MD MASUDUR RAHMAN

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EDUCATION

University of South Carolina – Columbia, SC — May 2023
Doctor of Philosophy in Chemical Engineering

Bangladesh University of Engineering and Technology – Dhaka, Bangladesh. — September 2015
Bachelor of Science in Chemical Engineering

RESEARCH PROJECTS

- *In situ* Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS) study to investigate oxidation reaction mechanisms of ethanol, methanol, acetaldehyde, and formaldehyde on commercial diesel oxidation catalysts (DOC) for emissions control.
- Study the effects of CO on alcohol (CH_3OH and C_2H_5OH) mutual inhibition on commercial oxidation catalysts for emissions control from lean-burn engines.
- Development of Ag based catalyst for direct epoxidation of ethylene to ethylene oxide (EO) using molecular oxygen and Ag catalyst for commercial application.
- Fundamental study of Ag based catalysts for direct epoxidation of propylene-to-propylene oxide (PO). (Ph. D. dissertation)
- Measurement of surface-active Ag sites concentration of promoted Ag based catalysts used in alkene epoxidation reactions by H_2 pulse titration on oxygen pre-covered surface. (Ph. D. dissertation)
- Study the role of nitric oxide (NO) to increase activity and ethyl chloride (C_2H_5Cl) to improve selectivity in direct epoxidation of propylene.
- Synthesis of mono and bimetallic catalysts using strong electrostatic adsorption (SEA) and electroless deposition (ED) methods.
- Dehydrogenation of methylcyclohexane (MCH) to toluene and vice versa to use MCH as H_2 storage medium.
- Identification of inexpensive natural bio-preservatives for food processing applications. (Bachelor thesis).

PROFESSIONAL EXPERIENCE

Post Doctoral Research Associate **|** Oak Ridge National Laboratory – Knoxville, TN — May 2023 – Present

- Catalyst development for off-road vehicles to meet emissions control regulations by using net-zero carbon fuels.
- Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS) study to investigate oxidation reaction mechanisms of ethanol, methanol, acetaldehyde, and formaldehyde on commercial diesel oxidation catalysts (DOC).

Graduate Research Assistant **|** University of South Carolina – Columbia, SC — Aug 2018 – Apr 2023

- Designed and assembled single and multiple micro-reactors. Quantified reactor outlet chemical components using online gas chromatography (GC) equipped with flame ionization detector (FID)

and thermal conductivity detector (TCD) to investigate/study catalytic performance, kinetics, and catalyst characterization.

- Conducted temperature-programmed reduction/desorption/reaction studies using a residual gas analyzer (RGA).
- Prepared catalysts using strong electrostatic adsorption (SEA), electroless deposition (ED) and dry/wet impregnation method.
- Performed catalyst characterization using Scanning Electron Microscopy (SEM) imaging, Energy Dispersive X-ray Spectroscopy (EDXS), Chemisorption, Brunauer-Emmet-Teller (BET) surface analysis, Barrett-Joyner-Helenda (BJH) pore size analysis, Inductively Coupled Plasma (ICP)-Optical Emission Spectroscopy (OES), X-Ray Diffraction (XRD) analysis techniques.

Graduate Teaching Assistant | University of South Carolina – Columbia, SC Aug 2018 – May 2020

- Instructed in the unit operation lab, supervised the experiments, and graded the lab reports.
- Graded homework and term papers, proctored the exams, assisted the students with solving homework and project problems.

Undergraduate Intern
Karnaphuli Fertilizer Company Limited – Chattogram, Bangladesh May 2014 – Jun 2014

- Attended industrial process safety, troubleshooting, and standard operation procedure (SOP) preparation training.
- Acquired knowledge on H_2 production from natural gas by steam reforming, Haldor Topsoe process of producing ammonia, urea production from NH_3, cooling tower function, water treatment plant, NH_3 storage and product handling procedure. Made recommendations on natural gas pre-treatment to remove sulfur (S) content and product handling to minimize cost.

ACADEMIC HONORS

- Awarded Graduate student travel grant award 2022.
- Achieved Dean's Merit List for Academic Excellence, Bangladesh University of Engineering and Technology (Session 2012-2013).
- Awarded University Merit Scholarship, Department of Chemical Engineering, Bangladesh University of Engineering & Technology (Session 2010-11, 2011-12, 2012-2013, 2012-13).
- Awarded BUET Technical Scholarship (2010-2015).
- Awarded Bangladesh Sweden Travel scholarship 2018.

PRESENTATIONS

- The 27th North American Catalysis Society Meeting, May 2022
  Topic: **Direct epoxidation of C_3H_6 using molecular O_2 and novel Ag catalyst**
- National Science Foundation Centre for Rational Catalyst Synthesis (CeRCaS) annual meeting, September 2021
  Topic: **Chemisorption of promoted Ag catalyst used in direct epoxidation of ethylene-to-ethylene oxide (EO)**
- University of South Carolina Chemical Engineering Graduate Student Symposium, April 2021
  Topic: **Insights into the Ag catalyzed direct epoxidation of C_3H_6 using molecular O_2**
- Southeastern Catalysis Society (SECS) Meeting (2024)
  Topic: **Net-zero carbon fuel reactivity on commercial catalysts for emission control**

- AIChE Annual Meeting 2024
  Topic: **Net-Zero Carbon Fuel Reactivity on Commercial Oxidation Catalysts for Emissions Control**
- Advance Engine Combustion Winter program review meeting 2025
  Topic: **Impact of H_2 and alcohol on N_2O formation on commercial emissions control catalysts**
- Southeastern Catalysis Society (SECS) Meeting (2025)
  Topic: **Effect of CO on Alcohol Oxidation over Commercial Oxidation Catalysts for Control of Emissions from Lean-burn Engines**

PUBLICATIONS

- Md Masudur Rahman, M. B. Burkholder, Arthur C. Reber, Anne M. Gaffney, B. F. Gupton, John R. Monnier, New perspectives and insights into direct epoxidation of propylene using O_2 and silver-based catalysts, *Applied Catalysis A: General*, **650** (2023), 119002.
- Md Masudur Rahman, Benjamin T. Egelske, Kevin Enyekwe, John M. Tengco, John R. Monnier, Characterization of $Ag/\alpha\text{-}Al_2O_3$ olefin epoxidation catalysts containing promoters and co-promoters using pulse hydrogen titration methods, *Journal of Catalysis*, **429** (2024), 115244.
- Sreshtha Sinha Majumdar, Md Masudur Rahman, Josh A. Pihl, "Reactivity of net-zero carbon alcohol fuels and their corresponding aldehyde intermediates on PGM-based commercial oxidation catalysts for lean-burn emissions control", *Chemical Eng. Journal,* **503** (2025), 158490.
- Md Masudur Rahman, Sreshtha Sinha Majumdar, Josh A. Pihl, "Effect of CO on alcohol oxidation over commercial oxidation catalysts for control of emissions from lean-burn Engines", *Applied Catalysis B: Environment and Energy*, **375** (2025) 125402.
- J. Monnier, J.M. Tengco, M. M. Rahman, "THERMODYNAMIC-BASED METHODS FOR FORMATION OF PROMOTED METAL CATALYSTS", US Patent Application No. 2025/0073691A1.
- Alaba U. Ojo, Deependra M. Shakya, Julian Stetzler, Musbau Gbadamosi, Md Masudur Rahman, Narayan Acharya, Nathan Thornburg, John Tengco, Santosh Kiran Balijepalli, John R. Monnier, Donna A. Chen, and John R. Regalbuto, "The Enhanced Reactivity of Graphitic Supports for Pd Catalyzed Toluene Hydrogenation", *Journal of Catalysis*, **445** (2025), 116029.

REFERENCES

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Dr. Anne Gaffney
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Dr. John R. Regalbuto
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CoEE Endowed Chair,
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