DHRUMIL SHAH

CURRICULUM VITAE

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RESEARCH INTERESTS

Catalysis, Reaction Engineering, Energy Engineering, Process Intensification, Process Design, Sustainable Engineering

KEY PUBLICATIONS AND HONORS

- **Learnings from Pratham, First Student Satellite of IIT Bombay** | Co-author *Dec '18*
  Full paper selected in *International Conference on Small Satellites 2019* to be presented in February, 2019
- **Institute Technical Person of the Year** | Awarded to 2 out of 10,000+ on-roll students of IIT Bombay *'18*
  For finalizing the payload of Advitiy, IIT Bombay's 2nd student satellite, after providing proof of concept and contributions towards establishing a new technical club, Ham Radio Club, IIT Bombay
- Presented Pratham, IIT Bombay student satellite project at Harbin Institute of Technology, China in the *Technical Forum on Student Micro/Nano-Satellites* *'17*
- **Hostel Technical Color** | Awarded to 3 out of 300+ hostel students of IIT Bombay *'17*
  For above par contribution towards hostel technical culture, winning the Inter-Hostel Overall General Championship

KEY RESEARCH/ TECHNICAL PROJECTS

Dry Reforming of Methane | B.Tech Project *Sep '18 - Present*

Guide: Prof. Sanjay M. Mahajani, Chemical Engineering Department, IIT Bombay

- Designed and established a setup for gas-solid heterogeneous reaction to occur at 800 ^{0}C based on furnace heating, with reactants being carbon dioxide and methane aimed to achieve high conversion
- Synthesized catalyst for the reaction and analyzed the same for BET Surface area, X-ray diffraction, Chemisorption and Temperature Programmed Desorption to assess the reaction mechanism on the catalyst
- Experimentally established almost zero conversion using Gas Chromatography in the absence of catalyst keeping all the other reaction conditions conducive for the reaction hence proving the need for catalyst
- Achieved close to 99% conversion at 800 ^{0}C with H_2:CO ratio at 1:1, establishing proof of concept of the reaction

Emitter Array for Nanosatellite Ion Thruster | Mitacs Globalink Research Internship *May '18 - Jul '18*

Guide: Prof. Fabio Cicoira, Chemical Engineering Department, École Polytechnique de Montréal

- Developed a Polydimethylsiloxane (PDMS) mold to be used to design emitter arrays on carbon xerogels
- Refined the Resorcinol-Formaldehyde based carbon xerogel synthesis process from 2 weeks synthesis time to 5 days
- Proposed various possible applications of carbon xerogels (due to its high specific surface area) in areas such as supercapacitors, catalysis etc. and devised possible synthesis procedure to meet these applications
- Designed a low cost strain gauge based weight measurement device for measuring the thrust produced by the microthruster which is of the order of few millinewtons

IIT Bombay Student Satellite Project | Payload and Ground Station Segment

Advitiy, 2nd student satellite of IIT Bombay *May '17 - May '18*

Advitiy is the next step after Pratham with the mission of making a 100% reliable, repeatable satellite bus

- Finalized Advitiy's payload (transmission of image in SSTV protocol and reception by low cost DIY receiver) after analyzing 30+ payload ideas, considering the mission statement, impact and social goal
- Developed a Payload wiki structure for the benefit of the institutes aiming to start their own Student Satellite Project; acknowledged by AMSAT-UK, world's largest organization for amateur satellites

Pratham, 1st student satellite of IIT Bombay *Feb '16 - Apr' 17*

Launched on-board PSLV-C35 in Sep '16, Pratham was designed and built exclusively by the students of IIT Bombay

- Designed an automated ground station to receive signals in amateur frequency range from more than 100 satellites operating in the amateur radio frequency bands; optimizing the communication link to receive signals upto -70 dBm

INDUSTRIAL EXPERIENCE

Overview of Indian Chemical Industries *Dec '17*

Guide: Prof. Sanjay M. Mahajani, Chemical Engineering Department, IIT Bombay

- Discussed the role of technology, economics, and safety in plant design with leading industry experts belonging to 5+ sectors including pharmaceutical, petrochemical and equipment fabrication sectors as part of interactive sessions
- Simulated Gas processing plant of GAIL India Ltd. located in Gujarat, India, using DWSIM; determined optimum working conditions constrained to meeting technical specifications as part of a course project
- Documented a report on Reliance Jamnagar Oil Refinery, world's largest oil refinery, detailing on-site oil processing as well as brief insight into the background of the company as part of a 3-member group project

SELECT COURSE PROJECTS

Technocommercial Analysis of 10 kTPA plant for Glyphosate *Jan '18 - May '18*

Guide: Prof. Sanjay M. Mahajani Course: Technocommercial Aspects of Fine and Specialty Chemicals

- Analyzed and compared 3 commercially established processes and designed a process using the hydrogen cyanide process of production as a base process; considering global demand and current producers and technical feasibility
- Using principles of basic economics, evaluated the plant to produce returns of investment at a rate of 21.24% per annum leading to a payback period of 2 years and 11 months, making it a promising venture

Life Cycle Assessment of production of Dimethyl Ether from Biomass and Coal *Jul '18 - Dec '18*

Guide: Prof. Yogendra Shastri Course: Sustainable Engineering Principles

- Estimated the environmental impact of production of dimethyl ether from two raw materials - biomass and coal
- Defined functional unit for comparison between the two processes, defined system boundaries for unbiased comparison of impact; analyzed the environmental impact using OpenLCA for the inventory estimated per kg of product

POSITIONS OF RESPONSIBILITY

Co-Founder and Manager, IIT Bombay Ham Radio Club *May '17 - Apr '18*

- Instituted a first-of-its-kind club in IIT Bombay for aiding national disaster relief operations using radio-based communication, when all other forms of communication fail; devised the team structure and various roles within club
- Fostered a diverse pool of 100+ people having different interests comprising both undergraduate and post-graduate students from inside as well as outside the campus

Project Manager, Team Zero Waste *Feb '18 - Present*

A project under supervision of Tata Centre for Technology and Design, IIT Bombay guided by Prof. Sanjay Mahajani, aimed towards mitigation of Solid Waste produced in the campus

- Spearheading a team of 20+ students aimed to create a model in the institute to minimize solid waste to landfill
- Defined technical approach considering the diverse challenges in managing multiple types of waste generated
- Executed 2-tier recruitment process recruiting 13 students out of more than 50 students evaluating technical aptitude

Institute Student Mentor and Department Academic Mentor *Jul '18 - Present*

- Selected among a team of 86 mentors out of 300+ participants to mentor 12 first-year students
- Involved in inspiring and motivating 3 mentees under the Academic Rehabilitation Program to improve academically

RELEVANT SKILLS

Programming Languages	C++, Arduino, HTML
Software	DWSIM, OpenFoam, MATLAB, ANSYS, SOLIDWORKS, Eagle, LaTeX, MS Office
Equipment Experience	Gas Chromatograph, Radio Transceivers