Hemanth N R

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Motivation

I am interested in accelerating the development of materials for sustainable energy through a combination of experimental and computational techniques. I particularly enjoy working on electrochemical characterization and modeling tools for various energy storage and conversion devices.

Education

University of Washington, Seattle *2022 - present*
MS in Materials Science and Engineering GPA: 3.88/4.0
Advisor: Prof. Guozhong Cao

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

Relevant Experience

Electric Hydrogen, Greater Boston *June 2023 - present*
Cell Development Co-op

- Studying two-phase flow in electrolyser through electrochemical testing and high-speed imaging.
- Developing models using open source platforms (OpenCV and Image J) to perform large scale image analysis.

Sol-gel Research Group, University of Washington, Seattle *September 2022 - present*
Graduate Student Researcher

- Examining the effect of temperature on LIB performance for freight trucks.
- Developing data-driven machine learning models to forecast life-cycle of LIBs.

Remote Research Collaboration *April 2020 - present*
Funding: Department of Science and Technology under India-Korea bilateral project & NRF-Korea
Advisors: Dr. Nitin K Chaudhari & Prof. Kwangyeol Lee

- Collaborated 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, NITK *August 2020 - April 2021*
Undergraduate Student Researcher

- Estimated latent heat for paraffin wax with graphene nanotubes using inverse heat problem appraoch and Newtonian calculations.
- Performed charaterization of paraffin wax for microelectronics and thermal energy storage applications.

Log9 Materials *November 2021 - June 2022*
Chief of Climate Action and Materials & Electrochemistry Intern

- Identified the degradation mechanism in 3V and 2.7V super-capacitors using a three-electrode split cell system.
- Achieved benchmark performance in 2.7V 18650 and coin cells super-capacitors by investigating different electrolytes.
- Developed the one-pot synthesis process to prepare an 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, DRDO, *May - July 2019*
Ministry of Defence, Government of India
Summer Research Intern
Advisor: Prof. Balasubramanian K

- Reviewed & published article on developments in MXene materials for energy applications.
- 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.

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 2023 - present*
  - 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 graduate with 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

Coursework

- Imaging at nanoscale and atomic scale, nanostructures and nanomaterials (thin-films, chemical/physical vapor deposition, lithography, spectroscopy), defects in materials, electron theory of materials.

Technical Skills

- *Engineering skills:* Non-destructive testing, MIG welding, Failure analysis & Metallographic examination.
- *Computer skills:* Python, OpenCV, ML Modeling, Vesta, Neware battery cycler, BioLogic, Catia, MS Office, Origin pro & C.