science and Technology (UST), South Korea.
- **MS. (2014):** Advanced Energy and Technology, Korea University of Science and Technology (UST), South Korea.
- **BS (2011):** Materials Engineering, GIK Institute of Engineering Sciences and Technology, Topi, Swabi, Pakistan

PROFESSIONAL Experience

- **Assistant Professor** at Department of Materials Science & Engineering, Pak-Austria Fachhochschule: Institute of Applied Sciences and Technology (PAF-IAST), Mang, Haripur, Pakistan | *Jan. 2021 – current* | www.paf-iast.edu.pk
- **Guest Research Professor** at Institute of Advanced Materials and Flexible Electronics Nanjing, University of Information Science & Technology, China | *Aug. 2023 – Sep. 2023* | https://en.nuist.edu.cn
- **Assistant Professor** at Faculty of Materials and Chemical Engineering, GIK Institute of Engineering Sciences and Technology, Topi, Swabi, Pakistan | *Jan. 2020 – Jan 2021* | www.giki.edu.pk
- **Postdoctoral Researcher** at Fuel Cell Research Laboratory, Korea Institute of Energy Research (KIER), South Korea | Sept. 2018 – Apr. 2019 | www.kier.re.kr
- **Research Scientist** at Clean Fuel Laboratory, Korea Institute of Energy Research (KIER), South Korea | Mar. 2014 –Feb. 2015 | www.kier.re.kr

HONORS & AWARDS

- Nominated by PAF-IAST, Haripur, for the National Best Researcher Award (2024) by the Higher Education Commission (HEC) of Pakistan.
- Research Excellence Award – August 2018, University of Science and Technology (UST), South Korea.
- Best Paper Award, Korea Hydrogen and New Energy Society Spring Conference (KHNES), May 2018, Incheon, South Korea
- Best Paper Award, Twenty-sixth International Conference on the Processing and Fabrication of the Advanced Materials (PFAM-XXVI), October 2017, Jeonju, South Korea
- Research Excellence Award – 2016, Korea Institute of Energy Research (KIER), South Korea
- Research Excellence Award – 2015, Korea Institute of Energy Research (KIER), South Korea
- Research Excellence Award – 2014, Korea Institute of Energy Research (KIER), South Korea
- Fully Funded MS Scholarship, University of Science and Technology (UST), South Korea (2012-2014)
- Fully Funded PhD Scholarship, University of Science and Technology (UST), South Korea (2015-2018

RESEARCH ACTIVITIES

- Development of Functional Materials for high-performance asymmetric supercapacitors and batteries
- Development of Functional Materials as Efficient and Durable Electrocatalysts for Enhanced Water Splitting
- Development and durability enhancement of high performing large-area anode-supported solid oxide fuel cells (SOFCs) and electrolysis cells (SOECs)
- Development of Nano-oxide dispersed ferritic stainless steels as potential interconnect materials for SOFCs
- Accelerated life testing and Lifetime prediction modeling of the SOFC cells and stacks
- Direct carbon solid oxide fuel cell (DCFC) fabrication, pyrolysis and steam gasification analysis of solid carbon fuels
- Upgradation of low rank coal (LRC) by oils (palm acid oil, crude oil, bio tar, tallow, cashew nutshell liquid etc.) coating and Production of Coke from Coal

RESEARCH PROJECT FUNDING [as Lead PI]

- "Development of Solid Oxide Electrolysis Cell Technology for Hydrogen and Syngas Production Utilizing Industrial Emissions from Brick Kilns, Power Plants, and Beyond", awarded by *the Higher Education Commission (HEC) of Pakistan* **[19.95 Million PKR; ~71,000 USD]**
- "Development of efficient and highly durable electrode materials for intermediate-temperature solid oxide fuel cells" awarded by the *ZhenJiang Youranjingguanlvhua Co.,Ltd. (Zhenjiang City), Jiangsu Province, China* **[149, 000 Chinese Yuan; ~5.8 Million PKR, ~21, 000 USD]**
- *"*Development of Metal Organic Frameworks as Efficient and Durable Electrocatalysts for Enhanced Water Splitting" approved by *MatEnTx Pvt. Ltd. Pakistan* **[1.0 Million PKR; ~3600 USD]**
- *"*Coke from Coal*",* sponsored by *Pakistan Mineral Development Corporation (PMDC),* **[0.625 Million PKR; ~2206 USD]**

RESEARCH PROFILE

- **Research papers: 83**; **Cumulative Impact Factor: ~600+**; **Conference presentations: 40+**
- **Google Scholar profile:** https://scholar.google.co.kr/citations?user=GWPiCAoAAAAJ&hl=en

SELECTED PUBLICATIONS IN PEER REVIEWED JOURNALS

- U. Hamayun, S.M. Abdullah, R. Ullah, M. Humayun, M. Bououdina, M.R.A. Karim, **M.Z. Khan**, M.B. Hanif, *Synergistic Integration of Ag@$Fe_{0.67}Cu_{0.22}Co_{0.11}S$ Core-Shell Nanostructures and SWCNTs for Improved Supercapacitor Performance*, **Journal of Alloys and Compounds** 1012 (2025) 178422. https://doi.org/10.1016/j.jallcom.2024.178422
- M. Anwar, A. Fazal, M.J. Iqbal, B.S. Almutairi, **M.Z. Khan***, et al., *Solution-combustion synthesis of $AgCo_3O_4$/FeMn-O multiphase composite for high-performance asymmetric supercapacitor*, **Journal of Energy Storage** 105 (2025) 114602.. https://doi.org/10.1016/j.est.2024.114602
- O. Gohar, H.A. Ishfaq, M.A. Iqbal, **M.Z. Khan***, S. Basharat, N. Kanwal, A. Riaz et al., *Recent Advancements in High-Performance and Durable Electrodes Materials for Magnesium-Ion Batteries*, **Coordination Chemistry Reviews** 538 (2025) 216702. https://doi.org/10.1016/j.ccr.2025.216702
- O. Gohar, **M.Z. Khan***, M. Saleem, O. Chun, M.M. Rehman et al., *Navigating the future of solid oxide fuel cell: Comprehensive insights into fuel electrode related degradation mechanisms and mitigation strategies*, **Advances in Colloid and Interface Science** 331 (2024) 103241. (https://doi.org/10.1016/j.cis.2024.103241)
- M.B. Hanif, S. Rauf, **M.Z. Khan**, Z.D. Babar, et al., *Innovative Advances and Challenges in Solid Oxide Electrolysis Cells: Exploring Surface Segregation Dynamics in Perovskite Electrodes*, **Materials Science and Engineering: R: Reports Journal** 161 (2024) 100864. (https://doi.org/10.1016/j.mser.2024.100864)
- S. Kim, D.W. Joh, D.Y. Lee, J. Lee, H.S. Kim, **M.Z. Khan**, J.E. Hong, S.B. Lee, S.J. Park et al. Microstructure tailoring of solid oxide electrolysis cell air electrode to boost performance and long-term durability, **Chemical Engineering Journal**, 410 (2021) 128318. https://doi.org/10.1016/j.cej.2020.128318.
- M.T. Mehran, T.H. Kim, **M.Z. Khan**, S.B. Lee, T.H. Lim, R.H. Song, Highly durable nano-oxide dispersed ferritic stainless steel interconnects for intermediate temperature solid oxide fuel cells, **Journal of Power Sources**, 439 (2019) 227109. https://doi.org/10.1016/j.jpowsour.2019.227109
- **M.Z. Khan**, M.T. Mehran, R.H. Song, J.W. Lee, S.B. Lee, T.H. Lim, A simplified approach to predict performance degradation of a solid oxide fuel cell anode, **Journal of Power Sources**, 391 (2018), 94-105. https://doi.org/10.1016/j.jpowsour.2018.04.080
- **M.Z. Khan**, R.H. Song, A. Hussain, S.B. Lee, T.H. Lim, J.E. Hong, Effect of applied current density on the degradation behavior of anode-supported flat-tubular solid oxide fuel cells, **Journal of the European Ceramic Society**, 40 (2020) 1407-1417. https://doi.org/10.1016/j.jeurceramsoc.2019.11.017.
- M.T. Mehran, **M.Z. Khan**, T.H. Lim, S.B. Lee, R.H. Song, Effect of nano-Al_2O_3 addition on mechanical durability of nickel-yttria stabilized zirconia anode support of solid oxide fuel cells, **Ceramics International**, 44 (2018) 14824-14833. https://doi.org/10.1016/j.ceramint.2018.05.114
- M.T. Mehran, **M.Z. Khan**, S.B. Lee, T.H. Lim, S. Park, R.H. Song, Improving sulfur tolerance of Ni-YSZ anodes of solid oxide fuel cells by optimization of microstructure and operating conditions, **International Journal of Hydrogen Energy**, 43 (2018) 11202-11213. https://doi.org/10.1016/j.ijhydene.2018.04.200

INVITED/PLENARY TALKS

- *Advancing Large-Area Solid Oxide Fuel Cells: Durable Architectures and Scalable Processing Strategies for the Next Energy Era*, The 4th ASEAN-Pakistan Conference on Materials Science (APCOMS) 2025, May 05-08, 2025, at SCME, NUST, Islamabad, Pakistan
- *Hydrogen-Powered Future: Advancing Solid Oxide Fuel Cells for Stability, Scalability, and Efficiency*, The 3rd International Conference on Modern Technologies in Mechanical and Materials Engineering (MTME-2025), April 16-17, 2025, at GIK Institute, Topi, Pakistan
- *Performance and Durability Enhancement of Solid Oxide Fuel Cell Cathode Materials,* Korea Institute of Energy Research (KIER) Education Festival, July 13, 2023, Daejeon, South Korea.
- *Performance and Durability Enhancement of Solid Oxide Fuel Cell Cathode by Robust Multi-doped Ceria Coating*, International Symposium on Current Trends in Nanotechnology, May 30, 2023, University of Haripur, Pakistan.
- *Recent Research Activities on Solid Oxide Fuel Cell Materials at KIER*, 1st International Conference on Nanoscience & Nanotechnology, November 1-2, 2018, SCME-NUST, Islamabad, Pakistan.

COURSES TAUGHT

Undergraduate Course Teaching:

MM393: Materials for Energy and Environment (3 Credits)
MM334: Heat Treatment and Processing (3 Credits)
MSE101: Fundamentals of Engineering Materials (3 Credits)
SS310: Professional Ethics (3 Credits)
MGT262: Entrepreneurship (3 Credits)
MSE222: Characterization Techniques (2 Credits)
CHE453: Chemical Analysis and Material Characterization (3 Credits)
MSE304: Ceramics and Glasses (3 Credits)
MSE333: Foundry Engineering (2 Credits)

Graduate (MS & PhD students) Course Teaching:

MM573: Materials for Energy Applications (3 Credits)
SS821: Research Methodology (3 Credits)
MSE872: Nanomaterials for Energy Applications (3 Credits)