SHUBHI GUPTA

Postal address:
FMME Department, IIT (ISM) Dhanbad,
Dhanbad, Jharkhand, India, 826004

Mailing address:
shubhi@iitism.ac.in
shubhigupta480@gmail.com
+91 8791876288

Research area

Waste biomass valorization to fuels and chemicals, Pyrolysis, Catalysis, Bio-oil upgradation, Plastic pyrolysis, Life cycle analysis (LCA), Multiobjective optimization

Experience

Assistant Professor	Department of Fuel, Mineral and Metallurgical Engineering, Indian Institute of Technology (Indian School of Mines) Dhanbad, Dhanbad, Jharkhand, India.	Nov. 2023-Present
Post-doctoral fellow (PDF)	Chemical Engineering Department, Indian Institute of Technology Bombay, Mumbai, Maharashtra, India. Project title: "Multiobjective optimization of biomass conversion techniques" Supervisor: Prof. Yogendra Shastri	June 2023-Oct 2023

Education

PhD — Chemical Engineering Department, Indian Institute of Technology Roorkee, Roorkee, Uttarakhand, India. (July 2018-May 2023)

Thesis title: "Valorization of waste biomass through catalytic pyrolysis to produce upgraded bio-oil".
Thesis defended on 09th May, 2023.
Supervisor: Prof. Prasenjit Mondal

- Multiparameter optimization of pyrolysis using response surface methodology (RSM) and process modeling through response surface methodology (RSM) and artificial neural network (ANN) approach.
- Developed three different types of catalysts: (1) conventional gamma alumina-based catalysts, (2) spent adsorbent derived catalysts and (3) biochar-based catalysts for catalytic pyrolysis of waste biomass.
- Evaluated the impact of catalysts on the degradation behavior, kinetics and thermodynamics of catalytic pyrolysis process with respect to non-catalytic pyrolysis
- Evaluated the effect of catalysts on the product distribution, properties and composition of pyrolysis products. Significant enhancement in the fuel value and phenolic content of bio-oil was achieved.
- Life cycle analysis (LCA) and operating cost assessment of both non-catalytic pyrolysis and catalytic pyrolysis processes were carried out by considering co-product's utilization in distinct scenarios, together with single parameter sensitivity analysis and Monte Carlo uncertainty analysis.

M.Tech — Chemical Engineering Department, Indian Institute of Technology Banaras Hindu University, Varanasi, Uttar Pradesh, India (2016-2018)
Thesis title: "Fixed bed slow pyrolysis of phosphoric acid pretreated walnut shell"
Supervisor: Prof. Manoj Kumar Mondal

B.Tech — Chemical Engineering Department, Moradabad Institute of Technology, Moradabad, Uttar Pradesh, India (2012-2016)

Publications

1 **Shubhi Gupta**, Goutam Kishore Gupta, and Monoj Kumar Mondal. "Slow pyrolysis of chemically treated walnut shell for valuable products: Effect of process parameters and in-depth product analysis." Energy 181 (2019): 665-676.
https://doi.org/10.1016/j.energy.2019.05.214

2 **Shubhi Gupta**, Prasenjit Mondal, Venu Babu Borugadda, and Ajay K. Dalai. "Advances in upgradation of pyrolysis bio-oil and biochar towards improvement in bio-refinery economics: A comprehensive review." Environmental Technology & Innovation 21 (2021): 101276.
https://doi.org/10.1016/j.eti.2020.101276

3 **Shubhi Gupta**, and Prasenjit Mondal. "Catalytic pyrolysis of pine needles with nickel doped gamma-alumina: Reaction kinetics, mechanism, thermodynamics and products analysis." Journal of Cleaner Production 286 (2021): 124930.
https://doi.org/10.1016/j.jclepro.2020.124930

4 **Shubhi Gupta**, Pushpraj Patel, and Prasenjit Mondal. "Biofuels production from pine needles via pyrolysis: Process parameters modeling and optimization through combined RSM and ANN based approach." Fuel 310 (2022): 122230.
https://doi.org/10.1016/j.fuel.2021.122230

5 **Shubhi Gupta**, Rahul Lanjewar, and Prasenjit Mondal. "Enhancement of hydrocarbons and phenols in catalytic pyrolysis bio-oil by employing aluminum hydroxide nanoparticle based spent adsorbent derived catalysts." Chemosphere 287 (2022): 132220.
https://doi.org/10.1016/j.chemosphere.2021.132220

6 **Shubhi Gupta**, Pushpraj Patel, and Prasenjit Mondal. "Catalytic Pyrolysis Using a Nickel-Functionalized Chemically Activated Biochar Catalyst: Insight into Process Kinetics, Products, and Mechanism." ACS Sustainable Chemistry & Engineering (2022): 5770–5780 .
https://doi.org/10.1021/acssuschemeng.1c08193

7 **Shubhi Gupta**, Pushpraj Patel, and Prasenjit Mondal. "Life cycle analysis (LCA) and economic evaluation of catalytic fast pyrolysis: implication of coproduct's end-usage, catalyst type, and process parameters." Sustainable Energy & Fuels (2022): 2970-2988.
https://doi.org/10.1039/D2SE00079B

8 **Shubhi Gupta**, Pushpraj Patel, and Prasenjit Mondal. "Life cycle analysis (LCA) and operating cost assessment of carbon negative catalytic pyrolysis technique using spent aluminum hydroxide nanoparticle (AHNP) adsorbent derived catalyst: Insights into co-products utilization and sustainability." Energy & Fuels (2023): 2960–2971.
https://doi.org/10.1021/acs.energyfuels.2c03944

9 **Shubhi Gupta**, Pushpraj Patel, and Prasenjit Mondal. " Environmental footprints of the catalytic pyrolysis of pine needles through integration of nickel decorated chemically modified biochar catalyst." ACS Sustainable Chemistry & Engineering.
https://doi.org/10.1021/acssuschemeng.2c07563

10 Pushpraj Patel, **Shubhi Gupta**, and Prasenjit Mondal. "Modeling of continuous adsorption of greywater pollutants onto sawdust activated carbon bed integrated with sand column." Journal of Environmental Chemical Engineering 10.2 (2022): 107155.
https://doi.org/10.1016/j.jece.2022.107155

11 Pushpraj Patel, **Shubhi Gupta**, and Prasenjit Mondal. "Electrocoagulation process for greywater treatment: Statistical modeling, optimization, cost analysis and sludge management." Separation and Purification Technology (2022): 121327.
https://doi.org/10.1016/j.seppur.2022.121327

12 Pushpraj Patel, **Shubhi Gupta**, and Prasenjit Mondal. "Modeling and optimization of process parameters of MB dye adsorption using waste-derived chemically activated biosorbents." Biomass Conversion and Biorefinery (2022): 1-20.
https://doi.org/10.1007/s13399-022-02693-w

13 Pushpraj Patel, **Shubhi Gupta**, and Prasenjit Mondal. "Life cycle assessment (LCA) of greywater treatment using $ZnCl_2$ impregnated activated carbon and electrocoagulation process: A comparative study." "ACS Industrial & Engineering Chemistry Research" (2023): 2960–2971.
https://doi.org/10.1021/acs.iecr.2c03353

14 Navneeta Lal, **Shubhi Gupta**, Hemant Goyal, Prasenjit Mondal. "Energy generation from waste packaging plastic via thermo-catalytic pyrolysis using catalysts produced from spent aluminum hydroxide nanoparticles" Clean Technologies and Environmental Policy (2023): 1-12. https://doi.org/10.1007/s10098-023-02644-7

15 **Shubhi Gupta**, Pushpraj Patel, Prasenjit Mondal. " Catalytic pyrolysis of pine needles using metal functionalized spent adsorbent derived catalysts: Kinetics, thermodynamics and prediction modelling using artificial neural network (ANN) approach. " Industrial Crops and Products (2024): 118481. https://doi.org/10.1016/j.indcrop.2024.118481

16 Pushpraj Patel, Ioanna Dimitriou, Prasenjit Mondal, Omvir Singh, **Shubhi Gupta***. "Process optimisation and enviro-economic assessment of carbon-negative hydrogen production from biomass co-gasification" Energy Conversion and Management (2025): 119211

Book chapter

1 **Shubhi Gupta**, Anil Kumar Varma and Prasenjit Mondal, Catalytic upgrading of biooil and bio-crude oil to synthetic transportation fuels, Woodhead Publishing

Conferences

1 **Shubhi Gupta**, Prasenjit Mondal, Nand K. Saini and Chiranjeevi Thota. "Upgradation of pyrolysis bio-oil through hydrodeoxygenation using bimetallic Fe-Co/Al_2O_3 catalyst". "ACS spring 2021, American Chemical Society meeting and events". (April 2021)

2 **Shubhi Gupta**, and Prasenjit Mondal. "Enhancement of bio-oil properties from catalytic pyrolysis of pine needles using iron doped gamma alumina catalyst". "Advances in Chemistry and Chemical Engineering 2021 (ACCE 2021) ". NIT Surat, India. (April 2021)

3 **Shubhi Gupta**, and Prasenjit Mondal. "Enrichment of bio-oil fuel properties via catalytic pyrolysis of pine needles using biochar catalyst". "Advances in Sustainable Research for Energy and Environmental Management (ASREEM-2021)". NIT Surat, India. (August 2021)

4 **Shubhi Gupta**, and Prasenjit Mondal. "Phenols and hydrocarbons enhancement in pyrolysis bio-oil using metal doped alumina catalyst". "CHEMCON–2021, 71th Annual Session of Indian Institute of Chemical Engineers". CSIR-IMMT, Bhubaneswar, India. (December 2021)

Teaching experience

1 Fine Particle Processing of Coal and Minerals
2 Processing of Liquid and Gaseous Fuels
3 Elements of Mineral Engineering
4 Particle Technology
5 Fine Particle Processing of Coal and Minerals Lab
6 Processing of Liquid and Gaseous Fuels Lab
7 Particle Technology Lab

Achievement and Award

Gold medalist in M. Tech 2018

Software skills

Life Cycle Analysis (GaBi); Response Surface Methodology (ANOVA); Artificial Neural Network (MATLAB); Mathematical optimization (GAMS)