VINOD KUMAR

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EDUCATION

Doctor of Philosophy (PhD) in Materials Science and Nanoengineering (*Fulbright Scholarship*) Aug 2022 – Present
Rice University; ***CGPA: 3.6/4.0*** *Houston, TX, USA*
Relevant Courses: Microscopy Methods, Crystallography, Materials Thermodynamics, Mechanics of Materials, and Nanomaterials for Energy Transition.

Master of Engineering in Metallurgy and Materials Engineering December 2019
Mehran University of Engineering & Technology (MUET); ***CGPA: 4.00/4.00*** *Jamshoro, Pakistan*
Thesis: Fabrication and Characterization of Graphene Oxide (GO) Nanoparticles Incorporated in Poly (Vinyl Alcohol) Electrospun Nanofibers & Its Crosslinking for Medical Applications.

Bachelor of Engineering in Metallurgy and Materials Engineering (*Distinction*) February 2016
*Mehran University of Engineering & Technology (MUET)****, CGPA: 3.7/4.0*** *Jamshoro, Pakistan*
Thesis: Synthesis and Characterization of Graphene Oxide (GO) for energy applications

EXPERIENCE

Rice University Aug 2022 – Present
Graduate Research Assistant, Dept. of Materials Science and Nanoengineering; ***(N^3L Lab)*** *Houston, TX, USA*
Project: 1 – Doped TMDs for Electrochemical CO_2 reduction. (Ongoing)

- Preparing doped 2D materials systems for effective electro/photo reduction of CO_2.
- Performing characterization of prepared materials by advanced tools. (SEM/EDS, XRD, Raman, XPS, TEM)
- Studying CO_2 electrochemical reduction characteristics of prepared material.
- Optimized the cell atmosphere by modifying the electrolytes, membranes, and potentials.
- Studying the electrochemical CO2 reduction products through GC-MS and NMR.

Project: 2: 2D Heterostructures for Photocatalytic H_2O_2 Production (Ongoing)

- Synthesizing Organic/inorganic 2D heterostructures. (COF and TMDs)
- Optimizing the ratio of both materials in heterostructure and understanding the mechanism for photocatalytic reaction.
- Analyzing the characteristics of heterostructure using XPS, XRD, BET, TGA, PL, TEM and UPS.
- Studying the product concentration using UV-Vis Spectroscopy.

Rice University June 24 – Aug 2024
Instructor, Carbon Project, TAPIA CAMP (Tapia Center of Excellence and Equity) *Houston, TX, USA*

- Teaching a course focused on Climate Change – Carbon Capture & Sequestration.
- Demonstrating the CCS process in the lab and making students build a reservoir model to understand the CO2 storage mechanism.
- Teaching about STEM communications and Poster presentation – preparing for a competition.
- Captain for NASA Center visits for four consecutive weeks.

Dawood University of Engineering and Technology (DUET) Feb 2022 – Aug 2022
Lecturer (Teaching Faculty), Dept. of Metallurgy and Materials Engineering. *Karachi, Pakistan*

- Teaching undergrad courses – Polymer and Composite Materials, Mechanics of Materials, Ceramics and Glass Materials.
- Helping students with senior-year design projects focusing on nanomaterials.

Dawood University of Engineering and Technology (DUET) Mar 2019 – Feb 2022
Lab-Engineer, Dept. of Metallurgy and Materials Engineering. *Karachi, Pakistan*

- Proficiently operated, demonstrated, and maintained a wide range of general lab equipment for Material Synthesis and Characterization, including SEM/EDS, Particle Sizer, Centrifuges, UTM, Hardness tester, Optical Emission Spectroscopy, Optical Microscopy, NDT tools, etc.
- Utilized a solid grasp of the experimental process to effectively design, execute, and analyze experiments. This ensured that experiments were well-organized, yielded accurate results, and were completed within the specified timeframes.

Atlas Cables (Pvt.) Ltd. May 2018 – Mar 2019
Trainee Engineer, Aluminum Melting & Quality Control Department *Kotri, Sindh, Pakistan*

- Collaborated with process engineers and quality technicians to ensure the quality of aluminum cables by considering the process parameters, from melting and rolling to stranding of cables.
- Created technical reports to identify and resolve customer complaints regarding the mechanical characteristics of Cables.

SKILLS SUMMARY

- **Domains:** Developing Nanostructures for Energy and Environment applications.
- **Materials Synthesis:** Wet-chemical method, Sol-gel Method, Hydrothermal, Ball milling, Sputtering, CVD, etc.
- **Materials Characterization & Application Study**:
  - **Equipment Operation**: XPS, XRD, SEM/EDS, FT-IR, Raman Spectroscopy, BET, UV-VIS, Zeta Potential, Potentiostat, and UTM.
  - **For Application-based studies:**
    - Electrochemistry (for HER/OER and CO_2RR), Gas Chromatography, and NMR.
    - Mechanical Applications: Studying mechanical behavior using UTM, Charpy test, Hardness, and fatigue testing.
- **Tools:** OriginPro, Zotero/Mendeley, Adobe Photoshop, Office 365, and Python.
- **Certifications:** ASNT – NDT Ultrasonic testing (UT level II), Dye- Penetrant Testing, Magnetic Particle Testing (MPI).

HONORS, SCHOLARSHIPS, AND AWARDS

1. ***Outstanding Presentation Award***, Idea Pitching Competition, Workshop: Communicating Science, by Boston University, USA (May 2023)
2. ***Fulbright Scholarship***, USA, (Fully funded PhD sponsored by US State Department) – (Aug 2022 – May 2027)
3. ***Merit Scholarship*** during Masters (partial tuition fee waived – Aug 2019)
4. ***Merit Award*** for Second Position in Bachelors, MUET, Jamshoro, Pakistan – Convocation – April 2016.
5. ***Best Thesis Award***, Final Year Project Competition, MME, MUET, Pakistan – December 2015
6. ***Recipient of Merit Award***, r*eceived a laptop*, under Prime Minster Youth Development Program 2014,
7. ***Minority Scholarship*** in Bachelors, MUET, Pakistan, (2013 – 2014)
8. ***Merit Scholarship*** in Bachelors, MUET, Pakistan (2012 – 2015).

PUBLICATIONS

1. "**2D Transition Metal Chalcogens (TMCs) based catalysts for Electrochemical CO2 Reduction: Challenges and Perspectives**", **V Kumar** et. al (2024), *(In prep)*
2. "**MXenes based electrocatalyst: CoS2@ Ti3C2Tx composite for hydrogen evolution reaction in alkaline media.**" - A Hanan, MN Lakhan, MY Solangi, MS Al Salhi, **V Kumar**, (2023) Materials Today Sustainability *(Published),*
3. **"An efficient and durable bifunctional electrocatalyst based on PdO and Co2FeO4 for HER and OER."** A Hanan, MN Lakhan, D Shu, A Hussain, M Ahmed, IA Soomro, **V Kumar**, (2023) International Journal of Hydrogen Energy *(Published).*
4. **"Graphene-loaded nickel oxide nanocomposite as anode material for the microbial fuel cell."** M Kumar, **V Kumar**, S Mustafa, U Aftab, ZA Laghari, (2022) Biomass Conversion and Biorefinery *(Published).*

UNDERGRADUATE INTERNSHIPS

Pakistan International Airlines (PIA). Karachi, Pakistan
- *Worked in a Non-destructive materials testing shop.* *July 2015*
- *Assisted in Airplane structure repair shop (Glass and Carbon Fiber Composites)*

Karachi Shipyard and Engineering Works (KS & EW) Karachi, Pakistan
- *Performed Destructive and Non-Destructive testing of materials.* *December 2014*
- *Worked in Dept. of Foundry & Ship Welding (TIG, MIG).*

United Refrigeration Industries Hyderabad, Pakistan
- *Rotational Job: Dept. of Light Metal Fabrication;* *Summer 2014*
- *Polymers production; injection molding, & extrusion*

ADDITIONAL PROJECTS

- Superhydrophobic coatings on different substrates using rice husk**.** *DUET Karachi, (Jan -Dec 2021)*
- Zinc Sulfide (ZnS) nanoparticles supported with reduced Graphene Oxide (rGO) as a durable electrocatalyst for the Oxygen Evaluation Reaction (OER). *DUET Karachi, (Jan -Dec 2021)*
- Synthesis and Characterization of Zinc Oxide (ZnO) Nanoparticles for (Methyl Blue) MB dye degradation under Sunlight. *DUET Karachi, (Jan -Oct 2020)*
- Graphene-loaded Nickel Oxide Nanocomposites as anode material for Microbial fuel cell. *MUET, Jamshoro (2016-17)*

EXTRACURRICULAR ACTIVITIES/ / LEADERSHIP ROLES / COMMUNITY SERVICE

- **IGNITE TREK 2024** | Four days Trek to Silicon Valley Palo Alto, CA, USA
  Site Visits (Tesla, Mitrachem), Sessions with successful entrepreneurs, & interaction with MBAs. *Mar 2024*
- **DISCO'23 | A Day-long trek to Austin – Lilie Rice University** Austin, TX, USA
  Entrepreneurship Training, Hands-on-Workshop to generate ideas as a team *Oct 2023*
- **Rice Pakistan Student Association (RPSA)** Houston, TX, USA
  President *May 2023- Present*
- **Fulbrighters@RICE** Houston, TX, USA
  Member of Ring leads Fulbright community at Rice *May 2023- May 24*
- **Office of Graduate and Postdoctoral Studies (GPS Rice)** Houston, TX, USA
  Graduate Student Ambassador *Jan 2023 – Present*
- **"Let's Walk for Change – Social welfare organization"** Sindh, Pakistan
  Volunteer, and lead Plantation Drive, Donation Drives during COVID'19 *Jul 2018 – 2022*
- **Mehranian Materials Advantage Chapter (MMAC), MUET** Jamshoro, Pakistan
  Served as President (2015), & Vice President (2014), led multiple events. *Jan 2013- Dec 2015*
- **The Scientist Academy** Hyderabad, Pakistan
  Founder and Co-Director; *promoting science & free education.* Jul 2013 – Mar 2019