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h-index: 9; Total citations: >470 (Data from Google Scholar)

EDUCATION:

Stanford University

Postdoctoral Scholar in Chemical Engineering, Oct. 2023 – present

Northwestern University

Pre-doctoral Fellow in Chemistry, Dec. 2022 – Sept. 2023

University of Toronto

Ph.D. in Electrical & Computer Eng. (4.00/4.00), Sept. 2019 – Nov. 2022

Thesis: *Programmable Self-Regenerating Bioelectronic Devices*.

McGill University

Mini-MBA (online), McGill Executive Institute, Jan. 2021 – June. 2021

NSERC CREATE Fellow in Chemistry (hybrid), Sept. 2020 – Aug. 2023

University of Waterloo

M.A.Sc. in Nanotechnology (94.7%), Sept. 2016 – Nov. 2018

Thesis: *Advanced Nanoelectromechanical Systems for Next Generation Energy Harvesting*.

Bangladesh University of Engineering and Technology

B.Sc.Engg. in Electrical and Electronic Engineering (with Highest Honors), May 2010 – Sept. 2015

UG Thesis: *Carbon Nanotube Field Effect Transistor – Circuit Level Implication and Performance Analysis*.

PROFESSIONAL APPOINTMENTS AND EXPERIENCE:

Stanford University: Stanford, California.

October 2023 to present

Postdoctoral Scholar, Bao Research Group, Department of Chemical Engineering

Projects:

- (i) Laser-printed graphene nanozymes for monitoring neurotransmitters and hormones in real time in living animals for precision mental health, in collaboration with the research group of Prof. Leanne M. Williams in the Psychiatry and Behavioral Sciences department at Stanford School of Medicine.
- (ii) Soft, intrinsically stretchable polymeric materials for recording and stimulating neural activities at the single neuron level, in collaboration with several research groups from the department of Neurosurgery and Wu Tsai Neurosciences Institute at Stanford School of Medicine.

Northwestern University: Evanston, Illinois.

December 2022 to September 2023

Pre-doctoral Fellow, Kelley Laboratory, Department of Chemistry

Visiting Scholar, Rogers Research Group, Querrey/Simpson Institute for Bioelectronics

Projects:

- (i) A laser-engraved graphene-based wearable electronic sensing platform for on-body sweat cytokine analysis, in collaboration with researchers from the Gao Research Group in the department of Medical Engineering at California Institute of Technology.

- (ii) A laser-machined gold electrode-based electrochemical wearable microfluidic sweat sensor.

University of Toronto: Toronto, Ontario.

September 2019 to December 2022

Research Assistant – Sargent Group, Department of Electrical & Computer Engineering.

Graduate Trainee – Leslie Dan Faculty of Pharmacy, and Temerty Faculty of Medicine.

Researched on DNA nanotechnologies, applied electrochemistry, and bioelectronics!

Developed novel reagent-free bioelectronic technologies for sensing, diagnostics, and therapeutics.

NanoMedicine Innovations Network: Vancouver, British Columbia.

September 2019 to December 2021

HQP - Developed micro-fluidic devices for early diagnosis of lung cancer by analyzing and profiling exosomal biomarkers.

Waterloo Institute for Nanotechnology: Waterloo, Ontario.

November 2018 to July 2019

Research and Development Specialist - Developed self-powered sensor technology utilizing triboelectric and piezoelectric energy harvesting mechanism.

University of Waterloo

January 2017 to August 2018

Teaching Assistant, Department of Electrical and Computer Engineering

Sonargaon University

January 2016 to August 2016

University Lecturer, Department of Mechanical Engineering

SELECTED PUBLICATIONS:

For a complete list of publications, please see my [Google Scholar](#) profile. *Denotes equal contribution

- (i) **A. Mahmud**, D. Chang, J. Das, S. Gomis, J.B. Chen, H. Yousefi, L. Pandey, E.H. Sargent, S.O. Kelley, Monitoring Cardiac Biomarkers Using Aptamer-based Molecular Pendulum Sensors, *Angewandte Chemie International Edition* 2023, e202213567.
- (ii) D. Chang*, D. Z. Wang*, C. D. Flynn, **A. Mahmud**, H. Wang, A. Geraili, X. Li, J. Zhang, E.H. Sargent, S.O. Kelley, A high-dimensional microfluidic approach for selection of aptamers with programmable binding affinities, *Nature Chemistry* 15, 773–780 (2023).
- (iii) D. Flynn, D. Chang, **A. Mahmud**, H. Yousefi, J. Das, K. Riordan, E. H. Sargent, S. O. Kelley, Biomolecular sensors for advanced physiological monitoring, *Nature Reviews Bioengineering* 1, 560–575 (2023).
- (iv) A. Clifford, J. Das, H. Yousefi, **A. Mahmud**, J.B. Chen, S.O. Kelley, Strategies for Biomolecular Analysis and Continuous Physiological Monitoring, *Journal of the American Chemical Society* 2021, 143 (14), 5281–5294.
- (v) H. Yousefi*, **A. Mahmud***, D. Chang*, J. Das, S. Gomis, J.B. Chen, H. Wang, T. Been, L.Yip, E. Coomes, Z. Li, S. Mubareka, A. McGeer, N. Christie, S. Gray-Owen, A. Cochrane, J.M. Rini, E.H. Sargent, S.O. Kelley, "Detection of SARS-CoV-2 Viral Particles Using Direct, Reagent-Free Electrochemical Sensing, *Journal of the American Chemical Society* 2021, 143 (4), 1722–1727.
- (vi) J. Das*, S. Gomis*, J. B. Chen, H. Yousefi, S. Ahmed, **A. Mahmud**, W. Zhou, E. H. Sargent, and S. O. Kelley, Reagentless Biomolecular Analysis Using a Molecular Pendulum, *Nature Chemistry* 13, 428–434 (2021).
- (vii) A.A. Khan, **A. Mahmud**, P. Voss, S. Islam, and D. Ban, A self-powered multi-broadcasting wireless sensing system realized with an all-in-one triboelectric nanogenerator, *Nano Energy* 62 (2019) 691–699.

- (viii) **A. Mahmud**, A.A. Khan, P. Voss, S. Islam, and D. Ban, Integration of organic/inorganic nanostructured materials in a hybrid nanogenerator enables efficacious energy harvesting via mutual performance enhancement, *Nano Energy*, 58 (2019) 112–120.
- (ix) A.A. Khan, **A. Mahmud**, D. Ban, Evolution of Single to Hybrid Nanogenerator: A Contemporary Review on Multimode Energy Harvesting for Self-Powered Electronics, *IEEE Transactions on Nanotechnology*, 18, 21-36, 2019.
- (x) **A. Mahmud**, A.A. Khan P. Voss, T. Das, E. Abdel-Rahman and D. Ban, A High Performance and Consolidated Piezoelectric Energy Harvester Based on 1D/2D Hybrid Zinc Oxide Nanostructures, *Advanced Materials Interfaces* 2018, 1801167

SELECTED RESEARCH TALKS:

2023 **ACS Fall Meeting**. (San Francisco, California) Body-Interfaced Bioelectronic Systems for Advanced Physiological Monitoring.

2023 **Bioelectronics, Gordon Research Conference**. (Andover, New Hampshire) Programmable Self-Regenerating Bioelectronic Devices.

2022 **MRS Spring Meeting & Exhibit**. (Honolulu, Hawaii) Integrating molecular pendulums with laser-engraved graphene for continuous wearable biosensing.

2021 **Electrochemical Society Meeting**. (Digital Meeting) Monitoring of Cardiac Disease with Reagent-free Molecular Pendulum Aptasensors.

2021 **American Heart Association Scientific Session**. (Boston, Massachusetts) Precision Quantification of Cardiac Biomarkers Using Reagent-Free Electrochemical Sensors.

(Invited) 2021 **31st Anniversary World Congress on Biosensors**. (Online Event) Reagent-Free Electrochemical Sensor for Intact SARS-CoV-2 Viral Detection.

2019 **International Conference on Nanoenergy and Nanosystems**. Synergistic Effect of a Piezoelectric and a Triboelectric Nanogenerator Leads to the Performance Enhancement of a Hybrid Energy Harvester.

2018 **International Conference & Exhibition on Advanced & Nano Materials**. (Quebec City, Quebec) The enhanced performance of flexible piezoelectric nanogenerator using p-n junction type ZnO nanowires.

2018 **MRS Electronic Materials Conference**. (Santa Barbara, California) Low temperature hydrothermal synthesis of ZnO nanowire arrays on metal substrates for energy harvesting.

2016 **International Conference on Electrical and Computer Engineering**. (Dhaka, Bangladesh) Optimization of CNFET op amp for high frequency operation in sub-10-nm node.

PATENTS:

S.O. Kelley, E.D. Sargent, J. Das, S. Gomis, J. Chen, S. Ahmed, H. Yousefi, D. Chang, **A. Mahmud**, REAGENTLESS ELECTROCHEMICAL BIOSENSOR," PCT/CA2021/050270

S.O. Kelley, H. Yousefi, **A. Mahmud**, D. Chang, J. Das, S. Gomis, J. Chen, Device and Method for Reagent-Free Electrochemical Quantification of Viral Particles, Canada. Disclosure Reference No: 10004008. 2020/06/03

A.A. Khan, **A. Mahmud**, Y. Zhang, D. Ban, S. Islam, P. Voss, "Triboelectric nanogenerator-powered transmission system," US patent. Application No: 62853101. 2019/05/27

A. Mahmud, A.A. Khan, P. Voss, D. Ban, "1D/2D Hybrid Piezoelectric Nanogenerator and Method for Making Same," US Patent App. 16/430, 820

HONORS AND COMPETITIVE SCHOLARSHIPS:

Predoctoral Fellowship, Northwestern University	2022-2023
NSERC CREATE PROMOTE Fellowship, McGill University	2020-2023
University of Toronto Fellowship, Department of Electrical and Computer Engineering	2019-2023
Edward S. Rogers Sr. Graduate Scholarship, University of Toronto	2019
Nanofellowship, Waterloo Institute for Nanotechnology	2017
Faculty of Engineers Award, University of Waterloo	2017
Nanofellowship, Waterloo Institute for Nanotechnology	2016
International Master's Student Award, University of Waterloo	2016-2018
Dean's List Award, Bangladesh University of Engineering and Technology	2015
University Merit Scholarship, Bangladesh University of Engineering and Technology	2010-2015

VOLUNTEERING ACTIVITIES:

Independent Journal Reviewer

Reviewed research manuscripts for several international journals including *ACS Sensors*, *Science Advances*, *Advanced Functional Materials*, *Nanotechnology*, *Solid-State Electronics*.

Organization of Group

I initiated and led the Energy Harvesting sub-group in Prof. Dayan Ban's lab at the University of Waterloo, which has led to a current multimillion dollar research program. I contributed to drafting concepts, grant proposals, and progress reports in Prof. Shana Kelley's group. My successful grant applications include a research grant from Toronto COVID-19 Action Initiative, Canada in 2020, \$4 M research grant from the Defense Advanced Research Projects Agency (DARPA), USA in 2023.

Leadership Contributions

I worked with a team of scientists to establish the electromechanical device characterization facility at the Waterloo Institute for Nanotechnology, which has been very successful (12+ peer-reviewed articles with 4 global patents in just five years). I have collaborated with several academic and industry partners (Prof. Wei Gao from Caltech, Prof. John Rogers from Northwestern University, and Analog Devices Inc.) for the development and strategic planning of a new biosensing technology for personalized health and wellness.

Mentorship

I mentored Dr. A.A. Khan and M. Rana, members of Prof. Dayan Ban's group at the University of Waterloo, on their doctoral dissertation (co-authored articles *Nano Energy* 2019, *IEEE Transactions on Nanotechnology* 2018). During my PhD, I mentored 1 Research Assistant Professor (Prof. A. GhavamiNejad), 6 post-docs (Dr. D. Chang, Dr. A. Clifford, Dr. H. Zargartalebi, Dr. X. Yang at the University of Toronto; Dr. K. Yang, Dr. K. Madsen at Northwestern University), 8 PhD students (Dr. H. Yousefi, Dr. J. Chen, F. Esmaili, C.D. Flynn, A. Geraili, L. Pandey, K. Riordan, Z. Wu), and several undergrads in Prof. Shana Kelley's group. I also mentored 3 engineers (Dr. S. Gomis, D. Dave, V. Kale) of ARMA Biosciences, to accelerate the translation of technologies based on my PhD thesis.

PERSONAL:

Hobbies

Triathlon, wellness, mindfulness, stargazing, painting & journaling.

Birthplace and date

Jessore, Khulna, Bangladesh. December 31, 1991.

Vision

I imagine an equitable, unbiased world where everyone – regardless of their race, nationality, age, gender, sexual orientation, and socio-economic background – will be able to explore the boundless possibilities of science & arts to advance knowledge and augment human capabilities.