A K M Fazlul Karim Rasel

arasel@asu.edu

Research Interest

Analytical Chemistry, Biomedical Engineering, Microfluidics, Biosensors, Advanced Diagnostics, Organs-on-a-chip, Electrokinetic Characterization and Transport, Separation Science, Dielectrophoresis, Modeling based on Finite Element Analysis

Skills

Microfluidics: Device design (AutoCAD, SolidWorks), Simulations (COMSOL Multiphysics), Microfabrication (soft lithography, PDMS molding and bonding), Integration of pumps, Testing & characterization (scanning electron microscopy, experiments in patch clamp and cyclic voltammetry, fluorescence microscopy, confocal microscopy, particle size analysis, pressure and flow rate analysis)

Programming and Data Analysis: Python, MATLAB, ImageJ, Excel

Statistical Analysis and Process Optimization: Experimental Design, Failure Mode and Effect Analysis (FMEA), Quality Control (QC), Statistical Process Control (SPC), Image Processing, Data Visualization

Chemistry: Electrochemistry (Patch Clamp, CV, Electrophoresis, Dielectrophoresis), Analytical chemistry, Chromatography (HPLC, PC, TLC), Spectroscopy (UV-Vis, FTIR, NMR), Mass spectrometry (GC-MS)

Soft skills: Leadership, Project management, Self-motivated, Creative and critical thinking, Cross functional collaboration, Documentation and reporting

Education

Doctor of Philosophy in Chemistry | Arizona State University
August 2019 – February 2026 (expected)
Research Advisor: Mark A Hayes
Dissertation: **Characterization and Separation of Micro- and Nano-scale Particles by Insulator-based Dielectrophoresis in Microfluidics**
Notable Courses: Bioanalytical Microfluidics, Separation Science, Advanced Inorganic Chemistry, Scientific Writing for Chemists, Organometallic Chemistry, Advanced Electrochemistry

Master of Science in Physical Chemistry | University of Dhaka
Research Advisor: Md Mufazzal Hossain
Thesis: Preparation and characterization of copper doped zinc oxide, and its application on the removal of a textile dye, Remazol Black B by formation of aqueous suspension
Notable Courses: Chemistry of Materials, Electrochemistry, Advanced Photochemistry, Atmospheric Chemistry, Advanced Spectroscopy and Molecular Symmetry, Supramolecular and Nano Chemistry

Bachelor of Science in Chemistry | University of Dhaka

Research Experience

Microfabrication Intern, Bioelectronics Research Group
Robert Bosch LLC, Sunnyvale, CA
June 2025 – present

- Accelerate development of new genomic analysis tools through designing comprehensive testing plans
- Fabricate microfluidic components of advanced bioelectronic devices using soft lithography
- Conduct structural analysis of Pt/SiO2-based chips by Scanning Electron Microscope (SEM)

- Evaluate electrochemical behavior of target solutions of biomolecules conducting experiments in patch clamp utilizing nanogap sensor technology
- Improve decision making by timely preparing reports and presentations and effectively communicating research findings to stakeholders

Graduate Research/Teaching Assistant
Arizona State University, Tempe, AZ
August 2019 – May 2025

- **Conducted** experiments on 7 type of microscale minerals using PDMS-based microfluidic devices and advanced microscopy, **revealing carbon–mineral interactions.**
- Designed 20+ microfluidic devices in CAD tools and performed FEA simulations in COMSOL Multiphysics to optimize transfer of dielectrophoresis-induced separated fractions and achieved 100 % mass transfer and 10 times concentration increment in the optimized device.
- Conducted experiments with custom-built laser light scattering system to characterize mouse coronavirus in BSL-2 environment, enabling development of viral detection method.
- Introduced streaming dielectrophoresis technique for characterizing nanoscale particles using their electrophysical signatures and extracted novel insights into enhanced green fluorescent protein and establishing a data pipeline to advance DEP theory.
- Investigated gold nanoparticles in 10 nm size under gradient-induced forces by conducting COMSOL modeling to quantify force interactions at the nanoscale.
- Quantified the resolution capability of dielectrophoresis induced separation technique by FEA-based modeling.

Journal Publications

1. **Rasel AKMFK**, Seyler SL, Hayes MA *****. "A numerical study on microfluidic devices to maintain the concentration and purity of dielectrophoresis-induced separated fractions of analyte", 2023, Analytical and bioanalytical chemistry, Vol 415, Issue 20, pp. 4861–4873. (**Highlighted as Paper in Forefront**)
2. Sheu J, Seyler SL, **Rasel AKMFK**, Hayes MA*. "Enhanced green fluorescent proteins streaming dielectrophoresis in insulator-based microfluidic Devices", 2025, Electrophoresis, Vol 46, Issue 15, pp 1149-1158
3. Ramirez AJ, **Rasel AKMFK**, Seyler SL, Hayes MA*****. "Gradient insulator-based dielectrophoresis of gold nanoparticles", 2025, Electrophoresis, Vol 46, Issue 11-12, pp 768-776
4. **Rasel AKMFK**, Ristich E, Hayes MA, Seyler SL*****. "Streaming-particle method for dielectrophoretic characterization", 2025, Electrophoresis, Vol 46, Issue 17, pp 1341-1357
5. Sheu J[ǂ], **Rasel AKMFK**[ǂ], Hayes MA*. "Sorting, Streaming and focusing dielectrophoresis: review". (Submitted in Analytica Chimica Acta); [ǂ] co-first author
6. Nguyen H, **Rasel AKMFK,** McLaren AC, Hayes MA*. "Decision-support enabling study for a new pathogen identification system". (Manuscript in preparation)
7. **Rasel AKMFK**, Johnson EN, Hartnett HE, Hayes MA*. "Probing carbon deposition on microscale minerals by insulator-based dielectrophoresis. (Manuscript in preparation)
8. Nguyen H, **Rasel AKMFK,** McLaren AC, Hayes MA*. Quantifying and minimizing the variance of insulator-based gradient dielectrophoresis device. (Manuscript in preparation)

Conference Poster Presentation (Notable)

1. **Rasel** et al., "Assessing microscale marine sediments by insulator-based dielectrophoresis", **International Symposium on Microscale Separations and Bioanalysis, May 18-21, 2025**, Memorial Union, Arizona State University, Tempe, Arizona, USA.
2. **Rasel** et al., "Streaming Mode Dielectrophoresis to Characterize Micro and Nanoscale Particles", **SCIX Conference 2024**, October 20–25, 2024, Raleigh, North Carolina, USA. (**Won Poster Award**)

3. **Rasel** et al., “Determination of Dipole Moments of Nanoparticles Utilizing Dielectrophoresis”, **ACS Spring 2024**, March 17–21, 2024, New Orleans, Louisiana, USA. (**Selected by Program Chair for SciMix**)
4. Harnett, **Rasel** et al., “Characterization of Sediments by Dielectrophoresis – A New Tool to Explore Organic Matter-mineral Interactions”, **2024 Goldschmidt Conference**, August 18-23, 2024, Chicago, Illinois, USA.
5. **Rasel** et al., “Dipole Measurement of Nanoparticles with Dielectrophoresis”, **Pittcon Conference and Exposition**, February 24–28, 2024, San Diego, California, USA.
6. **Rasel** et al., “A Numerical Investigation on Microfluidic Devices to Maintain the Purity and Concentration of Separated Fractions of Bioparticles”, **SCIX 2022 conference**, October 2-7, 2022, Northern Kentucky Convention Center, Covington, Kentucky, USA.
7. **Rasel** et al., “A numerical Investigation to Extend Quantification of Gradient-induced Forces within an Insulator – based Saw-tooth Design”, **DEP 2020.1 conference**, July 26-28, 2021, Northern Arizona University, Flagstaff, Arizona, USA.

Teaching Experience

Graduate Teaching Assistant, Arizona State University, Tempe, AZ, USA

- performed laboratory sessions; courses included General Chemistry, Organic Chemistry, and Analytical Chemistry
- taught around 1000 undergrad students and helped them develop their hands-on skills with techniques such as FTIR, HPLC, H-NMR, and GC-MS.
- graded test papers and lab reports, and proctored examinations of undergraduate students

Awards/Leadership Positions

- Outstanding Research Award by GSG at ASU 2025
- Student Poster Award by SAS in SciX 2024
- Travel Grant by ASU GSG 2024 – 2025
- Teaching Excellence Award by ASU GPSA 2024
- Travel Grant by ASU GPSA 2023 – 2024
- Vice President, ASU Bangladesh Students’ Association, 2024
- General Secretary, ASU Bangladesh Students’ Association, 2022

References

- Mark A Hayes (PhD)
  Professor
  School of Molecular Sciences
  Arizona State University, Tempe, Arizona
  MHayes@asu.edu

- Christopher Johnson (PhD)
  Senior Expert
  Bioelectronics Corporate Research, Health Care Solutions
  Robert Bosch LLC, Sunnyvale, California
  christopher.johnson2@us.bosch.com

- Hilairy E Hartnett (PhD)
  Professor and Director
  School of Oceanography
  University of Washington, Seattle, Washington
  hartnett@uw.edu