

SAYANI THAKUR

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SUMMARY

Chemical engineer (10+ years) specializing in catalytic process development, scale-up and techno economic evaluation for green fuels and circular economy pathways. Driving R&D innovation in clean hydrogen and circular process technologies toward global Net-Zero targets.

EXPERIENCE

Senior Research Scientist

Reliance Industries Limited

2021 - Present Jamnagar

Refining R&D

- Hydrogen / Bio-Methanol**
- Developed catalytic biomass gasification process to make **hydrogen rich syngas**, scaled up to 3,000 TPD commercial design at Jamnagar.
- Technology Potential Value:** H2 at <2 \$/kg; Bio-Methanol at 374 \$/T and Ammonia at 351 \$/T.
- Built reactor scale-up models, delivered BDEP and technology validation dossier for site implementation under Reliance's Net-Zero program.
- Technology is ready for commercial deployment.
- Chemical recycling of Waste Plastics**
- Co-invented a patented waste-plastic chemical recycling process, scaled from TRL 1 to 9, enabling circular-polymer production
- Life cycle cost:** Least among existing commercial processes
- Conducted lab to demo runs and developed kinetic-reactor models to scale the process to 25 TPD commercial units.
- Validated co-processing feasibility in refinery units (Coker, FCC, Cracker) for over 200 KTPA refinery integration; prepared BDEP for multiple commercial plants.
- Established circular polymer value chain within refinery operation.
- Catalytic Propane Dehydrogenation (PDH)**
- Led development of novel PDH catalyst and process from lab to commercial scale with **multizone fluidized-bed dehydrogenation** reactor design.
- Technology Potential Value:** 30% more than existing commercial processes
- Improved propylene yield by 25% and catalyst stability by 1.8x vs benchmark catalysts by developing a novel Cr-based multi-metallic catalyst.
- Reduced production cost per ton feed by 38% through optimized reactor configuration and operation strategies for the in-house technology.

Research Scientist

Reliance Industries Limited

2017 - 2021 Jamnagar

Refining R&D

- Crude-to-Chemicals (MCC)**
- Led reactor modeling and validation for **multi-zone catalytic cracking** (MCC) technology for direct crude-to-chemicals conversion, advancing the concept from lab to PDP stage.
- Developed and validated a 1D steady-state, 17-lump **kinetic-hydrodynamic reactor model** (C++ / MATLAB) using 900+ plant data points ($R^2 > 0.9$) versus FCC benchmarks and pilot data.
- Delivered insights on reaction pathways, CFD simulations, and optimized reactor configuration for the commercial design.
- Torrefied Biomass Co-processing**
- Conceptualized catalytic torrefaction and pyrolysis processes converting biomass to torrefied char and bio-oil for co-processing in RIL petcoke gasifiers.
- Developed reactor models and **determined reactor geometry and operating parameters**, that directly guided fabrication and successful commissioning of 10 TPD torrefaction and 5 TPD pyrolysis plants.
- Plant Troubleshooting**
- Diagnosed and **resolved recurrent shutdowns** in the **world's largest petcoke gasifier**, identifying slag-handling and feed inconsistencies as key causes.
- Built a non-linear multivariate regression model** correlating slag/slurry viscosity with metal content, **deployed for daily monitoring** to predict deviations and prevent unplanned gasifier shutdowns.

Research Assistant

Industrial Research and Consultancy Centre (IRCC)

2015 - 2017 Mumbai

Polymer Process Development – (IIT Bombay – DRDO Collaboration)

- Collaborated with **Prof. Devang Khakhar** and **Dr. Rahna Hakim (DRDO-India)** to **commission and optimize** pilot-scale cast-melt extrusion and corona-poling units for PVDF thin-film fabrication.
- Standardized process parameters** for uniform dielectric film quality and compiled results into a joint IIT Bombay–DRDO technical report supporting further development and scale-up.

Design Engineer

Pacific Scientific Pvt Ltd

2014 - 2015 Kolkata

- Designed process equipment for air pollution control systems various plant projects, ensuring technical and regulatory compliance.
- Prepared cost estimates and project scopes and coordinated execution and commissioning on time.

PUBLICATIONS

A Method for Catalytic Conversion of Waste Plastic into Liquid Fuel, granted in US11319493, IN458444, EU3844247, J510954

S. Daggupati, S. Thakur, S. Mandal, A. Das, A. V Sapre

A Catalyst Composition, a Process of Preparation and Dehydrogenation of Alkane, PCT/IB2024/062952

V. Palla, S. Daggupati, S. Thakur, S. Mandal, A. K Das

A multi-zone fluidized bed process for dehydrogenation of light alkane to alkenes and hydrogen, DN20250022

S. Thakur, S. Daggupati, S. K Mandal, A. K Das

Catalytic Gasification of Biomass in Dual-Bed Gasifier for producing Tar Free Syngas, Energy Fuels, 2019, 33, 2453–2466

S. Mandal, S. Daggupati, S. Majhi, S. Thakur, R Bandyopadhyay, A. K. Das.

CONFERENCES

2025 AIChE Annual Meeting (Nov 2025, Boston): "Catalytic dehydrogenation of Propane with Novel high-active Chromium based catalyst."

24th RPTM (Jan 2020, Bangalore): Circular Economy – Sustainable Catalytic Conversion of Waste Plastic to a Stable Oil.

EDUCATION

PhD, Chemical Engineering

Indian Institute of Technology Bombay

GPA
8.4 / 10

2020 - Present Mumbai

- Supervisors:** Prof. Sanjay Mahajani, IIT-B and Dr Asit Das, RIL
- Topic: 'Catalytic dehydrogenation of lower alkanes to high-value chemicals in fluid bed'

Chemical Engineering

Heritage Institute of Technology

GPA
8.6 / 10

2010 - 2014 Kolkāta, India

SKILLS

Catalytic Process Design | Reactor Modeling (PFR, CFB, FBR) | Kinetic Modeling | MATLAB/C++ | CFD- (ANSYS) | Process Scale-up | BDEP | Techno-economic Evaluation | Circular Economy | Sustainability | Team Mentorship.