Curriculum Vitae

Vikash Meghwal

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Research Areas and Subject Interest

Molecular materials, Surface science, Scanning Probe Microscopy (SPM), Scanning Tunneling Microscopy (STM), Atomic Force Microscopy (AFM), X-Ray photo-electron spectroscopy (XPS), 2D-FFT, Spin Coating, Vacuum distillation, NMR, Fluorescence, Absorption, Emission, IR spectroscopy, Quantum-Chemistry, Physical-Chemistry, Solid State, Molecular-Simulation, Semiconductors, & Programming in C++.

Current research

Currently working on the understanding of the synthesis and Electronic-Coupling and Band Gap Tunability of 2D Covalent organic framework **(2D COF)**, 2D Metal-organic framework **(2D MOF)**, Self-assembly of molecules **(SAM)** on surfaces, Atomic Force Microscopy (AFM), Conductive Atomic Force Microscopy Orca (C-AFM), X-ray Photo-electron spectroscopy (XPS) in the group of **Dr. Thiruvancheril. G. Gopakumar,** Department of Chemistry, Indian Institute of Technology Kanpur, India.

Educational Qualification

Year	Degree	Institute	CGPA/Percentage
2023-2024	M.S. (Chemistry)	Indian Institute of Technology Kanpur, India	8.94/10
2019-2023	B.S. (Chemistry)	Indian Institute of Technology Kanpur, India	7.10/10
2017-2018	12th grade (CBSE)	Lawrence and Mayo Public School, India	71.8%
2015-2016	10th grade (JKBOSE)	Bharti Public High School, India	82.8%

Master's Thesis Project   Jan'24-June'24

Supervisor: Prof. Thiruvancheril G. Gopakumar, **Molecular Functional Materials Research Group**
Dept. of Chemistry, IIT Kanpur Lab Project work   Official Website
Research Summary: Enhancing the Electronic-Coupling and Band Gap Tunability in Ferrocenyl Molecular Ultra-Thin Film by Palladium (Pd) & Copper (Cu) Doping.

- We have developed an ultra-thin molecular film using drop casting method where dopants are introduced at specific ligand sites. We formed semi-conducting surface-confined metal–organic networks (**SMONs**) with metals on highly oriented pyrolytic graphite (**HOPG**)surface at ambient conditions.
- Analyzed the Conductive Atomic Force Microscopy (**AFM**) on the Surface of Two ferrocene (Fc) functionalized molecules, 3-ferrocenyl propanoic acid (FcC3) and 5-ferrocenyl pentadienoic acid (FcC5). Used software like **Igor Pro, Agilent AFM, WSxM5, & Origin**.
- Studied the properties using **Self Assembly, Metal Doping (Pd & Cu), XPS Analysis**.
- Used Gauss View, Putty, WinSCP, DS-Viewer Pro.
- Calculated density of state (DOS), total energy using **Quantum wise ATK-DFT** simulations.

Internships

1. **Armatrix**, An Industrial and Defense Robotic, IIT Kanpur   Official Website
   Full Stack Developer Intern   Jan'24-April'24
   - Developed a fully functional website using ReactJs, incorporating CSS Tailwind for styling.
   - Implemented an efficient email fetching system utilizing EmailJs.
   - Maintained and updated the website as per company requirements, ensuring optimal functionality.

- Ensured seamless responsiveness across various screen sizes, delivering a bug-free user experience.
- Responsible for end-to-end website development, management over the Hostinger hosting platform.

2. **Supervisor**: Prof. Pratik Sen, **Biophysical Chemistry Research Group** [Official Website]
   Dept. of Chemistry, IIT Kanpur Lab Project | SURGE Program (Summer Research Intern)
   Research Summary: Elucidation of the Structure and Dynamics of Synergistic Mixed Solvent Systems.
   In this research project we have focused on investigating the structure and dynamics of synergistic mixed solvent systems through distillation, NMR spectroscopy, and data analysis on the three system (N, N-dimethylformamide (DMF), N-dimethylformamide (NMF) & Formamide).
   Skills Acquired:
   - Conducted in-depth investigations using **1H NMR** and absorption spectroscopy to characterize solvent interactions used **Mestre Nova**.
   - Deployed **vacuum distillation** technique to purify organic solvents.
   - Applied **absorption and emission spectroscopy** to understand the behavior of solvent system.
   - Utilized software tools like **IGOR Pro** and **Origin** for data analysis and visualization.
   - Performed Hydrophobicity trend graph analysis in **python**.

Conferences and Awards
- "Students-Undergraduate Research Graduate Excellence (SURGE)-2023", IIT Kanpur, Poster Presentation.
- "International Online Olympiad GRE & Tofel-2022", Galvanize, Participation.
- "Advances in Spectroscopy, Catalysis, and Synthesis-2021", IIT Kanpur, Participation.
- "State Level Science Exhibition-2015", INSPIRE Award Scheme, Govt. of Jammu & Kashmir, Participation.

Achievements
- Job Offer: OCFP Faculty position at ORCHIDS The International School, Bangalore (2024).
- JEE-Advance (Joint Entrance Exam) All-India Category Ranking (AIR): 2380 among 1.2 million (2019).
- JEE-Mains (Joint Entrance Examination) Qualified (2019).

Undergraduate Research Project (UGP)   Jan'22-May'22
Supervisor: Prof. Nagma Parveen, **Research Group, Chemical Biology (Bio-Nanoparticle Lab)**
Dept. of Chemistry, IIT Kanpur Lab Project   [Official Website]
Research Summary: Studying the SARS-CoV-2 fusion in detail using an opportunistic model for the fusing of the coronavirus membrane. Investigated receptor binding and priming of the spike protein of SARS-CoV-2 for membrane fusion.
Future Work: To create medicines for human consumption and vaccines to combat infections and disease. And use this knowledge to create nanoparticle medicines and enough adoptable vaccines.
Learning from lab: Viruses and Binding fusion in SARS-MERS Covid.

Course work assignments
1. **Supervisor**: Prof. Mainak Sadhukhan, **Theoretical Chemistry Research Group**
   Dept. of Chemistry, IIT Kanpur   [Official Website]
   Title: Numerical Methods in Fortran Programming   [Link]
   - Implemented Lorenz System solved by **Euler forward** and **Runge Kutta-4** methods and compared using 3D animated plot and X-Z graph with appropriate given points, demonstrating variation in the 3D graphical model plots.
   - Implemented **Gauss Legendre Polynomial, Monte Carlo, Trapezoidal,** and **Simpson's Rule** for integration. Created the terminal Program for all these models.
   - Used **Ising Model** to stabilize Energy and Temperature Dependencies, exploring Specific heat in constant volume and Magnetic momentum Magnetization determination.
   - Solved the Schrodinger Wave Function & Density Matrix.

2. **Supervisor**: Prof. Anish Upadhyaya, Dept. of Material Science and Engineering   IIT Kanpur
   Title: Manufactured a model of The **Cantilever Toolbox.**

We have worked on the manufacturing process, as well as designing the structure & components. Also created a 3D model using Fusion360 Designing Tool and finalized the cost of the manufacturing process.

Self-Project

1. **Full Stack E-commerce + CMS**   Admin / Client
   - NextJs 13 Application was created fully functional E-commerce app having admin and client platform.
   - Used latest web development technologies including ReactJs, tailwind, prisma, MongoDB, MySQL, Planet Scale, Stripe, Next AUTH, App Router & Deployed on Vercel.
2. **Organized Automation Website**   Website
   - **Website**: Angular (a web framework), ElectronJs, and web development tools were used. Console functionality is also embedded.
3. **Comic Creator Web App**   Website
   - Using React Web Application to developed Web Application that allows User to create & share 10-panel Comic strip. Comic is generated by input text, that fetch images from text-to-image API using a provided API key.
4. **Server and Client App**
   - Using Android-studio, created a Server and Client application that enables the storage of data on the Google Fire-base Framework

Positions of Responsibilities

1. **Council Secretary Exhibition**   2021-22, IIT Kanpur
   Responsibility for Exhibition Planning and Execution
2. **Techkriti RoboGames Senior Executive**   2020-21, IIT Kanpur
   Prepared a database of various colleges and contacted them as well as convince them to Participate in the RoboGames RoboCaAD Manoeuvre using abstract calling.
3. **Senior Secretary Chess Club**   2020-21, IIT Kanpur
   Organizes Chess tournaments for the campus community. Conducted various events on Lichess.
4. **Secretary | Ritambhara | Antaragni**   2020-20, IIT Kanpur
   Prepared a database of various fashion giants, and We contacted them and convince them to sponsor our event. Contacted various colleges and their fashion societies and increased participation in the event.
5. **Volunteer | Ritambhara | Antaragni**   2019-20, IIT Kanpur
   Assist the Senior Secretary in organizing an event while Antaragni, Pearl Academy Delhi. Volunteered for the Hospitality wing of Antaragni-IIT Kanpur's annual cultural fest.

Instrumental & Computational skills

- STM (RHK Technology/Home build)
- AFM (Agilent-5500) and C-AFM (Oxford instrument Asylum Research)
- Cyclic voltammetry (CH Instruments 700E)
- UV-Vis Spectrophotometer
- Data handling and analysis of XPS
- Density of state, Energy calculations, DFT calculations.

Software & Skills

Programming Languages:	C/C++, Fortran Programming, Python. . .
Lab related	Corel Draw, Origin, Gaussian 09 package, Latex, Chemdraw, Avogadro, Orca, Mendeley, Mestre Nova, Quantumwise for pDOS and force field/DFT calculations.
Android Development:	Android Studio, Flutter, Kotlin, and Postman API.
Developer Tools:	LATEX, Markdown, Html, CSS, Git, VS Code, Visual Studio, Sublime Text Editor, Jupiter Notebook, Colab.
Frameworks:	ElectronJs, Reactjs, Nodejs, AngularJs.
Operating System/ Terminal:	Knowledge of Linux, Windows & Mac environments and APIs, CMD, Power Shell.
Misc.:	Fusion360, PowerPoint, Adobe Photoshop, MS-Word, Adobe Illustrator, Auto CAD, Overleaf, MongoDB, GNU Plot, Linux Shell.