Malik Waqar **Arshad**

PhD. Candidate, University of Science and Technology (UST)
Computational Chemist | Chemical Engineer

chemcoms@krict.re.kr
(+82)10-2897-0863
126-4 Sinsoeng-dong, Youseng-gu,
Daejoen (34116), South Korea

Biography

Malik Waqar Arshad is a Chemical Engineer with 10 years of experience in the Industrial, academia, and R&D division. Before joining the University of Science and Technology (UST) and Korea Research Institute of Chemical Technology (KRICT), South Korea as a graduate researcher for his PhD studies, he served a couple of years in the Chemical Industry and 5 years at Dhofar University, Oman as a laboratory engineer and established Chemical Engineering Laboratories where he gains a vast range of lab development experience and also did many R&D projects topics including corrosion, nanoparticle synthesis, diesel quality improvement, bio-cellulose formation, water & wastewater treatments. Currently, he is working on heterogeneous catalysis, DFT calculation, C1 chemistry, microkinetic modelling and using machine learning (ML) tools for the development of complex reaction mechanisms.

Education

Aug 2022 – Mar 2018 **University of Science and Technology (UST), South Korea**
PhD in Chemical Engineering (Computational Catalysis)
Academic Supervisor: Dr Seok Ki Kim & Dr Iljeong Heo

PhD Thesis Title: Catalyst design for CO-assisted NOx reduction using mechanistic and microkinetic modelling.

Feb 2012 – Mar 2008 **COMSATS University Islamabad, Lahore Campus, Pakistan**
B.S. in Chemical Engineering (Oil & Gas)

Research Experience

Present – Mar 2018 **C1 Gas and Carbon Convergent Research Center, UST-KRICT, South Korea**
Computational Catalysis (DFT), DeNOx, CO_2 Conversion, Microkinetic Modeling, Machine Learning

Feb 2018 – Jan 2013 **Dhofar University, Sultanate of Oman**
Reaction Engineering Lab, Separation Process Technology Lab, Biotechnology Lab, Fuel Cell Lab, Fluid Mechanics Lab, Water & wastewater Treatment Lab.

Scholarships and Awards

Mar 2018 **UST-KRICT Graduate Research Fellowship**
Graduate research fellowship, awarded to students at UST-KRICT, which provides support towards stipend and research costs for MS and PhD in Chemical Engineering.

Feb 2018 **Best Service Award**
In the recognition for the development of Chemical Engineering Laboratories at Dhofar University, Sultanate of Oman.

Publications

Peer Review

1. **A first-principles understanding of the CO-assisted NO reduction on the IrRu/Al_2O_3 catalyst under O_2-rich conditions**
   M.W. Arshad, D.H. Kim, Y.W. You, S.M. Kim, I. Heo and S.K. Kim
   Catal. Sci. Technol, **2021***, 11,* 4353-4366.

2. **Unraveling the origin of extraordinary lean NOx reduction by CO over Ir-Ru bimetallic catalyst at low temperature**
   Y.W. You, Y.J. Kim, J.H. Lee, **M.W. Arshad**, S.K. Kim, S.M. Kim, H. Lee, L.T. Thompson and I. Heo
   Appl. Catal. B, **2021**, *280*, 119374

3. **Unraveling the role of cobalt in the direct conversion of CO_2 to high-yield liquid fuels and lube base oil**
   H. Jo, M.K. Khan, M. Irshad, **M.W. Arshad**, S.K. Kim and J. Kim
   *Appl. Catal. B, **2022**, 305, 121041*

Under Process

1. **A study of particle size and metal-support interaction effects on Ir-Ru alloy supported on Al_2O_3 and TiO_2 for CO-assisted NO reduction in O_2-rich condition**
   M.W. Arshad, Y.W. You, I. Heo and S.K. Kim

2. **In silico catalyst screening of CO-assisted NO reduction by using first-principle microkinetic modelling**
   M.W. Arshad, I. Heo and S.K. Kim

3. **NO reduction by CO over the NiOx/CeO_2 catalyst: A mechanistic insight**
   T.J. Kim, **M.W. Arshad** and S.K. Kim

4. **Study of Selective Reverse Water-Gas Shift Reaction over Pt/Na-Zeolite catalyst by Operando DRIFTS**
   S. Kim, **M.W. Arshad** and S.K. Kim

Conference Contribution

1. **Synthesis and Characterization of Metal Oxide Nanomaterials for Advanced Energy Applications**
   M.W. Ahmad, **M.W. Arshad**, M. Ul-Islam, G.H. Lee
   Conference on Energy Challenges in Oman, ECO'2015

2. **Bio-ethanol from waste sources: A renewable energy source**
   M. Ul-Islam, M.W. Ullah, S. Khan, M.W. Ahmad, **M.W. Arshad**
   Conference on Energy Challenges in Oman, ECO'2015

3. **IrRu bimetallic alloy for the low- temperature NO reduction using CO**
   M.W. Arshad, Y.-W. You, I. Heo and S.K. Kim
   27th North American Catalysis Society Meeting, 2021 (Abstract Submitted)

Teaching Experience

Dhofar University, Sultanate of Oman

Fall 2017
Spring 2013

CHEE 270L: Fluid Mechanics Laboratory
The laboratory covers experiments that include the basic principles of fluid mechanics. The course helps students to combine elements of theory and practice.

CHEE 311L: Reactive Process Engineering Laboratory
The laboratory covers exercises in the design, operation and implementation of various types of simple chemical reactors.

CHEE 411L: Separation Processes Laboratory
The laboratory covers exercises in techniques and instrumentation in separation processes.

CHEE 441L: Biotechnology Laboratory
The laboratory covers exercises in techniques and instrumentation in biotechnology.

CHEE 476L: Chemical Reactor Design Laboratory
The laboratory covers exercises in advanced chemical reactor design.

CHEE 487: Fuel Cell Laboratory
The laboratory covers modern techniques for the design and assessment of fuel cells, and the deployment in hybrid electric systems.

Employment History

Present
Mar 2018

Korea Research Institute of Chemical Technology (KRICT), South Korea

Graduate Researcher at C1 Gas and Carbon Convergent Research Center.

Responsibilities & Duties:

- Density functional theory (DFT) calculation using VASP software.
- Working on the reaction mechanism of DeNOx and CO_2 Conversion system.
- Microkinetic Modeling for the complex reaction networks.
- Applying Machine Learning (ML) tools to solve complicated reactions.

Dhofar University, Sultanate of Oman

Feb 2018
Jan 2013

I have worked at Dhofar University of Sultanate Oman as a "Chemical Laboratory Engineer"

Responsibilities & Duties:

To Conduct Experiments in Chemical Engineering Labs of

- Reactive Process Engineering Lab
- Fluid Mechanics Lab
- Fuel Cell Lab
- Biochemical Engineering Lab
- Water & wastewater treatment Lab

- Ensure all equipment are maintained, serviced and repaired as required.
- Diagnose and rectify faults/problems with equipment.
- Train faculty and students in the use of equipment and techniques.
- Ensures work is carried out and performed to the required standards.

Undergraduate Research Projects Contribution:

1. Nutritional study of Omani's date palm compares to the date palm of Al-Medina.
2. Seawater analysis of Oman region and production of some generic medicine.
3. Study the rate of corrosion on different metal alloys using different seawater.
4. Measurement of pH, heavy metal, vitamin D3, and Microbial Analysis for frankincense.
5. Study the Anti-corrosive properties of frankincense.
6. Modification of Omani Diesel Engine oil using coconut waste.

7. Cellulose–ZnO nanocomposite for medical applications.
8. Modification of Omani Diesel Engine oil using activated carbon and comparison study with well-known engine oil in the market.
9. Comparison study of analysis zam-zam Saudi water with Omani springs water.
10. Synthesis of Zinc Oxide nanoparticles and their antibacterial effect.
11. Production of bio-cellulose facial mask for medical application.
12. Production of bacterial cellulose from cheap resources.
13. Synthesis and Characterization of Iron Oxide Nano-Particles for Magnetic Resonance Imaging (MRI) Contrast Agents.
14. Surface Modified Gd_2O_3 Nanoparticles For Magnetic Resonance Imaging (MRI) Contrast Agents.

Crystalline Chemical Industry Pvt. Ltd, Pakistan

Dec 2012
Sep 2012

I have worked at Crystalline Chemicals Industries (Pvt) Ltd as a "Chemical Engineer"

Responsibilities & Duties:

- Monitoring all equipment's of biogas & ethanol plant on regular basis for better result.
- To ensure 3M safety and management of man, machinery and materials.
- Data logging of field equipment's on regular basis.
- Isolation of equipment for maintenance.
- Plant shutdown and startup procedures.
- Monitoring of maintenance jobs; (a) Preventive maintenance (b) Scheduled maintenance
- Performs work activities associated with a Reverse Osmosis Water Treatment Plant.

Jun 2012
Aug 2011

Newage Chemical Industry Pvt. Ltd, Pakistan

I have worked at Newage Chemicals (Pvt) Ltd as a "Chemical Engineer"

Responsibilities & Duties:

- Check Machinery & Production Status of the Newage products.
- Check inventory level for daily use and make production, Dispatch & inventory level reports daily.
- Conduct Physical & Chemical tests of raw & produced materials and prepare product quality reports.
- Working for the solution of problems while facing during troubleshooting.
- Conduct safety inspections on-site and report deviations to management.

Affiliations

2012 - present

Pakistan Engineering Council (PEC)
PEC No.: CHEM/09886

Languages

- English – Proficient

- Urdu – Native
- Arabic – Basic
- Korean – Basic

References

Name: Dr Seok Ki Kim
Employer: Ajou University, South Korea
Designation: Assistant Professor (Chemical Engineering Department)
E-mail: seokki@ajou.ac.kr

Name: Dr Iljeong Heo
Employer: Korea Research Institue of Chemical Technology (KRICT) and University of Science and Technology (UST), South Korea
Designation: Senior Researcher (KRICT) and Professor (UST)
E-mail: zaiseok@krict.re.kr

Name: Dr Mazhar Ul Islam
Employer: Dhofar University, Oman
Designation: Associate Professor (Chemical Engineering Department)
E-mail: mulislam@du.edu.om