

EDUCATION

- 2016-present Dual degree (B. Tech & M. Tech), Metallurgical and Materials Engineering, Indian Institute of Technology, Kharagpur
- 2014-15 **GPA - 8.35/10**
Higher Secondary Education (12th), Central Board of Secondary Education (CBSE), Indore Public School, Rajendra Nagar, AB road, Indore, India.
- 2012-13 Aggregate - 82.6%
Secondary Education, Central Board of Secondary Education (CBSE), Atomic Energy Central School (AECS), RRCAT, Indore, India
- GPA – 9.2/10

MICRO SPECIALIZATION: ELECTRONIC MATERIALS AND APPLICATIONS

- Theory courses include “Fundamentals of Electronic Materials”, “Technology of Ceramics for Electronic Applications” & “Optoelectronic Materials & Devices”.
- Completed a project on “Synthesis and Characterization of Na-ion battery electrode materials” in Material Science Centre, IIT Kharagpur.

PUBLICATIONS

- **Advait Gilankar**, Arijit Mitra, Jaspreet Singh, Siddhartha Das, S. B. Majumder. “Investigations on different strategies towards improving the electrochemical properties of $\text{Na}_2\text{VTi}(\text{PO}_4)_3$ for symmetrical sodium-ion batteries.” **Journal of Alloys & Compounds**, Volume 851, 15 January 2021, 156813. DOI-<https://doi.org/10.1016/j.jallcom.2020.156813>
- Arijit Mitra, **Advait Gilankar**, Sambadan Jena, Debasish Das, Subhasish B. Majumder, Siddhartha Das. “Solubility limit approach towards improvement in the cycling stability of Kazakhstanite phase Fe-V-O layered oxide for Lithium-ion Battery Cathode Materials.” **ACS Applied Materials & Interfaces**. Submitted on July 08th, 2020. (Status: Revision)

ACADEMIC DISTINCTIONS

- Qualified JEE-Advanced 2016 with a National Percentile of **99.8** among 1,50,000 students.
- Secured a **top 1** state percentile in National Standard Examination in Chemistry (NSEC) and was awarded with certificate of merit by Indian Association of Chemistry Teachers in 2014.
- Qualified two stages of the prestigious National Talent Search Examination (NTSE) and received scholarship from National Council of Educational Research and Training in 10th Grade (2012-13)
- Secured a state-rank of **20** in NTSE Stage-I held during the 10th grade. (2012-2013)

RESEARCH EXPERIENCE

- May-June, 2018 **Synthesis of positive electrode materials & development of high-capacity Li-ion battery.**
Advanced Materials Processing Lab, Materials Science Centre, IIT Kharagpur.
Advisor: Prof. Subhasish Basu Majumder

During this summer research project, I was assigned with the task to synthesize a suitable oxide based positive electrode for achieving 1mAh capacity Li-ion battery in a 2032 configuration. I synthesized a layered Li ($\text{Ni}_{0.6}\text{Co}_{0.2}\text{Mn}_{0.2}$) O_2 (NCM-622) and cubic spinel structured LiMn_2O_4 through Auto-combustion route. The synthesized electrodes were characterized electrochemically through Galvanostatic charge-discharge and Cyclic Voltammetry studies. The NCM (622) electrode demonstrated a stable specific capacity (160 mAhg^{-1}) at 0.1C-rate. This was chosen as a positive electrode material for making a full-cell with commercially procured MCMB electrode. Finally, a full-cell built with NCM (622) & MCMB electrodes delivered >1mAh capacity at 0.1 C-rate in 2032 coin-cell. This work was a part of a project funded by Samsung R&D (India).

Aug, 2018 -
May, 2020

Synthesis & Characterization of NASICON-based materials for developing Na-ion battery.

Metallurgical & Materials Engineering Dept. and Materials Science Centre, IIT Kharagpur.

Advisors: Prof. Siddhartha Das & Prof. Subhasish Basu Majumder

During this project work I synthesized different NASICON-based electrodes like $\text{Na}_3\text{V}_2(\text{PO}_4)_3$ (NVP), $\text{NaTi}_2(\text{PO}_4)_3$ (NTP) & $\text{Na}_2\text{VTi}(\text{PO}_4)_3$ (NVTP) using sol-gel process. NVTP being a new material was explored in-depth using different strategies, like, using different chelating agents. In addition to it, the effect of *in-situ* addition of r-GO on structural & electrochemical properties of NVTP was studied. The purpose of forming a composite with r-GO was to increase the electronic conductivity of the electrode. The structural Characterization was carried out using X-Ray Diffraction, Fourier Transform Infrared Spectroscopy, Raman Spectroscopy & X-ray Photoelectron Spectroscopy using Synchrotron X-ray radiation. The morphology of the electrodes was studied using Scanning Electron Microscopy & High-resolution Transmission Electron Microscopy. EDS compositional mapping of the individual electrodes was carried out using Scanning Transmission Electron Microscopy (STEM). The electrochemical study was done using Galvanostatic charge-discharge and Cyclic Voltammetry. It was observed that NVTP@rGO nanocomposite enhances the performance of the NVTP electrode at 5C & 10C-rates. Finally, a full-cell is built between NVTP and NVTP@rGO as positive and negative electrodes respectively which gives 100% coulombic efficiency at 3 C-rate for >100 cycles. Our findings resulted in a publication in the Journal of Alloys and Compounds.

July, 2019 -
Present

Development of a novel layered Fe-V-O electrode towards high-capacity Li-ion Batteries.

Metallurgical & Materials Engineering Dept. and Materials Science Centre, IIT Kharagpur.

Advisors: Prof. Siddhartha Das & Prof. Subhasish Basu Majumder

During this project, synthesis of layered Kazakhstanite phase ($\text{Fe}_5\text{V}_{15}\text{O}_{39}(\text{OH})_9 \cdot 9\text{H}_2\text{O}$) and its variants as positive electrode material for battery was carried out. This Fe-V-O based electrode material yields an initial specific capacity of about 350 mAhg^{-1} with Li metal anode. Structural Characterization of the electrode was performed using XRD, XPS, HR-TEM, SEM, AFM, Raman and FT-IR spectroscopy techniques. The material was electrochemically characterized using Galvanostatic charge-discharge studies, Cyclic Voltammetry & Electrochemical Impedance Spectroscopy. The electrode was tested using combinations of various salts and solvents to improve its cyclability & rate-performance. Ex-situ XRD and XPS studies were carried out for understanding the redox reactions taking place at different electrochemical potentials. Molecular Dynamics is being employed to garner transport properties like – conductivity, diffusion coefficient, viscosity, radial distribution function of the various electrolytes used for electrochemical tests. Investigations on developing full-cell and improving the electrode performance are currently underway.

SKILLS

Softwares & Languages

MAUD, GSAS-II, OriginPro, Fityk, ImageJ, Avogadro, Packmol, Moltemplate, VESTA, COMSOL, CasaXPS, Inkscape, OVITO, Lammmps, C, GNU Octave.

Instruments

XRD, SEM, Raman & FT-IR spectroscopy, TEM, XPS, Thermal characterization, Gamry series Potentiostat-cum-Galvanostat, Centrifuge, Vacuum oven, Battery tester, Optical Microscope.

RELEVANT COURSEWORK

Depth Courses

Metallurgical Thermodynamics and Kinetics*, Introduction to Engineering Materials*, Materials Processing*, Materials Characterization*, X-ray Diffraction and Transmission Electron Microscopy*, Computer Applications in Metallurgical Processes*, Transport Phenomena in Metallurgical Processes, Corrosion and Environmental Degradation of Materials, Partial Differential Equations, Probability and Stochastic Processes, Programming and Data Structures*, Basic Electronics*.

*: Includes lab component

Electives

Physics of Materials, Fundamentals of Electronic Materials, Energy Materials, Atomistic Modelling of Materials, Advanced Electron Microscopy & Analysis, Solar Photovoltaic Technologies & Systems, Technology of Ceramics for Electronic Applications, Advanced Phase Transformations, Biomaterials.

Micro-credit Course

Time dependent Density Functional Theory (DFT).

POSITION OF RESPONSIBILITY & EXTRA-CURRICULAR ACTIVITIES

- Team member of Gold Winning Hockey team in Inter-hall tournament 2016-17 & Silver Winning team in 2017-18.
- Served as a core team head of COMPOSIT (annual technology festival of Metallurgical and Materials Engineering Department, IIT Kharagpur).
- Conducted a Survey on Happiness levels of students during Covid-19 pandemic. This project was a part of a subject 'Science of Happiness & Well-being'.
- Actively participated in the Yoga activities & Run for Unity programs as a member of Health and Fitness division of National Sports Organization for the duration 2016-2018.
- Hobbies include reading novels, music, painting and football.