



Alan Ranjit Jacob

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Major Areas of Research/Up to 3 major sponsored projects

Rheology, 3D printing, Colloids, Emulsions and Foams

Funding: SERB, DRDO

Major Research Facilities in the Group

Dynamic Light Scattering,

Zeta Potential measurement

Fumehood for Chemistry Synthesis



Technology/Product Developed/Up to 3 most significant Publications

- 1) *Convective cage release in model colloidal glasses*, A. R. Jacob, A. S. Poulos, S. Kim, J. Vermant and G. Petekidis, PRL.115 (2015), 218301
- 2) *Interfacial rheology of gallium-based liquid metals* A. R. Jacob, D. P. Parekh, M. D. Dickey, L. C. Hsiao Langmuir 35 (2019), 11774-11783
- 3) *Printable homocomposite hydrogels with synergistically reinforced molecular-colloidal networks* A. H. Williams, S. Roh, A. R. Jacob, S. D. Stoyanov, L. C. Hsiao, O. D. Velev Nature Communications 12 (2021), 1-9



భారతీయ సాంకేతిక విజ్ఞాన సంస్థ హైదరాబాద్
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad



Anand Mohan

Associate Professor, Cardiovasc. Mech. Lab, Department of Chemical Engineering

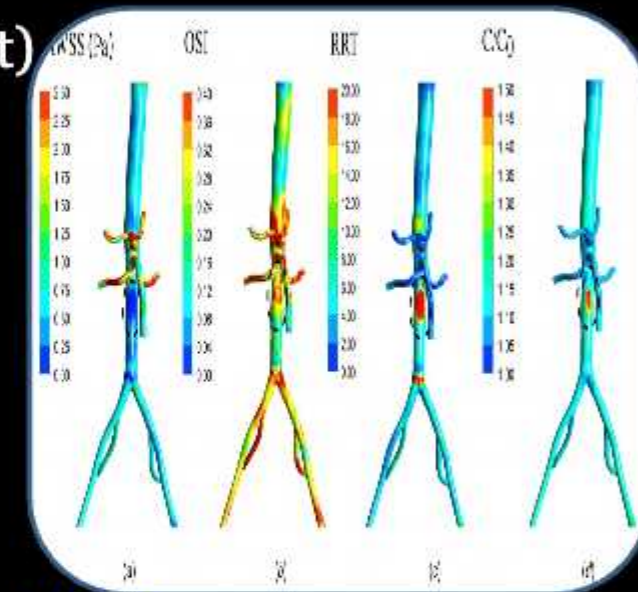
A-306; (040) 2301-6206; Mob: <->; anandm@che.iith.ac.in; www.iith.ac.in/~anandm

Major Areas of Research/Up to 3 major sponsored projects

Cardiovascular Mechanics, Complex Fluid Mechanics
Mathematical modeling of coagulation (DST-RFBR Project)
Modeling arteries with plaque (DBT, Basic Research)

Major Research Facilities in the Group

High-speed workstation (4 Nos)
ANSYS Academic (Research) License
Rheometer with Microscope



Technology/Product Developed/Up to 3 most significant Publications

CFD workflow to predict atherosclerosis sites in patient-derived geometries (see fig.)

Ameenuddin M. & Anand M. (2020). J. Biomech. Eng., 142(10): 101008.

Susree M., Pantelev M.A. & Anand M. (2018). J Theor. Biol., 453:108-116.



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Balaji Iyer Vaidyanathan Shantha

Associate Professor, CSMB Lab, Department of Chemical Engineering

Academic Building A-104.; Ph: 040 2301 6215; e-mail: balaji@che.iith.ac.in; Web:<http://iyerb.weebly.com>



Major Areas of Research/Up to 3 major sponsored projects

Modelling and Simulation of Bioinspired Particle-Polymer Hybrid Material Networks (DST SERB)

Multi-Scale Simulations for Design of Particle-Polymer Hybrid Materials (NSM)

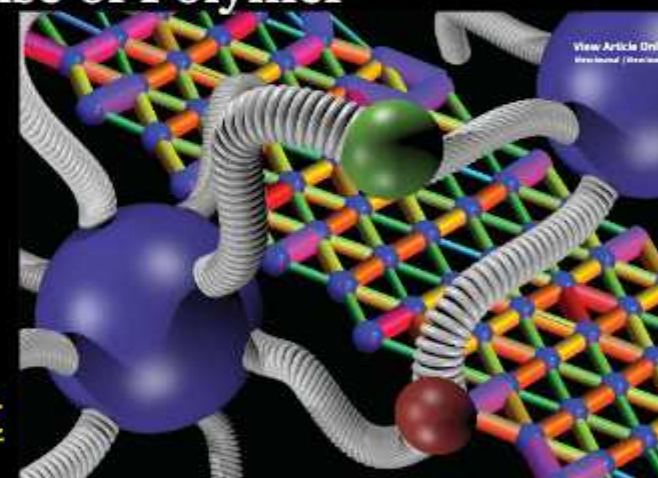
Effect of Functional Anisotropy on Mechanical Response of Polymer Nanocomposites

Major Research Facilities in the Group

HPC cluster

GPU workstations TITAN, PASCAL

NanoTracker Optical Tweezer Setup



Technology/Product Developed/Up to 3 most significant Publications

Phukan M., Haritha P., Roy, T. R and Iyer B. V. S., Soft Matter, 18, 8591–8604(2022)

Iyer B. V. S., Soft Matter, 18, 6209-6221(2022).

Diksha Kadre and Iyer B. V. S., Macromolecular Theory and Simulations, 30, 210005:1-19 (2021).



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Chandra Shekhar Sharma

Professor, CARBON Lab, Department of Chemical Engineering

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Major Areas of Research

Materials:

Nanostructured Carbon and Metal Oxide/Sulfides Materials, Electrospun Polymer Nanofibers

Applications:

Energy Storage Devices, Drug Delivery, Sensor

Major Research Facilities in the Group

Pouch & Coin cell Battery Assembly & Testing, Small Angle X-ray Scattering, Graphitizing Furnace (2800°C), UV-vis Spectroscopy, Goniometer, Electrospinning, Lithography

Technology/Product Developed

1. Nanofibers based Feminine Hygiene Products (TRL-6)
2. Direct Recycling of Polystyrene Waste (TRL-6)
3. Candle soot and Pencil lead based High Capacity Anodes for Li-ion batteries (TRL-4)



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Structure and Reactivity

Phase Change

Metal Nitrates $\xrightarrow[Calcination]{573\text{ K, 6 h}}$ Metal Oxides and Mixed metal oxides $\xrightarrow[Reduction\ H_2/N_2\ (60/40)]{573\text{ K, 3 h}}$ Metals and Metal Alloys

Reaction Mechanism

Legend:
 Yellow circle: Ni-Cs Alloy
 Red circle: Ni
 Blue circle: Co

The diagram illustrates the reaction mechanism for the synthesis of metal alloys on Al_2O_3 supports. The process involves the reduction of metal nitrates to metal oxides and mixed metal oxides, followed by the reduction of these oxides to metals and metal alloys. The reaction mechanism shows the interaction of H_2 with the metal oxides, leading to the formation of metal alloys and the release of H_2O and CO_2 .

1. Fourier Transformed Infrared Spectroscopy
2. HR-XRD; 3. Batch and Fixed bed reactors
4. Gas Chromatograph

1. T Kella, D Shee, Microporous and Mesoporous Materials 323 (2021) 111216
2. D Raikwar, S Majumdar, D Shee,, Green Chemistry 21 (2019) 3864-3881.
3. D Raikwar, S Majumdar, D Shee, Molecular Catalysis 499 (2021) 111290.



Devarai Santhosh Kumar

Associate Professor, IBBL Lab, Department of Chemical Engineering

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Major Areas of Research

- Production of mycelial biomass, microbial bioactive metabolites and industrial enzymes from edible fungi in submerged fermentation.
- Anti-cancer, Anti-diabetic, Anti-cholesterolic and Antioxidant bioactive metabolites from mushroom species (*P. ostreatus*).
- Identification of ergosterol and gallic acid from fungal mycelium as a promising anti-COVID-19 metabolites.
- Collection, Isolation and Screening of fungal species for L-asparaginase production.
- Fungal lipase production using fungi by solid-state fermenter- Application for Biodiesel Production



Major Research Facilities in the Group

HPLC, Bioreactors (7 litres, 2 litres, 1 litres), Solid-state fermenter, Rotary shaker incubator, Tray fermenter Solid-state incubator, Centrifuge, Rotary bed reactor, UV-spectrophotometer, Binocular microscope.



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Giridhar Madras

Professor, Department of Chemical Engineering

Major Areas of Research/Up to 3 major sponsored projects

Heterogeneous catalysis

Polymer applications

Supercritical fluids

Major Research Facilities in the Group

Catalytic reactor

Technology/Product Developed/Up to 3 most significant Publications

Production of Green Hydrogen

Catalytic treatment of waste water



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Kirti Chandra Sahu

Professor, Multiphase Microphysics Lab

Chemical Engineering Department

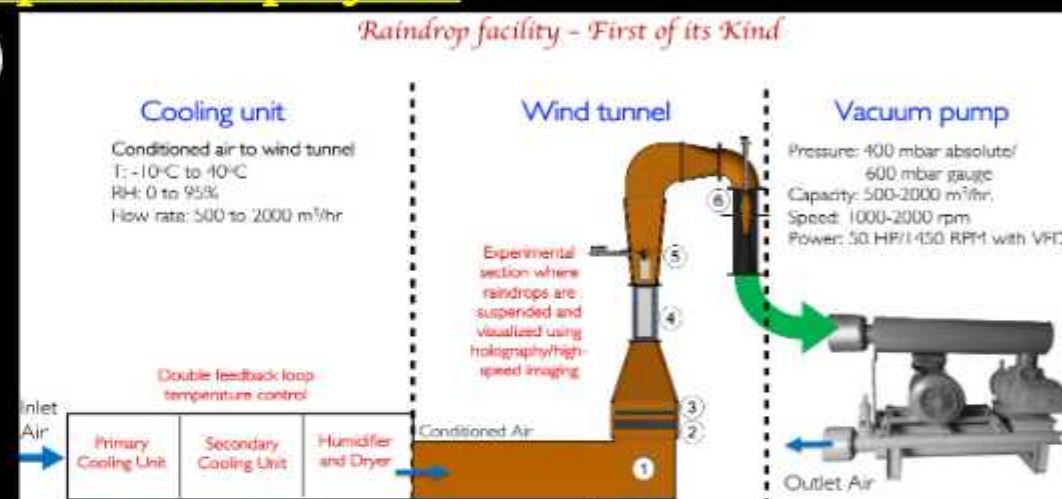
A-508; Office Phone No: +40 23016201; Email: ksahu@che.iith.ac.in

Major Areas of Research/Up to 3 major sponsored projects

- 1) Clouds and raindrops (SERB; SOCH)
- 2) Viscosity-stratified flows

Major Research Facilities in the Group

- 1) Experimental facility to measure the raindrop size distribution
- 2) Thermal Imaging System



Technology/Product Developed/Up to 3 most significant Publications

- 1) P. K. Kirar, S. K. Soni, P. S. Kolhe and K. C. Sahu, An experimental investigation of droplet morphology in swirl flow, Journal of Fluid Mechanics, 2022, 938, A6.
- 2) A. Hari Govindha, P. Katre, S. Balusamy, S. Banerjee and K. C. Sahu, Counter-intuitive evaporation in nanofluids droplets due to stick-slip nature, Langmuir, 2022, 38 (49), 15361-15371
- 3) K. C. Sahu, A new linearly unstable mode in the core-annular flow of two immiscible fluids, Journal of Fluid Mechanics, 2021, 918, A11.



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Kishalay Mitra

Professor, GOKUL, Department of Chemical Engineering

A 310; Office: 23016014; Mobile: 9490219010; kishalay@che.iith.ac.in; [Kishalay Mitra | IIT Hyderabad](#)

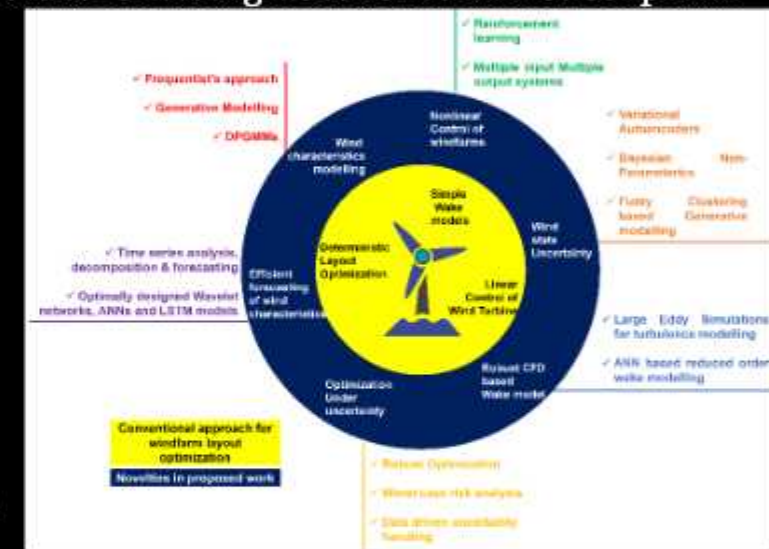


Major Areas of Research/Up to 3 major sponsored projects

- 1) Robust wind energy conversion system – deep learning meets sustainable energy utilization (DST National Supercomputing Mission)
- 2) AI based prediction of microstructure & correlating it with mechanical properties for steel grades rolled in Hot Strip Mill (Tata Steel)
- 3) Application of AI in optimizing protein/vaccine production in bioreactor for affordable bio-molecule production (DBT)

Major Research Facilities in the Group

- 1) Optimization environment for India wide Bio-supply chain design considering sources of uncertainty
- 2) HPC enabled AI software for building digital twins involving Auto-ML for computationally expensive programs
- 3) Wind farm layout optimization and control software under wind state uncertainty considering practical constraints
- 4) AI enabled sustainable crop yield monitoring framework based on satellite imagery



Technology/Product Developed/Up to 3 most significant Publications

1. Mittal, P., Mitra, K., In Search of Flexible and Robust Wind Farm Layouts Considering Wind State Uncertainty, Journal of Cleaner Production, 2020, 248, 119195
2. Gumte, K., Pantula, P. D., Soumitri M. S., Mitra, K., Achieving Wealth from Bio-Waste in a Nationwide Supply Chain Setup under Uncertain Environment through Data Driven Robust Optimization Approach, Journal of Cleaner Production, 2021, 291, 125702
3. Ravi Kiran, I., Soumitri M. S., Mitra, K., Deep Learning Based Dynamic Behaviour Modelling and Prediction of Particulate Matter in Air, Chemical Engineering Journal, 2021, 426, 131221



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Lopamudra Giri

Associate Professor, Bioimaging and data analysis,
Department of Chemical Engineering.

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Major Areas of Research

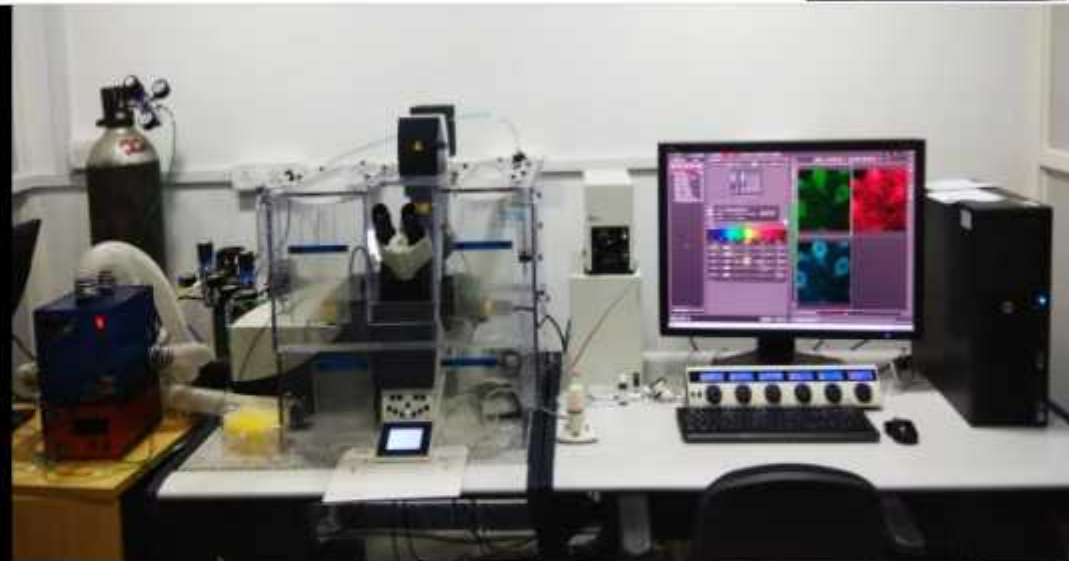
Bioimaging, Data analysis,
Construction of cell based disease
model and drug repurposing, Systems
Biology, 3D printed microfluidic
chip, Confocal microscopy

Major Research Facilities in the Group

Mammalian cell culture facility, 3D
printer,
Confocal microscopy with incubator for
live imaging facility, Fermentation facility
along with pH and oxygen sensing
system, Cell culture in shaker incubator.

Technology/Product Developed

Development of an imaging device: 3-D printing based
fabrication of microfluidic device suitable for mammalian
cell culture and imaging using confocal microscopy,
Indian Patent.: 201941027664, Title: Microfluidic devices
and methods of fabrication thereof, Accepted (2021,
April).



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Mahesh Ganesan

Assistant Professor, Soft Matter Lab, Department of Chemical Engineering

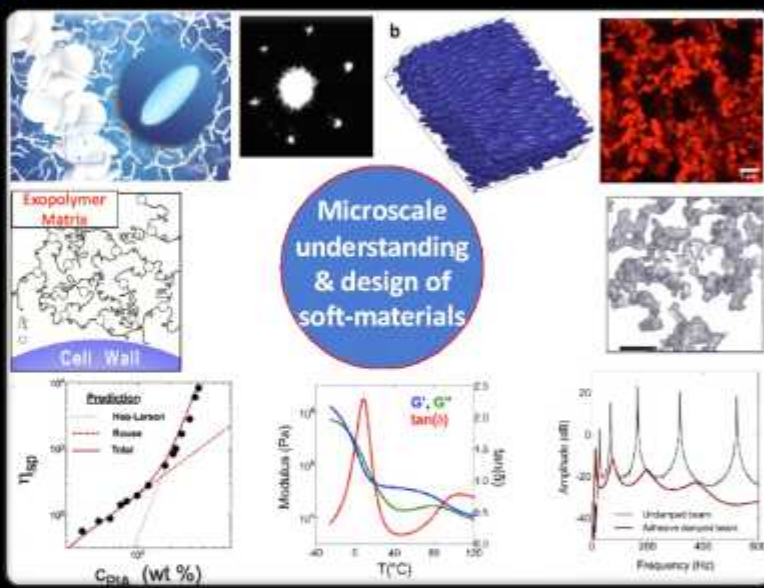
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Major Areas of Research/Up to 3 major sponsored projects

1. Structure, Rheology and Optical Properties of Colloidal Suspensions and Gels (SERB)
2. Design of Pressure Sensitive Adhesives Polymers (IITH)
3. Design of Soft Materials; Structure-Property of Polymers and Colloids; Rheology, Light Scattering, Microscopy, Image Analysis

Major Research Facilities in the Group

1. High Temperature Polymer Press
2. Dynamic Light Scattering (access via shared facility)
3. Rheometer (access via shared facility)
4. Confocal Laser Scanning Microscope (access via shared facility)
5. Customized Image Processing Packages for Soft Matter Studies



Technology/Product Developed/Up to 3 most significant Publications

1. Microstructure and elasticity of dilute gels of colloidal discoids, *Soft Matter*, 18 (2022)
2. High density equilibrium phases of colloidal ellipsoids by application of optically enhanced, direct current electric fields, *Soft Matter* 13 (2017)
3. Multilayer Tapes, European Patent No. EP 3670 622 B1 (March 30, 2022) ; Multilayer constrained layer damping, US Patent No. US 11,059,264 B2 (July 13, 2021)



Narasimha Mangadoddy

Professor, Mineral Processing & Multi-phase flow Lab, Chemical Engineering

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Major Areas of Research/Up to 3 major sponsored projects

- Mineral Processing, Particulate Technology, Industrial CFD/DEM & Waste utilization
- Development of an improved spirals for low grade chromite separation (UAY-TATA Steel)
- Development of non-spherical DEM tool for Mineral processing application (SERB)
- Recovery of valuable metals from lead-zinc tailings (Ministry of Mines & HZL)

Major Research Facilities in the Group

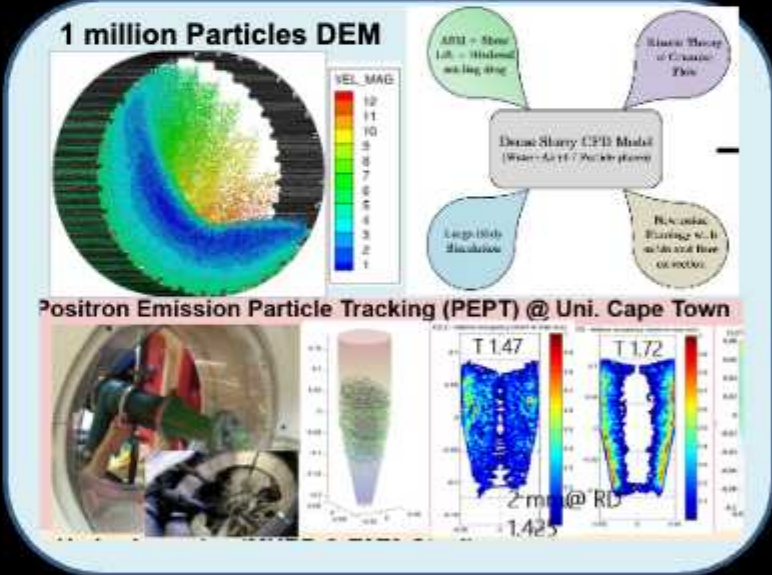
- Beneficiation Set-ups including Isa Mill
- Process tomography (ERT/ECVT)
- Laser diagnostic lab (2D LDA/PIV & High speed video camera)

Technology/Product Developed/Up to 3 most significant Publications

Development of Novel Hydrocyclone Designs for Improved Fines Classification Using Multiphase CFD Model
([10.1016/j.seppur.2016.10.026](https://doi.org/10.1016/j.seppur.2016.10.026))

Dense medium cyclone for near gravity coal fraction separation, Indian patent is filed (IN 201841023467)

A multi-component mathematical model for hydrocyclone classifier under SERB project (Under preparation)



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Parag D. Pawar

Associate Professor, Biosystems Lab, Department of Chemical Engineering

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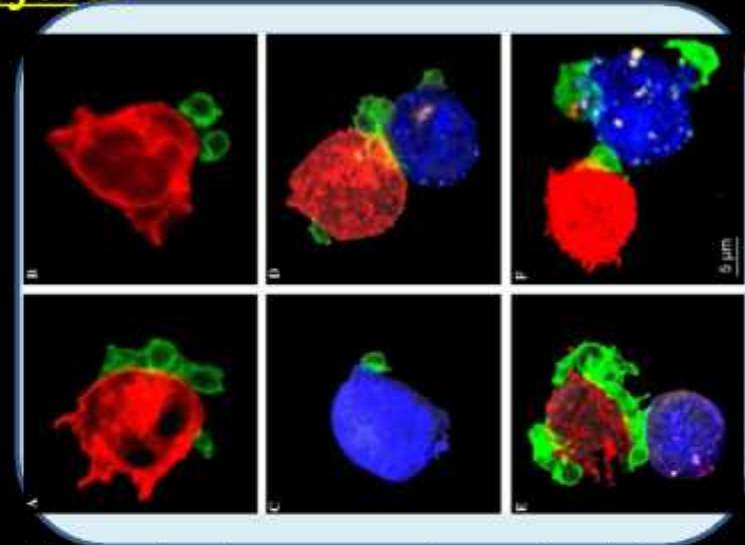
Major Areas of Research/Up to 3 major sponsored projects

Intercellular interactions
Biofilms and antibiotic resistance
Cellular automata

Major Research Facilities in the Group

Flow cytometer
Rheometer

Technology/Product Developed/Up to 3 most significant Publications



Chirathanamettu TR, Pawar PD. Quorum sensing-induced phenotypic switching as a regulatory nutritional stress response in a competitive two-species biofilm: An individual-based cellular automata model. *J Biosci.* 2020;45:122.

Machineni L, Chirathanamettu TR Nandamuri V, Pawar PD. A 3D individual-based model to investigate the spatially heterogeneous response of bacterial biofilms to antimicrobial agents. *Math Meth Appl Sci.* 2018;1-17.

Machineni L, Rajapantul A, Nandamuri V, Pawar PD. Influence of Nutrient Availability and Quorum Sensing on the Formation of Metabolically Inactive Microcolonies Within Structurally Heterogeneous Bacterial Biofilms.

Individual-Based 3D Cellular Automata Model. *Bull Math Biol.* 2020;82:618. doi:10.1007/s11538-017-0246-9



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Phanindra Jampana

Associate Professor, Stochastic Dynamical Systems Lab

Department of Chemical Engineering

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Major Areas of Research

- 1) System Identification
- 2) Automatic Control
- 3) ERT Algorithms

Major Research Facilities in the Group

Technology/Product Developed



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Ranajit Mondal

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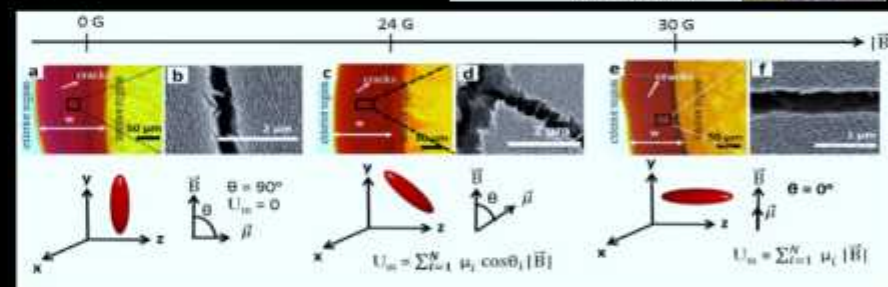
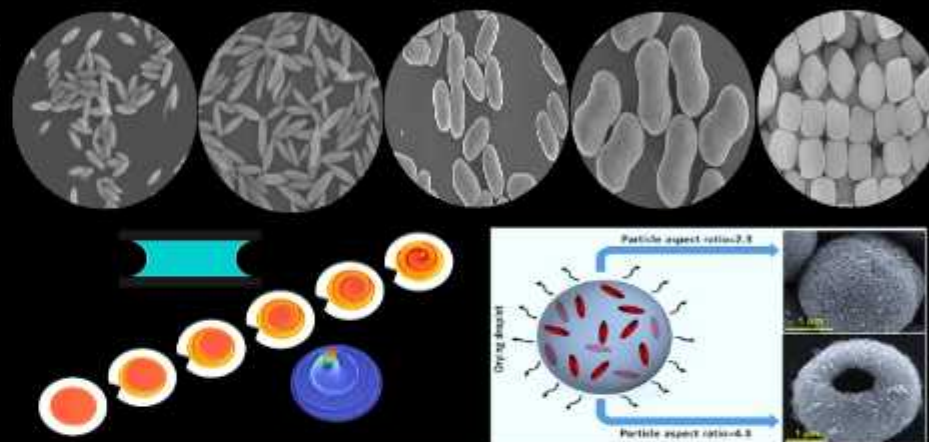
Major Areas of Research:

- ❖ Evaporative patterning and self-assembly of colloids
- ❖ Droplet drying
- ❖ Desiccation cracks
- ❖ Rheology of colloidal suspensions
- ❖ Emulsions and Foams
- ❖ Porous Materials

Major Research Facilities in the Group

- ❖ Potable digital USB microscope

Technology/Product Developed/Up to 3 most significant Publications



1. R. Mondal, M. G. Basavaraj, "Patterning of colloids into spiral via confined drying", Soft Matter, 16, 3753-3761 (2020).
2. R. Mondal, A. Das, D. Sen, D. K. Satapathy, M. G. Basavaraj, "Spray drying of colloidal dispersions containing ellipsoids", Journal of Colloid and Interface Science, 551, 242-250 (2019).
3. H. Lama, R. Mondal, M. G. Basavaraj, D. K. Satapathy, "Cracks in dried deposits of hematite ellipsoids: Interplay between magnetic and hydrodynamic torque", Journal of Colloid and Interface Science, 510, 172-180 (2018).



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Satyavrata Samavedi

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Major areas of research

1. Physics of polymer electrospinning
2. Design of polymeric nanofibrous meshes for sustained drug release
3. Co-delivery of multiple therapeutics for combination therapy
4. Biomaterial-driven immunomodulation in degenerative diseases

Major research facilities in the group

1. Electrospinning (multiple configurations)
2. High-throughput hybrid fluorescence microscope/plate reader
3. Circular dichroism spectrometer

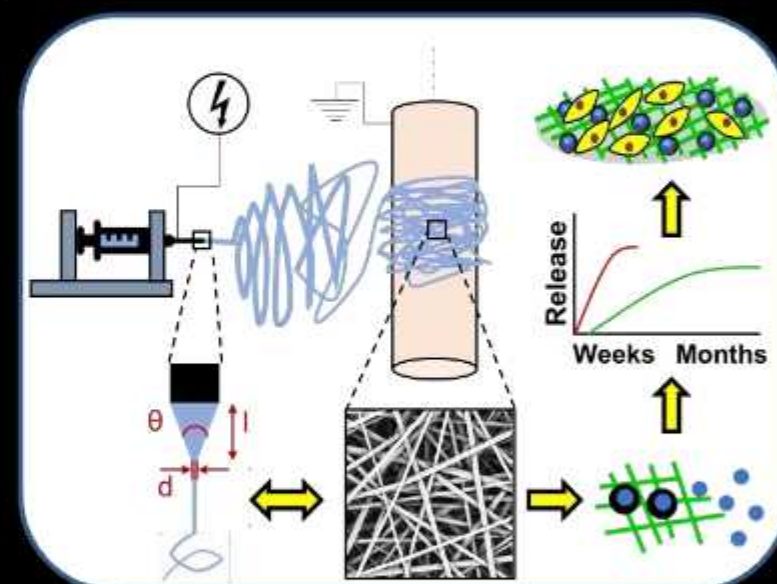
Three recent significant publications

1. N Joy *et al.*, "Coupling between voltage and tip-to-collector distance

in polymer electrospinning: insights from analysis of regimes, transitions & cone/jet features", Chemical Engineering Science, 230, 116200, 2021

1. D Venugopal *et al.*, "Electrospun meshes intrinsically promote M2 polarization of microglia under hypoxia and offer protection from hypoxia-driven cell death", Biomedical Materials, 16, 045049, 2021

3. N Joy *et al.*, "Robust strategies to reduce burst and achieve tunable control over extended drug release from uniaxially electrospun composites", European Polymer Journal, 168, 111102, 2022



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Shelaka Gupta

Assistant Professor, MMEC Lab, Department of Chemical Engineering

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Major Areas of Research/Up to 3 major sponsored projects

Upgradation of Biomass Derived Platform Molecules to Value Added Chemicals (DST Sponsored)

Rational Design of Heterogeneous Catalyst using Density Functional Theory Simulations

Understanding Diffusing and Oxidation Behavior in High Entropy Alloys

Major Research Facilities in the Group

Vienna *ab-initio* simulation package for DFT Simulations

HPC for DFT simulations

Technology/Product Developed/Up to 3 most significant Publications

1. Rajendran et al. CuO as a reactive and reusable reagent for the hydrogenation of nitroarenes, *Applied Catalysis B: Environmental* 297 (2021) 120417
2. Shenoy et al., Understanding the origin of structure sensitivity in hydrodechlorination of trichloroethylene on a palladium catalyst, *Reaction Chemistry & Engineering*, 2021 (6) 2270.
3. Alam et al., Development of 6-amyl- α -pyrone as a potential biomass-derived platform molecule, *Green Chem.*, 2016, 18, 6431-6435



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Vinod Janardhanan

Professor, Fuel cells and Catalysis, Department of Chemical Engineering

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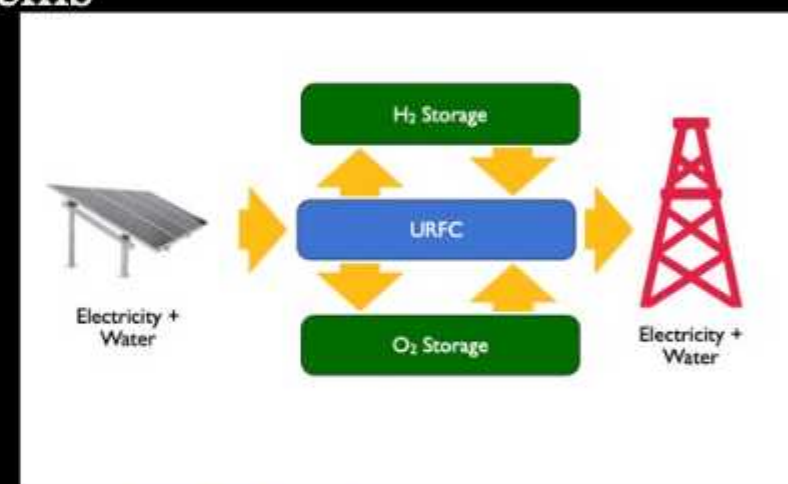


Major Areas of Research/Up to 3 major sponsored projects

- 1) HT-PEM fuel cell and electrolyzers
- 2) Development of kinetic models
- 3) Multi-scale modeling of chemically reacting systems

Major Research Facilities in the Group

Flow reactor
Gas-chromatograph
Autolab
Fuel cell test station for HT-PEM



Technology/Product Developed/Up to 3 most significant Publications

- 1) Mechanistic modeling of electrochemical charge transfer in HT-PEM fuel cells, *Electrochem Acta*, 261, 436-444 (2018)
- 2) Micro-kinetic modeling of CO₂ and H₂O electrolysis on Ni in a solid oxide electrolysis cell: A critical evaluation, *J. Electrochem. Soc.* 168, 124507 (2021)
- 3) Mechanistic model for biogas dry reforming, *Ind. Eng. Chem. Res.* 59, 15737-14746, (2020)



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