

ABHA KUMARI

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EDUCATION

Chemical Engineering Ph.D. Program	University of Michigan Ann Arbor	August 2021- Present
Bachelors and Masters in Chemical Engineering	Indian Institute of Technology Kharagpur	2016-2021

RESEARCH EXPERIENCE

- **Isolation and Molecular Characterization of Extracellular vesicles (EVs) from Glioblastoma patients using a Microfluidic Device**
Prof Sunitha Nagrath, Nagrath Lab and Prof. Adam Sonabend, Northwestern University *March 2022- Present*
 - Investigating the potential of EVs as **biomarkers** for glioblastoma using a microfluidic device
 - Performing RNA extraction, qPCR, Western Blot and Nanoparticle tracking analysis to characterize cancer EVs
 - Analyzing the role of EVs as prognostic markers for glioblastoma patients undergoing chemotherapy
- **Porous PDMS-based Microsystem (ExoSponge) for Rapid Cost-effective Tumor Extracellular Vesicle Isolation and Mass Spectrometry-based Metabolic Biomarker Screening**
Prof Sunitha Nagrath, Nagrath Lab, University of Michigan *September- December 2022*
 - Planned and performed experiments to capture EVs of lung cancer patients using a porous PDMS-based platform (ExoSponge)
 - Prepared samples for scanning electron microscopy and mass spectrometry-based metabolites screening
- **Chiroptical detection and Mutation analysis of Cancer-associated Extracellular vesicles in Microfluidic devices with Oriented Chiral nanoparticles**
Prof Sunitha Nagrath and Prof. Nicholas A. Kotov, University of Michigan *August 2022- Present*
 - Supporting role in experiments designed to detect lung cancer-associated exosomes using chiral gold nanoparticles
 - Performed RNA extraction, qPCR, and Nanoparticle tracking analysis to characterize lung cancer exosomes
 - Harvested exosomes using ultracentrifugation by culturing four lung cell lines
- **Capture and Isolation of Senescent Cells from Blood to Prevent Age-Related Disorders**
Prof Sunitha Nagrath, Nagrath Lab, University of Michigan *October 2022- Present*
 - Studying the role of Doxorubicin and irradiation on induction of senescence in breast and brain cancer cells
 - Currently working on the characterization and capture of senescent fibroblasts using a microfluidic device
- **Study of Transport in Extended Meniscus Thin-Films of Non-Newtonian Liquids**
Prof Sunando Dasgupta, MTP Laboratory, IIT Kharagpur *January 2020- April 2020*
 - Mastered the protocol of cleaning and assembling a thin-film setup; obtained thin films of a non-Newtonian liquid of NaCMC
 - Performed experiments and literature survey to study the effects of angle of inclination and temperature on thin-film profile
- **Investigation of Crack Dynamics and Morphology in sessile colloidal droplets**
Prof Sunando Dasgupta, MTP Laboratory, IIT Kharagpur *January 2018 - March 2019*
 - Distinguished between **crack morphology** in neutral and charged colloidal droplets on hydrophilic and hydrophobic substrates
 - Employed **MATLAB** to predict crack-tip velocity; corroborated with velocity-time plots obtained from experiments
 - Provided solutions to the problem of **crack propagation**; crack-tip velocity can be reduced by varying charge of colloids

PUBLICATIONS AND APPEARANCES

- **Published:** Marvar, J. and Kumari, A., et al., Porous PDMS-based Microsystem (ExoSponge) for Rapid Cost-effective Tumor Extracellular Vesicle Isolation and Mass Spectrometry-based Metabolic Biomarker Screening, Advanced Materials Technologies (2023), Volume 8, Issue 9, 2201937
- **Poster presentation** at the AACR Annual Meeting 2023 Yoon-Tae Kang, Ji-Young Kim, Emine Sumeyra Turali-Emre, Hee-Jeong Jang, Minjeong Cha, Abha Kumari et al., Abstract 994: Chiroptical detection and mutation analysis of cancer-associated extracellular vesicles in microfluidic devices with oriented chiral nanoparticles. Cancer Res 1 April 2023; 83
- **Presented at :** Bioinnovations in Brain Cancer (BIBC) Symposium, University of Michigan, October 2022

- **In preparation:** Ghosh, U. U., Bhandari, A., Kumari, A., et al., Crack Formation in Sessile Colloidal Droplets on Substrates of Varying Wettability: Effects of Particle Surface Charge

SKILLS

- **Experimental :** Western Blot, Quantitative polymerase chain reaction (qPCR), Immunostaining, Cell Culture
- **Equipments :** Malvern Nanosight, Sorvall Ultracentrifuge, Biorad ZE5 cell analyzer, NanoDrop Spectrophotometer, Goniometer, Rheometer, Covance plasma asher, Spin Coat, Nikon and Leica Light microscope
- **Software Packages:** AutoCAD, COMSOL Multiphysics, GraphPad Prism, ANSYS Fluent, Aspen Plus, MATLAB(Numerical Computations), MS Excel, MS Powerpoint, MS Word, SolidWorks
- **Language:** English (Proficient), Hindi (Native)

INTERNSHIPS

- **Study of Mass and Momentum Transport in Cells using FE Analysis in FEBio**
Prof. Henry Shum, Department of Applied Mathematics, University of Waterloo *Summer 2020*
 - Adopted a finite-element analysis software to model momentum and mass transport in simple geometries
 - Used **Fluid-Structure Interaction analysis** in cells to study the fluid flow-profile as a function of membrane stiffness
- **Study of deposition characteristics of different metal anodes using Kinetic Monte Carlo method**
Prof Partha P. Mukherjee, ETSL, Purdue University *Summer 2019*
 - Studied the **electrodeposition morphology** of metal anodes (Li,Al,Mg) using **Kinetic Monte Carlo**, statistical technique
 - A solution to dendrite formation was obtained; operating conditions or materials can be changed to get dendrite-free deposits

OUTREACH ACTIVITIES AND POSITIONS OF RESPONSIBILITY

- **Peer mentor**, Department of Chemical Engineering, University of Michigan (August 2022- Present)
- **Activities coordinator**, Women+ Excelling More in Math, Engineering, and the Sciences (F.E.M.M.E.S.), University of Michigan (January 2022- Present)
- **Outreach officer**, Chemical Engineering Graduate Society, University of Michigan (January 2022- Present)
- **Mentor**, Joint Entrance Examination (JEE) Counselling Forum, 2017-2020
- **Department representative**, Undergraduate Council, IIT Kharagpur (Academic year 2019-20)
- **Vice President**, Chemical Engineering Association, IIT Kharagpur(Academic year 2019-20)

ACADEMIC ACHIEVEMENTS

- **Department Rank-1** among all batches of undergraduate students of IIT Kharagpur *July 2018 - July 2021*
- Selected for **Mitacs Globalink Research Internship 2020** - an initiative for international undergraduate students from 13 countries to experience research training in **Canada**; secured one of 2000 projects after a three-step selection process
- Selected for **S. N. Bose Scholars Program 2019** - a student exchange program between premier institutions in India and the **United States** by DST, Government of India, Winstep Forward and Indo-US Science and Technology Forum
- Received Endowment Prize for being among the **best girl student** with the **highest CGPA** at the end of sixth semester
- **Department Change** from Chemistry(Integrated M.Sc), achievable only by 110 out of 1400 students in a batch *2017*
- Selected for the **INSPIRE SHE** by the Department of Science and Technology, Govt. of India for excellence in JEE 2016

TEACHING EXPERIENCE

Teaching assistant of the course Chemical Reaction Engineering in Autumn semester 2020, IIT Kharagpur

EXTRA-CURRICULAR

- Received the **(National Cadet Corps) B Certificate**(NCC, IIT Kharagpur), participated in social service schemes -2018
- Served as a **Captain** in Dramatics, Elocution and Rangoli for Inter-Hall events, won **Bronze** (Hindi Elocution, Open IIT)
- **Silver** in Debate Competition(District Level) organized by The Telegraph in association with The Neotia University-2015
- **Gold** in Extempore Competition(District Level), a part of Vigilance Awareness Program organized by BPSC- 2012