

Curriculum Vitae

Personal information

Name **Madhumita Patel**
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Nationality Indian

- Research interest:**
- Biomass/Waste to biofuels and value-added chemicals
 - Upcycling of plastics through catalysis
 - Waste management
 - Life cycle assessment and techno-economic assessment of bioenergy network
 - Coprocessing of biofuels with refinery
 - Environmental Aspects of Industries

- Teaching interest:**
- Solid Waste Management
 - Environmental Impact Assessment
 - Air Pollution Control

Education and training:

Dates: September 2012 –November 2018

Name of organisation: **University of Alberta, Canada**

Title of qualification: **PhD in Engineering Management (Sustainable Energy Research Lab), Department of Mechanical Engineering** with cumulative grade point average (CGPA) **3.83/4**
Received **Best PhD Thesis Award** in the field of **Bioenergy Research at Canadian Society of Bioengineering Conference (CSBE), Vancouver, 2019**

Dates: July 2009 - May 2011

Name of organisation: **Indian Institute of Technology Delhi, India**

Title of qualification awarded: **Postgraduate, MTech in Chemical Engineering** with cumulative grade point average (CGPA) **9.22/10 (consistently topped the class in all semester)**

Dates: July 2003 – May 2007

Name of organisation: **IGIT Sarang (Govt. Engineering College), Odisha India**

Title of qualification awarded: **Bachelor of Technology in chemical engineering** with cumulative grade point average (CGPA) **8.23/10**

Publications:

- Journal Publications:
1. **Patel M**, Oyedun AO, Kumar A, Gupta R. What is the production cost of renewable diesel from woody biomass and agricultural residue based on experimentation? A comparative assessment, **Fuel Processing Technology**, 2019, 191: 79-92. (Impact factor: 4.982)
 2. **Patel M**, Oyedun AO, Kumar A, Doucette J. The development of a cost model for two supply chain networks of the decentralized pyrolysis system to produce bio-oil, **Biomass and Bioenergy**, 2019, 128: 105287. (Impact factor: 3.551)
 3. **Patel M**, Oyedun AO, Kumar A, Gupta R. Predicting the biomass conversion performance in a fluidized bed reactor using an isoconversional model-free method, **The Canadian Journal of Chemical Engineering**, 2018, 9999:1-11. (Impact factor: 1.61)
 4. **Patel M**, Oyedun A, Kumar A, Gupta R. A techno-economic assessment of renewable diesel and gasoline production from aspen hardwood, **Waste and Biomass Valorization**, June 2018, 1-16 (Impact factor: 2.851)



5. **Patel M**, Kumar A. Production of renewable diesel through the hydroprocessing of lignocellulosic biomass derived bio oil: a review, **Renewable and Sustainable Energy Reviews**, 2016, 58:1293-1307. (Impact factor: 10.556)
6. **Patel M**, Zhang X, Kumar A. Techno-economic and life cycle assessment of lignocellulosic biomass-based thermochemical conversion technologies: a review, **Renewable and Sustainable Energy Reviews**, 2015, 53: 1486-1499. (Impact factor: 10.556)
7. **Madhumita Patel**, Tarun K. Jindal, and Kamal K. Pant. 'Kinetic Study of Steam Reforming of Ethanol on Ni-Based Ceria–Zirconia Catalyst. **Ind. Eng. Chem. Res.**, 2013, 52 (45),15763–15771. (Impact factor: 3.375)
8. Pravakar Mohanty, **Madhumita Patel** and Kamal K Pant. 'Hydrogen production from steam reforming of acetic acid over Cu–Zn supported calcium aluminate' **Bioresource Technology**, 2012 123, 558-565. (Impact factor: 5.807)

Book Chapters:

9. Oyedun A, **Patel M**, Kumar M, Kumar A, The upgrading of bio-oil via hydrodeoxygenation. **Book Chapter** submitted to Chemical Catalysts for Biomass Upgrading for Wiley, Mark Crocker and Eduardo Santillan-Jimenez ISBN: 978-3-527-34466-6 (accepted).
10. **Madhumita Patel**, K K Pant, Pravakar Mohanty 'Renewable hydrogen generation by steam reforming of acetic acid over Cu-Zn-Ni supported calcium aluminate catalysts' **Book Chapter** for American Chemical Society (ACS) Books, Nanocatalysis for Fuels and Chemicals, 2011

Technical Reports:

1. Adetoyese Oyedun, Mahdi Vaezi, Abayomi Oni, Eskinder Gemechu, **Madhumita Patel**, Mayank Kumar, Matthew Davis, Giovanni Di Lullo, Mustafizur Rahman, M.I.H.S Soiket, Amit Kumar. Data to Support Lifecycle Carbon Intensity Reductions in Canadian. Submitted to Environment and Climate Change Canada, April 2018.
2. R. Keivani, F.H. Abanda, M. Archibald, D.P. de Leon Barido, H. Rahmat, **M. Patel**, L.F. Cabeza, V. Vilarino, Smart Cities and their Promise for Addressing Climate Change in Cities. Submitted to Intergovernmental Panel on Climate Change, April 2018.
3. Oyedun A, Akbari M, **Patel M**, Kumar M, Biswas D, Kumar A. Techno-economic assessment of biomass conversion technologies. Final report submitted to Natural Resources Canada (NRCan), 500 Booth Street, Ottawa, Ontario, Canada K1A 0E4, January 2019

Conference Presentations:

1. Sebastian R, Patel M, Akbari M, Kumar A. Assessment of Renewable Jet Fuel Production Potential for Alberta. CIGR 2020, June 14-18, 2020, Quebec City, Canada.
2. Bowen M, Oyedun AO, **Patel M***, Kumar A. Prospects of renewable natural gas in North America: A review of feedstock availability, conversion technology, economic viability and emissions reduction potential. Abstract submitted to the CSBE/SCGAB AGM and Technical Conference, July 14-17, 2019, Vancouver, BC.
3. Rahman W*, **Patel M**, Kurian V, Kumar A. Techno-economic assessment of introducing intermediate pyrolysis in small community landfills across Alberta. Abstract submitted to the CSBE/SCGAB AGM and Technical Conference, July 14-17, 2019, Vancouver, BC.
4. **Patel M***, Oyedun A, Kumar A, Gupta R.. Comparative experimental and techno-economic analysis of production cost of renewable diesel from woody biomass and agricultural residue, abstract accepted to the 15th International Symposium on Bioplastics, Biocomposites and Biorefining Conference, July 24 - 27, 2018, Guelph, Ontario.
5. **Patel M***, Oyedun A, Kumar A. A techno-economic comparison of centralized and distributed mobile pyrolysis systems for the production of bio-oil from hardwood, abstract accepted to the 67th Canadian Chemical Engineering Conference, October 22-25, 2017, Edmonton, AB.
6. **Patel M***, Oyedun AO, Kumar A. Production of renewable diesel from woody biomass and agricultural residue: a techno-economic analysis comparative study, abstract accepted for the ASABE 2017 Annual International Meeting, July 16-19, 2017, Spokane, Washington, USA.
7. **Patel M***, Oyedun AO, Kumar A. Techno economic analysis of bio-oil production from poplar hardwood for renewable diesel in Western Canada, abstract accepted for the ASABE 2016 Annual International Meeting, July 17-20, 2016, Orlando, Florida, USA.
8. **Patel M***, Oyedun AO, Kumar A, Gupta R. Thermogravimetric analysis (TGA) and pyrolysis kinetic study of aspen and pine hardwood, abstract accepted for the ASABE 2016 Annual International Meeting, July 17-20, 2016, Orlando, Florida, USA.
9. **Patel M***, Kumar A. Review on production of hydrogenation-derived renewable diesel from bio-oil, presented at the CSBE/SCGAB Technical Conference and AGM 2015, Innovation in Water, Energy and Biosystems (iWEB) Positioning the Globe for 2050, July 5-8, 2015, Edmonton, AB, Canada.



10. **Patel, M***, Kumar, A. .Techno-economic comparison of a centralized and distributed mobile pyrolysis system for conversion of hardwood, presented at the 2015 ASABE Annual International Meeting, July 26-29, 2015, New Orleans, Louisiana, USA.
11. **Patel, M***, Zhang, X, Kumar, A. A review of economics and environmental footprints of lignocellulosic biomass thermochemical conversion technologies, presented at the 2015 ASABE Annual International Meeting, July 26-29, 2015, New Orleans, Louisiana, USA.
12. **Madhumita Patel**; Amit Kumar Techno-economic and life cycle assessment of renewable diesel production from lignocellulosic biomass in Western Canada poster presentation in Biological Solutions, Sept 30-Oct 2, 2014 in Edmonton, Alberta.
13. **Patel M***, Kumar, A. A Techno-economic analysis of bio oil production from woody biomass for renewable diesel production in western Canada, abstract accepted for the American Society of Agricultural and Biological Engineers Annual International Meeting, July 13-16, 2014, Montreal, QC
14. **Patel M***, Kumar A. Hydrogenation-derived renewable diesel production from bio-oil: A review, presented at the 2013 ASABE Annual International Meeting, July 21-24, 2013, Kansas City, Missouri, USA.

Teaching Experience

- Financial Management for Engineers, ENG M 401 (Class of 95, LEC X01 Winter,2013)
- Financial Management for Engineers, ENG M 401 (Class of 110, LEC X01 Fall,2017)
- Engineering Economy ENG M 310 (Class of 150, LEC B1 Wi18)

Academic Research and Projects

Title of dissertation – M.Tech.: Worked on project “Kinetics and modelling of catalytic steam reforming of acetic acid for hydrogen production, under the guidance of Professor K. K. Pant from IIT Delhi.

Work experience:

Dates: February 2019 - Present

Name and address of employer: University of Alberta

Occupation or position held: Postdoctoral Fellow in Sustainable Energy Research Laboratory, Department of Mechanical Engineering

Main activities and responsibilities: **Production of renewable natural gas (RNG) from lignocellulosic biomass and waste**

- Development of detailed process model to produce RNG from gasification (conventional and hydrothermal) and anaerobic digestion process
- Estimation of production cost of RNG from the developed process model from a range of biomass feedstocks and wastes
- Development of life cycle assessment model to estimate greenhouse gas emission

Thermo-Catalytic Reforming (TCR) plant for semi continuous operation to produce bio-oil

- Municipal solid waste (MSW) preparation which involves drying, grinding, particle size separation and finally palletisation to form pellets
- Carry out the intermediate pyrolysis experiment followed by catalytic reforming to produce high value bio-oil
- Characterization of TCR products

Dates: July 2011- June 2012

Name and address of employer: Indian Institute of Technology Delhi, New Delhi

Occupation or position held: Project research assistant

Main activities and responsibilities: **Catalytic oxidative and non oxidative steam reforming of bio ethanol for hydrogen production**

- It involves development of various batches of catalysts, its characterization and testing of the catalysts at different process conditions for non oxidative steam reforming of bio ethanol.
- To find out the best suitable catalyst for this non oxidative steam reforming reaction to maximize the hydrogen yield with minimization of carbon monoxide and methane.
- Study of reaction mechanism and development of the kinetics model for the suitable catalyst.
- Thermodynamics analysis of the non oxidative steam reforming reaction of bio ethanol to find out the optimum condition for reaction using HYSYS.

Software: Aspen Plus®, Aspen Hysys, Aspen Economizer, Origin, Visio, MS Office, GREET (LCA software)

Equipment handled: Gas chromatography-Mass Spectroscopy (GC-MS), Thermal Conductivity Detector (TCD), Flame Ionization Detector (FID), BET Surface Analyser, Thermogravimetric Analyser (TGA) analysis etc.



- Award and Scholarship received:**
- University of Alberta Doctoral Recruitment Scholarship
 - Shell Enhanced Learning Fund
 - Best poster presentation award in Biological Solutions Forum 2014
 - Graduate teaching scholarship, IIT Delhi
 - Ph.D. Research and Teaching Assistantship – University of Alberta
 - Graduate Thesis Award in CSBE/SCGAB conference, Vancouver, 2019

