

Muhammad Saqib

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CARRIER OVERVIEW

- 8+ years of experience in materials science R&D, and development experience in ceramic materials, SOFC, and electrochemical energy systems.
- Focused on scaling lab-scale technologies—such as fuel cells and advanced energy storage materials—toward commercial manufacturing.
- Acknowledged for expertise in advanced materials, with 19+ co-authored publications, a Korean patent, and leadership in an ARPA-E project funded by the U.S. Department of Energy.

EXPERIENCE

Maryland Energy Innovation Institute, University of Maryland

College Park, MD

Post-Doctoral Associate

Apr 2022 – Present

- Led SOFC development for ARPA-E-funded hybrid fuel cell-turbogenerator project, scaling low-temperature SOFCs from lab-scale to commercial-size 10×10 cm² cells.
- Developed scalable ceramic manufacturing workflows, including tape casting, lamination, spray coating, and sintering, resulting in flatter, defect-free large-area cells outperforming commercial benchmarks.
- Designed and implemented high-current test infrastructure (100 A and 400 A boosters) for I–V and power performance evaluation of large-area SOFCs.
- Demonstrated scale-up of GDC SOFCs from button/lab cells to 5×5 cm² and 10×10 cm² commercial cells, delivering peak power densities of 1.4 W/cm² (at 0.5 V) and 1.0 W/cm² (at 0.75 V), respectively, at 650 °C.
- Utilized advanced characterization tools (TGA, optical dilatometry, XRD, SEM) for thermal, structural, and microstructural optimization of cell components.
- Resolved critical fabrication bottlenecks, increasing cell yield and quality across scaled-up production runs through iterative process refinement.
- Authored technical reports and milestone presentations for ARPA-E, detailing process scale-up, performance data, and commercialization strategy.
- Supported methane conversion project, investigating CH₄ to C₂ hydrocarbons and H₂ using catalytic membrane reactors—contributed to catalyst testing and data interpretation.

Department of Physics, COMSATS University Islamabad

Islamabad, Pakistan

Lecturer

Jan 2015 – Feb 2016

- Taught Applied Physics to engineering and science undergraduates with a focus on real-world applications.
- Created lecture content, lab activities, and assessments aligned with modern engineering needs.
- Supported students in conducting experiments, analyzing results, and preparing reports—building foundational research skills.
- Maintained class records, graded assignments, and ensured effective student communication.

Research Associate

Apr 2011 – Jan 2015

- Conducted advanced research on oxide materials for energy applications, focusing on synthesis and characterization techniques to enhance material performance.
- Operated and maintained X-ray diffraction (XRD) equipment for structural analysis, contributing to the understanding of material properties.
- Mentored students and co-authored peer-reviewed publications on energy materials synthesis and characterization.

TECHNICAL SKILLS & EXPERTISE

- *Material Synthesis & Characterization*
 - Structural analysis (XRD, Rietveld refinement, & In situ-XRD)
 - Microscopy (SEM and EDS, TEM, & 3D laser scanning microscope)
 - Thermal Analysis Techniques (TGA & Optical Dilatometer)
- *Advanced Ceramic Materials Processing (Lab-to-Commercial Scale)*
 - Tape casting & Lamination of Multi-Layer Ceramic Architecture
 - Spray-coated electrode fabrication
- *Electrochemical Testing for large area cells*
 - Performed I–V/P measurements with 100 & 400 A boosters
 - Electrochemical Impedance Spectroscopy (EIS) & Distribution of Relaxation Times (DRT) analysis
 - Single and Multi-cell Stack Preparation and Testing
- Electrical conductivity measurements (Probe station)
- Assisted in experiments involving Gas Chromatography and Mass Spectrometry

EDUCATION

Sejong University, Seoul, South Korea

Doctor of Philosophy (Ph.D.), Nanotechnology and Advanced Materials Engineering

Dec 2021

COMSATS University Islamabad, Islamabad, Pakistan

Master of Science (M.S), Electrical Engineering

Jan 2015

Bachelor of Science (B.S), Electronics

Sep 2010

ACCOMPLISHMENTS

- Brain Korea 21 (BK21) Ph.D. Scholarship Recipient, 2016–2022
- Oral Presentation: “Transitioning Low-Temperature GDC-Based SOFCs from Lab to Commercial Scale,” 245th Electrochemical Society (ECS) Meeting, San Francisco, CA | May 2024
- 19 peer-reviewed publications | 591 citations | <https://scholar.google.com/citations?user=vodbtWMAAAAJ&hl=en&oi=sra> |

PATENT

- **Korean Patent No. 10-2019-0039155, Granted 2021**

Title: Air Electrode Active Material and Electrochemical Device Including the Same

Description: Co-inventor of a novel air electrode active material designed to enhance the performance and durability of electrochemical devices such as solid oxide fuel cells.



HIGHLIGHTED PUBLICATIONS (4 out of 19)

- K. Park, **M. Saqib**, et al. *Water-mediated exsolution of nanoparticles in alkali metal-doped perovskite structured triple-conducting oxygen electrocatalysts for reversible cells.* **Energy & Environmental Science**, 17, 1175–1188 (2024).
- **M. Saqib**, I.-G. Choi, H. Bae, et al. *Transition from perovskite to misfit-layered structure materials: a highly oxygen-deficient and stable oxygen electrode catalyst.* **Energy & Environmental Science**, 14, 2472–2484 (2021).
- **M. Saqib**, J.-I. Lee, J.-S. Shin, et al. *Modification of oxygen-ionic transport barrier of $\text{BaCo}_{0.4}\text{Zr}_{0.1}\text{Fe}_{0.4}\text{Y}_{0.1}\text{O}_3$ steam (air) electrode by impregnating samarium-doped ceria nanoparticles for proton-conducting reversible solid oxide cells.* **J. Electrochem. Soc.**, 166, F746 (2019).
- Y. Ostrovskiy, **M. Saqib**, J. Hong, et al. *Optimization of SOFC anode microstructure for flatness and performance in commercial-scale cells.* **J. Electrochem. Soc.**, 17, 044509 (2024).
- Q. Tang, **M. Saqib**, A. Anjum, et al. *Direct Non-Oxidative Methane Conversion Ceramic Membrane Reactor with In-Situ Coke Removal.* **Appl. Catal. B: Environmental & Energy**, Submitted/In Review (2025).