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RESEARCH INTEREST

Hydrogen Fuel Cells, Electrolyzers, Energy Conversion and Storage, Energy Efficiency, Transport Phenomena.

EDUCATION

Ph.D. in Mechanical Engineering, University of Connecticut, USA **Aug 2011-Jan 2016**
Dissertation: Cation Contamination in Polymer Electrolyte Fuel Cells: Impacts, Mechanisms, and Mitigation
Advisor: Prof. Ugur Pasaogullari
B.Sc. in Mechanical Engineering, Bangladesh Univ. of Eng. & Tech., Bangladesh **Dec 2004-Oct 2009**

PROFESSIONAL EXPERIENCES

Associate Professor, Bangladesh University of Eng. & Tech (BUET), Dhaka	July 2023 – present
Assistant Professor, Bangladesh University of Eng. & Tech (BUET), Dhaka	Feb 2020 – June 2023
Postdoctoral Research Associate, Los Alamos National Laboratory, USA	Jan 2019 – Jan 2020
Research Scientist, Carnegie Mellon University, Pittsburgh, PA, USA	Sep 2017 – Jan 2019
Postdoctoral Fellow, University of Connecticut (UConn), Storrs, CT, USA	Feb 2016– Aug 2017
Lecturer, Bangladesh University of Eng. & Tech (BUET), Dhaka, Bangladesh	May 2011 – Aug 2011

HONORS AND AWARDS

Graduate Predoctoral Fellowship Award, UConn, 2015 (Best researcher in Mechanical Engineering)
Doctoral Dissertation Fellowship, UConn, 2015 (Top 10% student in doctoral programs)

RECENT RESEARCH PROJECTS

Project: Empowering Women-led Agricultural Microenterprises in Rural Bangladesh *funded by* Gates Foundation. October 2024 – Present

Role: PI, Funding: \$200,000

- The core focus of our project is empowering rural women with **climate-smart technology**—who face systemic disadvantages and are disproportionately affected by **climate change**.

Project: Captive Power Generation for Industries in Bangladesh – Overview and Recommendations on Efficiency Improvement *funded by* Asian Gate Ltd. October 2023– February 2025

Role: PI, Funding: \$35,000

- Evaluated the efficiency, environmental impact, and power quality of captive generator sets in Bangladesh's industries, including a comparison with grid power.
- Explored opportunities for improving performance through high-efficiency gen-sets, co-generation/tri-generation applications, and potential gas savings.

Project: Optimization of Porous Transport Layer for Low-Cost Polymer Electrolyte Membrane Water Electrolyzer *funded by* RISE, BUET. March 2023– August 2024

Role: PI, Funding: \$15,000

- Conducted experimental characterization of common PTLs with varying porosities through thermal conductivity, mechanical, and electrical conductivity measurements to identify materials with high conductivity and strong mechanical stability.

- Developed a computational framework, including a PTL optimization model and a two-dimensional multiphase, multiphysics PEMWE cell model, to propose an improved PTL design for electrolyzers.

Project: Development of a Design Standard for Easybikes in Bangladesh *funded by* BEPRC. Oct 2021– Oct 2023

Role: Co-PI, Funding: \$300,000

- Developed a guideline for standardization of currently used designs, considering the techno-economic feasibility of the Easybikes.
- Proposed a design standardization for new Easybikes and fabricated prototypes in accordance to design standardization guidelines.

JOURNAL PUBLICATIONS

Google Scholar: <https://scholar.google.com/citations?user=oRa4xxUAAAAJ&hl=en>

1. A. Ghosh, M. M. H. Ratul, and **M. A. Uddin**, 'Towards optimized dual-layer PTLs in PEM electrolyzers: A pore network modeling study of fiber-scale design parameters', Int. J. Hydrogen Energy, 198, 152778 (2026). **Impact factor: 8.3**
2. R. U. Hasan, M. I. Moin, A. Saha, and **M. A. Uddin**, 'Machine learning-based prediction of power demand and fuel consumption of a power plant: A case study from Bangladesh', Next Energy, 9, 100444 (2025).
3. F. A. Neerob, U. Pasaogullari, and **M. A. Uddin**, 'Two-dimensional, multiphase, multi-physics modeling of proton exchange membrane water electrolyzer', Int. J. Hydrogen Energy, 151, 150216 (2025). **Impact factor: 8.3**
4. S. Banik, I.A. Khan, A.K.M.M. Morshed, M. Z. R. Khan and **M. A. Uddin**, 'Industrial power needs in Bangladesh: A fuzzy MCDM analysis of captive versus grid solutions' Results in Engineering, 27, 106266 (2025). **Impact factor: 7.9**
5. S Komini Babu, A Yilmaz, MA Uddin, J LaManna, E Baltic, et al., 'A Goldilocks Approach to Water Management: Hydrochannel Porous Transport Layers for Unitized Reversible Fuel Cells', Adv. Energy Mater., 2203952, (2023). **Impact factor: 27.8**
6. D. E. Beltrán, A Uddin, et al., 'Elucidation of Performance Recovery for Fe-Based Catalyst Cathodes in Fuel Cells', Adv. Energy Sustainability Res., 2100123, 2 (2021). **Impact factor: 5.7**
7. L. Dunsmore, **A. Uddin**, H. Zhang, G. Wu, and S. Litster, 'Non-planar platinum group metal-free fuel cell cathodes for enhanced oxygen transport and water rejection', J. Power Sources, 230188, 506 (2021). **Impact factor: 7.9**
8. **A. Uddin**, L. Dunsmore, H. Zhang, L. Hu, G. Wu, and S. Litster, 'High Power Density Platinum Group Metal-free Cathodes for Polymer Electrolyte Fuel Cells', ACS App. Mat. Inter., 12, 2216 (2019). **Impact factor: 8.2**
9. Y. He, S. Hwang, D. Cullen, **M. A. Uddin**, et al., 'Highly active atomically dispersed CoN₄ fuel cell cathode catalysts derived from surfactant-assisted MOFs: carbon-shell confinement strategy', Energy Environ. Sci., 12, 250 (2019). **Impact factor: 30.8**
10. A. N. Aphale, **M. A. Uddin**, et al, 'Synthesis and Stability of Sr_xNi_yO_z Chromium Getter for Solid Oxide Fuel Cells', J. Electrochem. Soc., 165, F635 (2018). **Impact factor: 3.3**
11. C. J. Banas, **M. A. Uddin**, et al, 'Thinning of Cathode Catalyst Layer in Polymer Electrolyte Fuel Cells Due to Foreign Cation Contamination', J. Electrochem. Soc., 165, F3015 (2018). **Impact factor: 3.3**
12. J. Qi, J. Ge, **M. A. Uddin**, et al, 'Evaluation of cathode contamination with Ca²⁺ in proton exchange membrane fuel cells', Electrochim. Acta, 259, 510 (2018). **Impact factor: 5.6**
13. **M. A. Uddin**, et al, 'Electrochemical Validation of In-Cell Chromium Getters to Mitigate Chromium Poisoning in SOFC Stack', J. Electrochem. Soc., 164, F1342 (2017). **Impact factor: 3.3**
14. M. O. Ozdemir, **M. A. Uddin**, et al, 'Experimental observation of the effect of cleansing agents on the performance of polymer electrolyte fuel cells', Int. J. Hydrogen Energy, 42, 26068 (2017). **Impact factor: 8.3**

15. J. Park, **M. A. Uddin**, L. Bonville, and U. Pasaogullari, 'Changes in the Wettability of Polymer Electrolyte Fuel Cells Components during Cationic Contamination and Mitigation', *Int. J. Hydrogen Energy*, 42, 21146 (2017). *Impact factor: 8.3*
16. Su J. Heo, B. Hu, **M. A. Uddin** et al, 'Role of Exposure Atmospheres on Particle Coarsening and Phase Transformation of LiAlO₂', *J. Electrochem. Soc.*, 164, H5086 (2017). *Impact factor: 3.3*
17. **M. A. Uddin**, J. Park, L. Bonville, and U. Pasaogullari, 'Effect of hydrophobicity of Gas Diffusion Layer in Calcium Cation Contamination in Polymer Electrolyte Fuel Cells', *Int. J. Hydrogen Energy*, 41, 14909 (2016). *Impact factor: 8.3*
18. **M. A. Uddin** and U. Pasaogullari, 'Light-Matter Interactions in Aligned Silver Nanorod Arrays', *Thin Solid Films*, 616, 247 (2016). *Impact factor: 2*
19. **M. A. Uddin**, X. Wang, J. Park, U. Pasaogullari, and L. Bonville, 'Distributed Effects of Calcium Ion Contaminant on Polymer Electrolyte Fuel Cell Performance' *J. Power Source*, 296, 64 (2015). *Impact factor: 7.9*
20. **M. A. Uddin**, X. Wang, J. Qi, O. Ozdemir, U. Pasaogullari, L. Bonville, and T. Molter, 'Effect of Chloride on PEFCs in Presence of Various Cations', *J. Electrochem. Soc.*, 162, F373 (2015). *Impact factor: 3.3*
21. **M. A. Uddin**, J. Qi, X. Wang, U. Pasaogullari, and L. Bonville, 'Distributed Cation Contamination from Cathode to Anode Direction in Polymer Electrolyte Fuel Cells', *Int. J. Hydrogen Energy*, 40, 13099 (2015). *Impact factor: 8.3*
22. J. Qi, X. Wang, M. O. Ozdemir, **M. A. Uddin**, et al., 'Effect of Cationic Contaminants on Polymer Electrolyte Fuel Cell Performance', *J. Power Source*, 286, 18 (2015). *Impact factor: 7.9*
23. **M. A. Uddin**, and U. Pasaogullari, 'Computational Modeling of Foreign Cation Contamination in PEFCs', *J. Electrochem. Soc.*, 161, F1081 (2014). *Impact factor: 3.3*
24. X. Wang, J. Qi, O. Ozdemir, **A. Uddin**, U. Pasaogullari, L. Bonville, and T. Molter, 'Ca²⁺ as an Air Impurity in Polymer Electrolyte Membrane Fuel Cells', *J. Electrochem. Soc.*, 161, F1006 (2014). *Impact factor: 3.3*

ARCHIVAL CONFERENCE PUBLICATIONS

1. C. J. Banas, M. T. A. Arman, **M. A. Uddin**, J. Park, L. J. Bonville, and U. Pasaogullari, "Polymer Electrolyte Fuel Cell Degradation through Foreign Cation Contamination, Proton Depletion and Carbon Corrosion." *ECS Trans.*, 86 (13) 407 (2018).
2. B. Hu, A. N. Aphale, C. Liang, S. J. Heo, **M. A. Uddin**, and P. Singh, 'Carbon Tolerant Double Site Doped Perovskite Cathodes for High-Temperature Electrolysis Cells', *ECS Trans.*, 78 (1), 3257 (2017).
3. S. J. Heo, B. Hu, A. N. Aphale, **M. A. Uddin**, and P. Singh, 'Low Temperature Chromium Poisoning of SOFC Cathode', *ECS Trans.*, 78 (1), 1055 (2017).
4. S. Ganesan, **M. A. Uddin**, U. Pasaogullari, L. Bonville, and T. Molter, 'Impact of Cationic Impurities on Low-Pt Loading PEFC Cathodes', *ECS Trans.*, 66 (24), 19 (2015).
5. J. Park, **M. A. Uddin**, S. Ganesan, U. Pasaogullari, L. Bonville, and T. Molter, 'Effects on Wetting Agents in Cationic Contamination and Mitigation in PEFCs', *ECS Trans.*, 66 (24), 91 (2015).
6. **M. A. Uddin**, S. Ganesan, U. Pasaogullari, L. Bonville, and T. Molter, 'A Cationic Contamination in PEFC Cathode: A Cause and Effect Study', *ECS Trans.*, 66 (24), 29 (2015).
7. **M. A. Uddin**, J. Park, J. Qi, U. Pasaogullari, L. Bonville, and T. Molter 'The Role of Gas Diffusion Layer in Cationic Contamination and Mitigation in Polymer Electrolyte Fuel Cells', *ECS Trans.*, 64 (3), 537 (2014).
8. **M. A. Uddin**, J. Qi, X. Wang, M. O. Ozdemir, Bonville, U. Pasaogullari, and T. Molter, 'Study of through Plane Cation Contamination in Polymer Electrolyte Fuel Cell', *ECS Trans.*, 61 (12), 37 (2014).
9. **M. A. Uddin**, X. Wang, M. O. Ozdemir, J. Qi, L. Bonville, U. Pasaogullari, and T. Molter, 'Distributed PEFC Performance during Cationic Contamination', *ECS Trans.*, 61 (12), 49 (2014).
10. **M. A. Uddin**, U. Pasaogullari, and T. Molter, 'Computational Modelling of Cation Contamination in PEFCs', *ECS Trans.*, 64 (3), 705 (2014).

11. **M. A. Uddin**, X. Wang, J. Qi, O. Ozdemir, U. Pasaogullari, L. Bonville, and T. Molter, 'Effects of Chloride Contamination on PEFCs', ECS Trans., 58 (1), 543 (2013).
12. J. Qi, X. Wang, M. O. Ozdemir, **M. A. Uddin**, L. Bonville, and T. Molter, 'Effect of Cationic Contaminants on Polymer Electrolyte Fuel Cell Performance', ECS Trans., 58 (1), 537 (2013).
13. P.V. Biswas, **M.A. Uddin**, M.A. Islam, et al., Harnessing raindrop energy in Bangladesh, Proceedings of the International Conference on Mechanical Engineering, ICME09-AM-29, (2009).

MEETING ABSTRACTS AND PRESENTATIONS

1. L. Langhorst, **M. A. Uddin**, H. Zhang, G. Wu, and S. Litster, 'Limiting current measurements of oxygen transport resistance in platinum group metal-free fuel cell cathodes' 236th ECS meeting, Atlanta, GA, October 13-17, 2019.
2. **M. A. Uddin**, L. Langhorst, H. Zhang, Y. Guo, X. Xu, D. Beltran, G. Wu, and S. Litster, 'Progress Towards High Power Density and Durable PEFCs with PGM-Free Cathodes' 235th ECS meeting, Dallas, Texas, May 26-31, 2019, abstract 1811. **(Invited)**
3. **M. A. Uddin**, L. Langhorst, Y. Guo, H. Zhang, M. Chen, D. A. Cullen, K. L. More, H. Xu, G. Wu, and S. Litster, 'Development of PEFC Membrane Electrode Assemblies for Iron-Doped Metal Organic Framework Catalysts' 234th ECS meeting Cancun, Mexico, Sep 3-Oct 4, 2018, abstract 115690.
4. **M. A. Uddin**, C. J. Banas, U. Pasaogullari, K. P. Recknagle, B. J. Koeppel, J. W. Stevenson, and P. Singh, 'Design and Optimization of Chromium Getter for SOFC Systems through Computational Modeling', SOFC-XV 15th Int. Symposium on SOFC, Hollywood, FL, July 23-28, 2017, abstract 101100.
5. **M. A. Uddin**, A. N. Aphale, B. Hu, U. Pasaogullari, and P. Singh, 'In Cell Chromium Getters to Mitigate Cathode Poisoning in SOFC Stack', SOFC-XV 15th Int. Symposium on SOFC, Hollywood, FL, July 23-28, 2017, abstract 100253.
6. A. N. Aphale, **M. A. Uddin**, B. Hu, C. Liang, J. Webster, and P. Singh, 'Chemical and Structural Stability of Sr_xNi_yO_z Chromium Getter for SOFC Systems', SOFC-XV 15th Int. Symposium on SOFC, Hollywood, FL, July 23-28, 2017, abstract 101108.
7. S. J. Heo, B. Hu, A. N. Aphale, **M. A. Uddin**, and P. Singh, 'Low Temperature Chromium Poisoning of SOFC Cathode', SOFC-XV 15th Int. Symposium on SOFC, Hollywood, FL, July 23-28, 2017, abstract 101108.
8. B. Hu, A. N. Aphale, C. Liang, S. J. Heo, **M. A. Uddin**, and P. Singh, 'Carbon Tolerant Double Site Doped Perovskite Cathodes for High Temperature Electrolysis Cells', SOFC-XV 15th Int. Symposium on SOFC, Hollywood, FL, July 23-28, 2017, abstract 101108.
9. C. Liang, B. Hu, A. Aphale, W. Rodriguez, **M. A. Uddin**, and P. Singh, 'Mitigation of Chromium Assisted Degradation of LSM Cathode in SOFC', 230th ECS Meeting, Chicago, IL, Oct 2-7, 2016, abstract 93729.
10. **M. A. Uddin**, S. Ganesan, U. Pasaogullari, L. Bonville, and T. Molter, 'A Cationic Contamination in PEFC Cathode: A Cause and Effect Study', 227th ECS Meeting, Chicago, IL, May 24-28, 2015, abstract 1549.
11. **M. A. Uddin**, 'Tailored Light-Matter interactions in PVD Grown Nanostructures', Mechanical Engineering Research Competition, University of Connecticut, April 17, 2015.
12. **M. A. Uddin**, J. Park, U. Pasaogullari, L. Bonville, 'Cation Contamination in Polymer Electrolyte Fuel Cells: Impacts, Mechanisms, and Mitigation', ECS Conference on Electrochemical Energy Conversion & Storage with SOFC-XIV, Glasgow, Scotland, July 26-31, 2015, abstract 647.
13. J. Park, **M. A. Uddin**, U. Pasaogullari, and L. Bonville, 'A Study of Cationic Contamination and Mitigation on GDL/MPL Wettability and Metallic Plate Corrosion for PEFCs', ECS Conference on Electrochemical Energy Conversion & Storage with SOFC-XIV, Glasgow, Scotland, July 26-31, 2015, abstract 614.
14. S. Ganesan, **M. A. Uddin**, U. Pasaogullari, L. Bonville, and T. Molter, 'Impact of Cationic Impurities on Low-Pt Loading PEFC Cathodes', 227th ECS Meeting, Chicago, IL, May 24-28, 2015, abstract 1548.
15. J. Park, **M. A. Uddin**, S. Ganesan, U. Pasaogullari, L. Bonville, and T. Molter, 'Effects on Wetting Agents in Cationic Contamination and Mitigation in PEFCs', 227th ECS Meeting, Chicago, IL, May 24-28, 2015, abstract 1592.

16. **M. A. Uddin**, U. Pasaogullari, and T. Molter, 'Computational Modelling of Cation Contamination in PEFCs', 226th ECS and SMEQ Joint International Meeting, Cancun, Mexico, Oct 5-9, 2014, abstract 1033.
17. **M. A. Uddin**, J. Park, J. Qi, U. Pasaogullari, L. Bonville, and T. Molter, 'The Role of Gas Diffusion Layer in Cationic Contamination and Mitigation in PEFCs', 226th ECS and SMEQ Joint International Meeting, Cancun, Mexico, Oct 5-9, 2014, abstract 1229.
18. **M. A. Uddin**, X. Wang, M. O. Ozdemir, J. Qi, L. Bonville, U. Pasaogullari, and T. Molter, 'Distributed PEFC Performance during Cationic Contamination', 225th ECS Meeting, Orlando, FL, May 11-15, 2014, abstract 638.
19. **M. A. Uddin**, J. Qi, X. Wang, M. O. Ozdemir, N.K.H. Dalasam L. Bonville, U. Pasaogullari, and T. Molter, 'Study of through Plane Cation Contamination in Polymer Electrolyte Fuel Cell', 225th ECS Meeting, Orlando, FL, May 11-15, 2014, abstract 637.
20. W. Wu, J. Y. Wu, **M. A. Uddin**, and M. T. Pettes, 'Bulk nanostructured bismuth telluride networks templated by PS-b-PEO block copolymer', Poster session presented at the Spring Meeting of the Materials Research Society, San Francisco, California, USA, April 21-25, 2014, NN6.34.
21. **M. A. Uddin**, X. Wang, J. Qi, O. Ozdemir, U. Pasaogullari, L. Bonville, and T. Molter, 'Effects of Chloride Contamination on PEFCs', 224th ECS Meeting, San Francisco, CA, Oct 17-Nov 1, 2013, abstract 1334.
22. J. Qi, X. Wang, M. O. Ozdemir, **M. A. Uddin**, L. Bonville, and T. Molter, 'Effect of Cationic Contaminants on PEFC', 224th ECS Meeting, San Francisco, CA, Oct 17-Nov 1, 2013, abstract 1333.