Hemanth N R

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Education

University of Washington, Seattle *Sep 2022 - Jun 2024 (expected)*
MS in Materials Science and Engineering GPA: 3.88/4.0
Advisor: Prof. Guozhong Cao

National Institute of Technology Karnataka, Surathkal, India *2017 - 2021*
B.Tech in Metallurgical and Materials Engineering GPA: 8.08/10
Advisor: Prof. K Narayan Prabhu
Thesis: Characterization of Paraffin Wax for Microelectronics and Thermal Energy Storage Applications.

Work Experience

Electric Hydrogen, *Cell Modeling R&D Co-op* | Natick, Ma *Jun 2023 - Dec 2023*
- Analyzed two-phase flow transport in electrolyzer using electrochemical characterization & high-speed imaging
- Developed two-phase models using OpenCV and ImageJ libraries to perform large scale image analysis
- Built customized two-phase map for EH2's requirements to achieve desired flow regime
- Investigated the effects of catalyst, flow plates & gas diffusion layers on the flow properties at small stack level

Log9 Materials, *Materials & Electrochemistry Intern* | India *Nov 2021 - Jun 2022*
- Identified degradation mechanism in 3V& 2.7V super-capacitors using a three-electrode split cell system
- Achieved benchmark performance at 18650 and coin cell formats through electrolyte investigation
- Developed the one-pot synthesis process to prepare aqueous lithium-titanate anode slurry for LIBs
- Analyzed, interpreted & presented the cycler data of LIBs and super-capacitors in weekly team meetings

Defence Institute of Advanced Technology, *Summer Research Intern* | India *May - Jul 2019*
Advisor: Prof. Balasubramanian K
- Successfully delaminated layered MXenes through intercalation and sonication of dimethyl sulfoxide
- Assisted PhD students in drafting & editing articles on polymers for electronics & super-capacitor applications
- Acquired laboratory skills & working principles of characterization tools such as viscometer, UV/VIS spectrometer, electro-spinning setup, single and twin-screw extruder, probe sonicator, contact angle goniometer and melt flow indexer

Research

Sol-gel Research Group, *Graduate Student Researcher* | UW Seattle *Sep 2022 - present*
- Modeling experimental and data-driven life-cycle prediction tool for lithium-ion batteries (LIBs)
- Examining impact of various parameters at different SOH levels
- Investigating vanadium oxide cathode materials for sodium-ion battery

Remote Research Collaboration, *Funding: DST India-Korea & NRF-Korea Project* *Apr 2020 - present*
Advisors: Dr. Nitin K Chaudhari & Prof. Kwangyeol Lee
- Collaboration with researchers from Pandit Deendayal Energy University, Korea University and the University of British-Columbia in interdisciplinary project grants
- Evaluated and published articles on the performance metrics of MXene materials and their heterostructures for energy storage and neuromorphic computing applications

Prabhu Research Lab, *Undergraduate Student Researcher*| NITK *Aug 2020 - Apr 2021*
- Estimated latent heat of paraffin wax nanocomposite using Inverse Heat Conduction & Newtonian calculations
- Performed paraffin wax charaterization for microelectronics & thermal storage using Differential Scanning Calorimetry

Coursework

- Imaging at Nanoscale & Atomic Scale | Nanostructures & Nanomaterials (thin-films, PVD, CVD, lithography, spectroscopy) | Defects in Materials | Electron Theory of Materials | Thermodynamics | Composite Materials.

Technical Skills

- *Engineering skills:* SEM, XRD, EIS, Optical Microscopy, Arbin and Neware Cycler Operation, Laser Cutting, Ion Chromatography, Slurry Preparation, Non-Destructive Testing, MIG Welding, Clean and Dry Room (1% and 10% RH), Cell Assembly, Testing, Continuous Coating Machine, Doctor Blade Coating, Glove Box, Failure Analysis & Metallographic Examination.
- *Computer skills:* Python, OpenCV, ML Modeling, Vesta, MD, DFT, Quantum ESPRESSO, BioLogic, JMP, Catia, ImageJ, FIJI, MS Office, Origin pro & C.

Publications

Book Chapters

* - equal contribution

1. **Chapter 7: MXene-transition metal compound sulfide and phosphide hetero-nanostructures for photo-electrochemical water splitting** in **Solar-Driven Green Hydrogen Generation and Storage**
Ranjit Mohili, **N R Hemanth**, Kwangyeol Lee and Nitin K Chaudhari.
129-139, 2023. DOI: 10.1016/b978-0-323-99580-1.00008-x.

Journal Publications

7. **Emerging High Entropy Metal Sulphide and Phosphide for Electrochemical Water Splitting**
Ranjit Mohili*, **N R Hemanth***, Haneul Jin*, Kwangyeol Lee and Nitin K Chaudhari.
J. Mater. Chem. A. 11, 10463-10472 (2023). DOI: 10.1039/D2TA10081A

6. **MXenes: promising 2D memristor materials for neuromorphic computing components**.
Monika Patel, **N R Hemanth**, Jeny Gosai, Ranjit Mohili, Ankur Solanki, Mohendra Roy, Baizeng Fang and Nitin K Chaudhari.
Trends Chem. 4, 835–849 (2022). DOI: 10.1016/j.trechm.2022.06.004

5. **Metallic Nanosponges for Energy Storage and Conversion Applications**.
N R Hemanth*, Ranjit D Mohili*, Monika Patel, Arvind H Jadhav, Kwangyeol Lee and Nitin K Chaudhari.
J. Mater. Chem. A. 10, 14221-14246 (2022). DOI: 10.1039/d2ta02057b

4. **Transition Metal Dichalcogenides decorated MXenes: Promising Hybrid Electrodes for Energy Storage and Conversion Applications**.
N R Hemanth*, Taekyung Kim*, Byeongyoon Kim*, Arvind H. Jadhav, Kwangyeol Lee and Nitin K. Chaudhari
Mater. Chem. Front., 5, 3298-3321 (2021). DOI: 10.1039/D1QM00035G

3. **Recent advances in 2D MXenes for enhanced cation intercalation in energy harvesting Applications: A review**.
N R Hemanth and Kandasubramanian, B.
Chem. Eng. J. 392, 123678 (2020). DOI: 10.1016/j.cej.2019.123678

2. **Multifunctional conjugated 1,6-heptadiynes and its derivatives stimulated molecular electronics: Future moletronics**.
RaviPrakash Magisetty, **N R Hemanth**, Pawan Kumar, Anuj Shukla, Raja Shunmugam and Balasubramanian K.
Eur. Polym. J. 124, 109467 (2020). DOI: 10.1016/j.eurpolymj.2019.109467

1. **Poly(1,6-heptadiyne)/$NiFe_2O_4$ composite as capacitor for miniaturized electronics**.
RaviPrakash Magisetty, **N R Hemanth**, Anuj Shukla, Raja Shunmugam, Balasubramanian K.
Polymer-Plastics Technology and Materials, 59:18, 2018-2026 (2020). DOI: 10.1080/25740881.2020.1784217

Responsibilities

- *Graduate Chemistry Tutor* - STARS program, University of Washington *February - June 2023*
  - Taught Chemistry 142 and Chemistry 152 for $\sim$ 30 students
  - Mentored highly motivated Washington state residents from low-income backgrounds & under-deserved high schools to pursue degrees in engineering and computer science

- *Vice-Captain Operations & Brake Systems Head* - Baja NITK Racing, Baja SAE India, NITK *2018 - 2021*
  - Administered and designed the braking system of an all-terrain vehicle per the Baja SAE rulebook
  - Strengthened the operational strategies by forecasting budget and secured INR 3.5 lakhs funding
  - Secured 1st place in marketing presentation out of 80+ teams at Baja SAE India 2018, IIT Ropar
  - Ranked 11th in overall static events and 4th in cost report out of 150+ teams in Baja SAE India 2021
  - Ranked 1st in B-plan and overall 2nd in the ATVC virtual championship 2021

- *Class Representative, Metallurgical and Materials Engineering, NITK Students Council* *2019 - 2021*
  - Spearheaded a class of 50 students at different levels of the student body and competitions
  - Proposed and implemented a revised course plan to improve cohesive learning and teaching methods
- *Joint Convener, Incident 2019 NITK* *2018 - 2019*
  - Organized student participation and managed logistics for the five-day annual cultural festival $\sim$ 8,000 attendees