

### Current Address

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### SUMMARY

Over 20 years of academic research experience in the field of chemical engineering, specializing in biomass to value-added chemicals and fuels, green hydrogen production, micro-structured and optofluidic devices, multifunctional reactors, washcoating, supported bimetallic catalysts, bifunctional catalysts, reaction kinetics, microkinetic modeling, reactor design and high throughput experimentation. I also have teaching experience in a range of environments. TWO Post-Doc, EIGHT Ph.D., THIRTEEN M.Tech. and THIRTEEN B.Tech. students completed their projects under my supervision. Currently EIGHT Ph.D., ONE M.Tech. and THREE B.Tech. students are working in various fields of research under my supervision. My research group is funded well with **FOURTEEN sponsored research projects** that are completed/on-going/sanctioned. The funding is from both government (SERB, MeitY and DST) and private funding agencies. The funding is of various categories such as sponsored, consultancy and technology transfer. Our group is currently working in the following research areas: Biomass conversion to value-added chemicals; Catalytic co-pyrolysis of biomass and waste plastic to transportation fuels; Mesoporous zeolites; Opto-fluidic microdevices for water splitting reaction to produce hydrogen.

Selected career accomplishments: Published **SIXTY FOUR** peer reviewed international journal articles and **THREE** book chapters with over 2100 total citations and an h-index of 25; **THREE** Indian patents granted and another **FOUR** patents are filed; Efficiently transformed lignocellulosic biomass to fuels and value-added and platform chemicals; Rationally designed bimetallic catalysts for gas phase reactions; Developed micro-structured reactors for steam ethanol reforming and photocatalytic water-splitting; Integrated micro-reactors with micro-heat exchangers; Designed and developed a 9-channel high-throughput catalyst screening system; Ph.D. from Indian Institute of Technology Kanpur, India; Post-Doctoral Research studies from the Department of Chemical and Biomolecular Engineering, University of Delaware; and currently, Professor in the Department of Chemical Engineering at Indian Institute of Technology Guwahati, India.

### EDUCATIONAL QUALIFICATIONS

- **Post-Doctoral Researcher** (Chemical and Biomolecular Engineering), *April, 2011- July, 2014*  
**University of Delaware, Newark, USA.**
- **Ph.D.** (Chemical Engineering), *July, 2005 – November, 2010*  
**Indian Institute of Technology (IIT), Kanpur, INDIA, CPI: 7.88/10.0**
- **Master of Technology (M. Tech)**(Chemical Engineering), *July, 2002 – July, 2004*  
**Indian Institute of Technology (IIT), Kanpur, INDIA, CPI: 9.00/10.0**
- **Bachelor of Technology (B. Tech)** (Chemical Engineering), *August, 1998 – April, 2002*  
**J.N.T. University, Hyderabad, INDIA, 79.06 % of marks**

### ONGOING and COMPLETED R&D PROJECTS

- **Sponsored Project from IITG:** “Metal Encapsulated Zeolite Catalysts for upgradation of Bio-oil”, Budget: Rs. 5,00,000/-, Startup grant from IIT Guwahati. (Dec., 2014 – Dec., 2016)
- **Sponsored Project from SERB:** “Carbohydrates (Cellulose, Glucose and Fructose) Conversion to 5-Hydroxymethylfurfural using Ionic Liquid Encapsulated Mesoporous Zeolite Catalysts”, Budget: Rs. 31,70,000/-, Young Scientist Start up grant from SERB-DST (File No. YSS/2015/000911). (April, 2016 – July, 2019)

- **Sponsored Project from DST-CERI:** “Design and Fabrication of an Integrated Optofluidic Device for Solar Irradiated Water-splitting using Bio-synthesized Metal/TiO<sub>2</sub> Photocatalysts.”, Budget: Rs. 44,19,200/- The DST-CERI File No. is DST/TMD/CERI/C19(G). (July, 2016 – Dec., 2019)
- **Sponsored Project from IITG:** “Glucose and Xylose Conversion to 5-Hydroxymethylfurfural and Levulinic Acid”, Budget: Rs. 10,00,000/-, Top-up grant. (Dec, 2018 – Dec, 2020)
- **Sponsored Project from IMPRINT-IIC:** “Combined Catalytic Reforming and Upgrading Technique for Production of Biofuels in Circulating Fluidized Bed Reactor” Budget: Rs. 36,30,000/-(from SERB) + Rs. 31,00,000/- (from Industry in terms of cash + kind) = Rs. 67,30,000/-. (Co-PI and Prof. Nanda Kishore, Dept. Chemical Engg., IITG is the PI) (Oct, 2019 – May, 2022); File number: IMP/2019/000244.
- **Consultancy Project:** “Kinetic studies for production of HCl and Sodium bicarbonate from NaCl, H<sub>2</sub>SO<sub>4</sub> and ammonium bicarbonate: Phase-I” Budget: Rs. 15,87,000/- from Garima Industries, Guwahati (Co-PI and Dr. Rajesh Kumar Upadhyay, Dept. Chemical Engg., IITG was the PI) (Aug, 2016 – Aug, 2019)
- **Technology-Transfer Project:** “Coating of LTA zeolite membranes onto the ceramic tubes” Budget: Rs. 15,00,000/- from ChemDist Membrane Solutions Pvt. Ltd., Pune (Dec, 2020 – Dec, 2023)
- **ChemDist Center of Excellence (CoE) for Industrial NanoTech Innovations:** “Carbohydrates conversion to levulinic acid and formic acid at 2 L reactor scale” Budget: Rs. 18,63,000/- in cash, a pilot plant and 2 project staff in kind from ChemDist Membrane Solutions Pvt. Ltd., Pune (Feb, 2022 – Feb, 2025).
- **Sponsored Project from MeitY, GoI:** “Smart Wearable Advanced Nanosensing Technologies in Healthcare ASICs (SWASTHA)” Budget: Rs. 42,00,00,000/-, MeitY, GoI File Number 5(1)/2022-NANO (Co-PI and Dr. Akshai Kumar, Head, Center for Nanotechnology, IITG is the PI) (Mar, 2022 – Mar, 2026).
- **Sponsored Project from SERB (Core Research Grant, CRG):** “Sugars Conversion to Bio-based Monomeric Molecules” Budget: Rs. 40,20,000/-, SERB file number: CRG/2022/005144 (Jan, 2023 – Jan, 2026).
- **Sponsored Project from IITG-TIDF (TIH):** “Underwater natural resources to disinfectants and corrosion resistant materials” Budget: Rs. 60,18,000/- + manpower (TWO JRFs), Project number: TIH/TD/0113 (Feb, 2023 – Mar, 2026).
- **Sponsored Project from SERB (Core Research Grant, CRG):** “Investigation of the Reentrant Disorder Behavior and Catalytic Properties of Frustrated Pyrochlore Nanostructures” Budget: Rs. 61,71,000/-, SERB file number: CRG/2022/006155 (Co-PI and Prof. Subhash Thota, Dept. Physics, IITG is the PI).
- **Sponsored Project from BIRAC-BIG:** “Process Validation of Bamboo biomass conversion to levulinic acid and its derivatives for pharmaceutical applications” Budget: Rs. 50,00,000/-, Project Number: BIRAC/KIIT01881/BIG-SP/02/22.
- **Sponsored Project from SPARC:** “Integrated bio-refinery process for sustainable production of bio-crude oil from algal biomass and its upgrading to synthetic transportation fuels” Budget: Rs. 60,98,782/-, SPARC project number: P2704 (sanctioned) (Indian Co-PI and Prof. VV Goud, ChE, IITG is the Indian-PI).

## STUDENTS UNDER MY SUPERVISION

### I. Post-Docs

1. Dr. Anjireddy Bhavanam (National Post-Doctoral Fellow (NPDF) worked on “Catalytic co-pyrolysis of lignocellulosic biomass and waste plastics”) August 2017 – January 2018, presently at NIT Jalandhar as an Assistant Professor.
2. Dr. Sumana Paul (Institute Post-Doctoral Fellow (IPDF) working on “2-D materials for photocatalysis”) January 2022 – January 2024, Prof. Pravat Kumar Giri is a co-mentor.

### II. Ph.D. Students:

#### Completed:

1. Dr. Yedla Santosh Kumar (**Completed in Sep 2019**, co-supervisor Prof. Golder, CL); Title: Modified Zeolites and Titania Catalysts for the Conversion of Carbohydrates to 5-Hydroxymethylfurfural.

2. Dr. Mahaboob Alam (**Completed in Nov 2021**); Title: Catalytic and Non-Catalytic Co-Pyrolysis of Torrefied Bamboo Biomass and Plastic: Synergism, Kinetics and Reaction Mechanism.
3. Dr. Velaga Bharath (**Completed in Dec 2021**); Title: Biomass to Specialty Chemicals: Advanced Catalysts, Processes and Techno-Economics.
4. Dr. Devipriya Gogoi (**Completed in Dec 2021**, co-supervisor Prof. Golder, CL); Title: Design and Synthesis of Efficient Charge Transfer Photocatalysts for Visible-light-driven Green H<sub>2</sub> and O<sub>2</sub> Production.
5. Dr. Ponnala Rambabu (**Completed in May 2023**); Title: Photocatalytic water splitting in opto-fluidic devices.
6. Dr. Anirban Chowdhury (**Completed in June 2023**, co-supervisor Prof. Golder, CL); Title: Metal Oxides and Metal Sulphide Electrocatalysts for CO<sub>2</sub> and N<sub>2</sub> Conversion to Value-added Chemicals.
7. Dr. Prasad Pala (**Completed in Jan 2024**); Title: Optofluidic planar microreactors for the production of hydrogen and oxygen from photocatalytic water-splitting.
8. Dr. Hanumanth Reddy Pemmana (**Completed in Aug 2024**, co-supervisor Prof. Uppaluri, CL); Title: Studies on carbon-supported Pt-V and Ru-V bimetallic catalysts and microreactor technology for the green production of Lactic acid, 2,5-Furandicarboxylic acid, and 5-Hydroxymethylfurfural.

#### Ongoing:

9. Mr. Ameer Suhail (Joined CfN in July 2018, working, co-supervisor Prof. Pamu, PH); Title: Opto-fluidic microdevices for photocatalytic water-splitting.
10. Ms. Sarmistha Baruah (Joined CfN in July 2019, working, co-supervisor Dr. Akshai Kumar, CH, Thesis submitted on 12/03/2025); Title: Direct-Ethanol Fuel Cells.
11. Mr. Masresha Adasho (Joined ME in July 2019, working, co-supervisor Prof. P. Muthu Kumar, ME); Title: Methanol steam reforming for hydrogen production.
12. Mr. Prince Kumar Barnwal (Joined in Jan 2022, working); Title: 5-Hydroxymethylfurfural production in microchannel reactors.
13. Mr. Sumit Kumar (Joined in July 2024, working, co-supervisor Prof. Thota, PH); Title: Steam reforming of methanol to hydrogen: production, separation and storage.
14. Mr. Muzammil Bora (Joined in July 2024, working, co-supervisor Prof. Goud, CL); Title: Levulinic acid derivatives production and applications.
15. Mr. Debarshi Kumar Deb (Joined in July 2024, working); Title: Biomass-based substrates conversion to valuable chemicals.
16. Mr. Adarsh Maurya (Joined in Jan 2025, working, co-supervisor Prof. Kishore, CL); Title: Levulinic acid and its derivatives production.

#### III. M.Tech Students:

1. Mr. Yogendra Kumar (Completed in July 2016); Thesis Title: Synthesis and Characterization of Ni/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> Catalyst by strong electrostatic Adsorption (SEA) Method
2. Ms. Pooja Saxena (Completed in June 2017); Thesis Title: Conversion of Glucose to 5-HMF Using Ionic Liquid Encapsulated Zeolites
3. Mr. Amit Kumar Kiste (Completed in June 2017); Thesis Title: Conversion of CO<sub>2</sub> into Carbon Monoxide
4. Mr. Souradip Choudhury (Completed in July 2018, Currently working in AEC, Guwahati); Thesis Title: Conversion of Xylose to Furfural Using Ionic Liquid Encapsulated Zeolites
5. Mr. Pardeep Soni (Completed in July 2019); Thesis Title: Selective Production of Furfural by Xylose Dehydration using Zeolites.
6. Mr. Solanke Madhav Bhagwan (Completed in July 2020); Thesis Title: Continuous Flow Reactor for the Conversion of Carbohydrates to 5-(Hydroxymethyl)furfural.
7. Mr. Dharanikota Naga Phani Sai Kumar (Completed in June 2021); Thesis Title: Photocatalytic Reduction of Carbondioxide.
8. Mr. Reddi Ramu (Completed in June 2021); Thesis Title: Glycerol Oxidation to Lactic Acid.
9. Mr. Chetan Dhongdiya (Completed in June 2022); Thesis Title: Biomass conversion to valuable chemicals.
10. Mr. Rahul Agarwal (Completed in June 2022); Thesis Title: Glycerol to valuable chemicals.
11. Mr. Gundala Srikanth (Completed in May 2023); Thesis Title: Production and purification of levulinic acid and 5-hydroxymethylfurfural from fructose and sucrose.

12. Ms. Macharla Sumaithry (Completed in June 2023); Thesis Title: Conversion of carbohydrates to valuable chemicals: experiments and aspen plus simulations.
13. Mr. Saumya Samir Parikh (Completed in May 2024); Thesis Title: ASPEN+ simulation of biomass conversion processes.
14. Mr. Mayank Yadav (Completed in June 2024); Thesis Title: Direct Ethanol Fuel Cells.
15. Mr. Prajapati Pankaj Birendra (Completed in May 2025); Thesis Title: Conversion of carbohydrates to levulinic acid: conversion, separation and purification.
16. Ms. Kolli Mounika (Joined in July 2024, working); Thesis Title: Conversion of carbohydrates to levulinic acid: conversion, separation and purification.

#### IV. B.Tech Students:

1. Mr. Sonu Rudhra (Completed in May 2016); Title: Synthesis and Characterization of Mesoporous Template-free Faujasite Type Zeolite-Y from Sodium Aluminosilicate Solution
2. Mr. Pawan Kumar (Completed in May 2017); Title: Synthesis of Mesoporous Zeolite Y and Mordenite Nanocrystals and Its Use as a Catalyst in Glucose Dehydration to 5-HMF
3. Mr. Parde Rajat Prakash (Completed in May 2018); Title: Carbohydrates Conversion to Value-Added Chemicals
4. Mr. Tharun Kumar Vankunavath (Completed in May 2018); Title: Preparation of Cu<sub>2</sub>O Thin Film on ITO Glass for Photocatalytic Applications
5. Mr. Rajdeep Doley (Completed in May 2018); Title: Seed-Assisted Zeolite ZSM-5 Synthesis
6. Mr. Adharsh K Sivaram (Completed in May 2019); Title: Synthesis of Hydrogen by Photocatalytic Water Splitting Using Microreactors.
7. Mr. Vikash Kumar Gupta (Completed in June 2020); Title: Seed-Assisted Zeolite Synthesis.
8. Mr. Piyush Singh Mandavi (Completed in June 2020); Title: Micro-Extraction.
9. Mr. Kundan Roy (Completed in June 2020); Title: Separation of Two Immiscible Liquid Phases in Microdevices.
10. Mr. Rajesh Kumar Sahoo (Completed in April 2021); Title: Photocatalytic reduction of carbon dioxide.
11. Ms. Gitika Sonker (Completed in April 2021); Title: Direct ethanol fuel cells.
12. Ms. Sampada Mahajani (Completed in April 2023); Title: Green hydrogen production in optofluidic devices.
13. Ms. Poluri Sriya (Completed in May 2024); Title: Direct ethanol fuel cells.
14. Mr. Rajendra Prasad Sarswat (Completed in May 2025); Thesis Title: ASPEN+ simulation of biomass upgradation process
15. Mr. Sugam Barman (Completed in May 2025); Thesis Title: Green hydrogen production
16. Mr. Goutam Kumar Hembram (Completed in May 2025); Thesis Title: Direct ethanol fuel cells

## PUBLICATIONS

### A. Book Chapters:

- 1) **N.R. Peela** and D. Kunzru, (2015) "Microstructured Reactors for Hydrogen Production from Ethanol" in Nanoscale and Microscale Phenomena: Fundamentals and Applications, S Khandekar and YM Joshi (Eds.) Book Series, "Springer Tracts in Mechanical Engineering" Pages 309 – 334. DOI 10.1007/978-81-322-2289-7
- 2) M. Alam, S.K. Yedla, S.T. Bhutia, V.V. Goud, **N.R. Peela\*** (2017) "Advancement in development of biodiesel production in last two decades: an Indian overview on raw materials, synthesis, byproducts and application" in Sustainable Biofuels Development in India, A.K. Chandel, R.K. Sukumaran (eds.), Springer International Publishing, Pages 167-188. DOI: 10.1007/978-3-319-50219-9\_7
- 3) **N.R. Peela\*** (2020) "Biomass Conversion to Selected Value-Added Chemicals Using Zeolites: A Review" in Reference Module in Materials Science and Materials Engineering. Vol. 5 23-28. DOI: 10.1016/B978-0-12-803581-8.11499-7

### B. Publications in refereed international journals

**ORCID:** 0009-0006-4332-7574

**Scopus ID:** 29068162800

CV, Peela

**Total citations: 2152, h-index: 25, i10-index: 45** (from Google Scholar, [https://scholar.google.co.in/citations?hl=en&user=jmA\\_4DYAAAAAJ](https://scholar.google.co.in/citations?hl=en&user=jmA_4DYAAAAAJ), accessed on 22/05/2025)

- 1) “Graphitic carbon nitride-based high-performance Organic Field-Effect Transistor and photodetector” S. Kumari, J. Mahanta, M.K. Singh, A. Suhail, N.R. Peela, D.K. Singh Diamond and related materials 155 (2025) 112289; DOI: <https://doi.org/10.1016/j.diamond.2025.112289>.
- 2) “Advancing paper-based microfluidic ethanol fuel cells with gel-assisted dual electrolytes: A step towards scalable power solutions” S. Baruah, A. Kumar, and **N.R. Peela\*** Energy Conversion and Management 332 (2025) 119767; DOI: <https://doi.org/10.1016/j.enconman.2025.119767>.
- 3) “Solvent assisted shape dependent MAPbI<sub>3</sub>/Polyfluorene heterostructures with larger surface area for improved photocatalytic H<sub>2</sub> evolution” T. Pal, S. Bhowmik, A.S. Tanwar, A. Suhail, **N.R. Peela**, C.V. Sastri P.K. Iyer Energy Advances 3 (2024) 2965 – 2971; DOI: <https://doi.org/10.1039/D4YA00457D>.
- 4) “Seed-Assisted in Situ Encapsulation of Ultrasmall NiCo Nanoclusters within ZSM5 Zeolite for Enhanced Alkaline Ethanol Electro-Oxidation Reaction” S. Baruah, A. Kumar, and **N.R. Peela\*** ACS Applied Nano Materials 7 (2024) 25212–25224, DOI: <https://doi.org/10.1021/acsanm.4c05299>.
- 5) “Hydrogen production via Steam Reforming of Methanol using Cu/ZnO/Al<sub>2</sub>O<sub>3</sub>: Effect of catalyst synthesis method and Cu to Zn molar ratio on physico-chemical properties and catalytic performance” M.A. Achomo, P. Muthukumar\*, **N.R. Peela\*** (Accepted for publication in the International Journal of Hydrogen Energy, 2024, DOI: <https://doi.org/10.1016/j.ijhydene.2024.09.238>).
- 6) “Composites of Reduced Graphene Oxide and MAPbI<sub>3</sub> Crystals for Photocatalytic Hydrogen Generation” T. Pal, S. Bhowmik, A. Suhail, S. Sharma, **N.R. Peela**, C.V. Sastri, and P.K. Iyer; ACS Applied Nano Materials (2024) 12163–12170 (DOI: 10.1021/acsanm.4c01909).
- 7) “Experimental Studies on Hydrogen Production from Steam Reforming of Methanol Integrated with Metal Hydride-based Hydrogen Purification System” M. Adasho, A. Kumar, P. Muthukumar\* and **N.R. Peela\*** International Journal of Hydrogen Energy, 76 (2024) 28 – 43 (DOI: 10.1016/j.ijhydene.2024.01.188).
- 8) “Hydrogen Production from Steam Reforming of Methanol: A Comprehensive Review on Thermodynamics, Catalysts, Reactors, and Kinetic Studies” M. Adasho, A. Kumar, **N.R. Peela\*** and P. Muthukumar\*; International Journal of Hydrogen Energy, 58 (2024) 1640 – 1672 (DOI: 10.1016/j.ijhydene.2024.01.159).
- 9) “The promotional effect of Ag in activated carbon supported Pt-Ag nanoalloy electrocatalyst towards alkaline ethanol oxidation reaction: A kinetic study” S. Baruah, A. Kumar, and **N.R. Peela\***; Journal of Electroanalytical Chemistry 953 (2024) 118015 (1–11) (DOI: 10.1016/j.jelechem.2023.118015).
- 10) “Synthesis of spinel type 2D Co<sub>3</sub>O<sub>4</sub> nanodiscs using gallic acid for electrochemical NH<sub>3</sub> formation by N<sub>2</sub> reduction” A. Chowdhury, **N.R. Peela** and A.K. Golder; Materials Science & Engineering B, 299 (2024) 116912 (1–12) (DOI: 10.1016/j.mseb.2023.116912).
- 11) “Glycerol selective oxidation to lactic acid over platinum-vanadium bimetallic catalysts supported on activated carbon” H.R. Pemmana, R. Reddi, R.V.S. Uppaluri, and **N.R. Peela\***; Reaction Chemistry and Engineering, 9 (2024) 260 – 272 (DOI: 10.1039/D3RE00425B).
- 12) “A simple template-free bioinspired route of 1D Bi<sub>2</sub>S<sub>3</sub> nanorods synthesis for electrochemical CO<sub>2</sub> reduction to formate” A. Chowdhury, C. Bhan, **N.R. Peela** and A.K. Golder; Journal of Industrial and Engineering Chemistry, 127 (2023) 138-148 (DOI: 10.1016/j.jiec.2023.06.055).
- 13) “Selective aerobic-oxidation of glycerol to lactic acid over ruthenium-vanadium bimetallic catalysts” H.R. Pemmana, P.K. Barnwal, R.V.S. Uppaluri, and **N.R. Peela\***; Journal of Industrial and Engineering Chemistry, 124 (2023) 224 – 231 (DOI: 10.1016/j.jiec.2023.04.010).
- 14) “Role of ZSM-5/AC hybrid support on the catalytic activity of Pd-Ag electrocatalysts towards ethanol oxidation: An experimental and kinetic study” S. Baruah, A. Kumar and **N.R. Peela\***; Electrochimica Acta, 453 (2023) 142357 (DOI: 10.1016/j.electacta.2023.142357).
- 15) “Activated Carbon Supported Ni-Co Layered Double Hydroxides Nanowires: An Effective and Low-Cost Electrocatalyst for Ethanol Electro-oxidation in Alkaline Media” S. Baruah, A. Kumar and **N.R. Peela\***; Journal of The Electrochemical Society, 170 (2023) 034509 (DOI: 10.1149/1945-7111/acc488).
- 16) “In-situ CdS Nanowires on g-C<sub>3</sub>N<sub>4</sub> Nanosheet Heterojunction Construction in 3D-Optofluidic Microreactor for the Photocatalytic Green Hydrogen Production” P. Rambabu and **N.R. Peela\***; International Journal of Hydrogen Energy, 48 (2023) 15406 – 15420 (DOI: [10.1016/j.ijhydene.2023.01.041](https://doi.org/10.1016/j.ijhydene.2023.01.041))
- 17) “A Tunable Bioinspired Process of SnO<sub>2</sub> NPs Synthesis for Electrochemical CO<sub>2</sub>-into-formate Conversion” A. Chowdhury, C. Bhan, **N.R. Peela** and A.K. Golder; Journal of CO<sub>2</sub> Utilization, 66 (2022) 102263. (DOI: 10.1016/j.jcou.2022.102263)
- 18) “Organic-inorganic hybrid photocatalyst consisting of highly conjugated metal complex and graphitic carbon nitride for efficient hydrogen evolution and Cr(VI) reduction” B. Das, L.P.R. Pala, M. Mohanta, M. Devi, D.

- Chakraborty, **N.R. Peela**, M. Qureshi and S. Dhar; *Journal of Materials Chemistry A*, 10 (2022) 23691–23703. (DOI: 10.1039/D2TA05200H)
- 19) “Visible Light Active IrO<sub>2</sub>/TiO<sub>2</sub> films for Oxygen Evolution from Photocatalytic Water Splitting in an Optofluidic Planar Microreactor” L.P.R. Pala and **N.R. Peela\***; *Renewable Energy*, 197 (2022) 902–910. (DOI: 10.1016/j.renene.2022.08.017).
  - 20) “Unraveling high alkene selectivity at full conversion in alkyne hydrogenation over Ni under continuous flow conditions” V.R. Bakuru, K. Fazl-Ur-Rahman, G. Periyasamy, B. Velaga, **N.R. Peela**, M.E. DMello, K.S. Kanakikodi, S.P. Maradur, T.K. Maji and S.B. Kalidindi; *Catalysis Science and Technology*, 12 (2022) 5265–5273. (DOI: 10.1039/d2cy00875k)
  - 21) “Levulinic Acid Production from Furfural: Process Development and Techno-Economics” B. Velaga, and **N.R. Peela\***; *Green Chemistry* 24 (2022) 3326 (DOI: [10.1039/D2GC00089J](https://doi.org/10.1039/D2GC00089J))
  - 22) “Thermal plasma gasification of organic waste stream coupled with CO<sub>2</sub>-sorption enhanced reforming employing different sorbents for enhanced hydrogen production” V.S. Sikarwar, **N.R. Peela**, A.K. Vuppaladadiyam, L.B. Ferreira, A. Maslani, R. Tomar, M. Pohořelý, E. Meers, and M. Jeremiáš; *RSC Advances* 12 (2022) 6122–6132 (DOI: 10.1039/D1RA07719H).
  - 23) “Catalytic Co-Pyrolysis of Wet-Torrefied Bamboo Sawdust and Plastic over the Zeolite HY: Synergism and Kinetics” M. Alam, and **N.R. Peela\***; *Journal of the Energy Institute* 100 (2022) 76–88; (DOI: [10.1016/j.joei.2021.11.004](https://doi.org/10.1016/j.joei.2021.11.004)).
  - 24) “Optofluidic Microreactor for the Photocatalytic Water Splitting to Produce Green Hydrogen” P. Rambabu, S. Patel, D. Gogoi, R.V.S. Uppaluri and **N.R. Peela\***; *International Journal of Hydrogen Energy*, 47 (2022) 2152–2163 (DOI: 10.1016/j.ijhydene.2021.10.171).
  - 25) “Green Hydrogen Production in an Optofluidic Planar Microreactor via Photocatalytic Water Splitting under Visible/Simulated Sun Light Irradiation” L.P.R. Pala, **N.R. Peela\***; *Energy & Fuels* 35 (2021) 19737–19747 (DOI: [10.1021/acs.energyfuels.1c02686](https://doi.org/10.1021/acs.energyfuels.1c02686)).
  - 26) “Step-scheme heterojunction between CdS nanowires and facet-selective assembly of MnO<sub>x</sub>-BiVO<sub>4</sub> for an efficient visible-light-driven overall water splitting” D. Gogoi, A.K. Shah, P. Rambabu, M. Qureshi, A.K. Golder, and **N.R. Peela\***; *ACS Applied Materials and Interfaces* 13 (2021) 45475–45487; (DOI: 10.1021/acsami.1c11740).
  - 27) “Synergistic Effect of Metal Complex and Dual Doped Graphitic Carbon Nitride for Superior Photocatalytic Hydrogen Evolution” B. Das, D. Gogoi, M. Devi, S.S. Dhar, and **N.R. Peela**; *Energy & Fuels* 35 (2021) 15223–15233 (DOI: 10.1021/acs.energyfuels.1c01732).
  - 28) “Hollow cuboidal MnCo<sub>2</sub>O<sub>4</sub> coupled with nickel phosphate: A promising oxygen evolution reaction electrocatalyst” A.K. Shah, S. Bhowmick, D. Gogoi, **N.R. Peela**, M. Qureshi; *Chemical Communications* 57 (2021) 8027–8030 (DOI: 10.1039/d1cc02383g).
  - 29) “Catalytic Co-pyrolysis of Wet-Torrefied Bamboo Sawdust and Linear Low Density Polyethylene (LLDPE) in Presence of Zeolite HZSM-5” M. Alam, D. Rammohan and **N.R. Peela\***; *Renewable Energy* 178 (2021) 608–619 (<https://doi.org/10.1016/j.renene.2021.06.109>).
  - 30) “Synthesis of Cu<sub>2</sub>O NPs using bioanalytes present in *Sechium edule*: Mechanistic insights and application in electrocatalytic CO<sub>2</sub> reduction to formate” A. Chowdhury, **N.R. Peela** and A.K. Golder; *Journal of CO<sub>2</sub> Utilization* 51 (2021) 101622(1–12) (<https://doi.org/10.1016/j.jcou.2021.101622>).
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- 38) S.K. Yedla, A.K. Golder, and **N.R. Peela\***, “Efficient Conversion of Carbohydrates to 5-Hydroxymethylfurfural over Mesoporous Zeolites” presented (oral) at ICET-19, March, 2<sup>nd</sup> 2019, Hyderabad, India.
- 39) B. Velaga and **N.R. Peela\***, “Selective Production of Levulinic Acid from Bamboo Biomass Using Mesoporous Mordenite” presented (oral) at CHEMCON, December, 27-30<sup>th</sup> 2018, Jalandhar, India.
- 40) D. Gogoi, A.K. Golder, and **N.R. Peela\***, “Photocatalytic Water Splitting over Bio-inspired Ag doped TiO<sub>2</sub> semiconductor” presented (Oral) at 71<sup>th</sup> Annual Session of Indian Institute of Chemical Engineers CHEMCON-2018 at NIT Jalandhar, December, 27-30<sup>th</sup> 2018, Jalandhar, Punjab, India.
- 41) S.K. Yedla, A.K. Golder, and **N.R. Peela\***, “One-Pot Production of 5-Hydroxymethylfurfural (5-HMF) from Carbohydrates by using different Solid Acid Catalysts”, presented (oral) at REFLUX 2017, March, 24-26<sup>th</sup> 2017, Indian Institute of Technology Guwahati, India.
- 42) S.K. Yedla, A.K. Golder, and **N.R. Peela\***, “Production of 5-Hydroxymethylfurfural (5-HMF) from Fructose over H-MOR Zeolite Catalyst” presented (poster) at REFLUX 2017, March, 24-26<sup>th</sup> 2017, Indian Institute of Technology Guwahati, India.
- 43) **N. R. Peela\***, “Microchannel Reactors for Ethanol to FC-Grade Hydrogen Production” HySA Workshop on “Fuel to Electricity” at Cape Town, South Africa during 26 – 27<sup>th</sup> of October, 2016 (Invited talk)

- 44) S. K. Yedla, A. K. Golder, and **N. R. Peela\***, “Studies on the Production of 5-hydroxymethylfurfural (5-HMF) from Cellulose- A Mini Review” presented (poster) at CHEMCON 2015, December 27-30<sup>th</sup> 2015, Indian Institute of Technology Guwahati, India.
- 45) **N. R. Peela**, I. C. Lee and D. G. Vlachos, “Rational Design of Bimetallic Catalysts for Metal Catalyzed Vapor Phase Reactions”, presented (oral) at International Conference on Nanoscience, Nanotechnology and Advanced Materials (NANOS-2015), December 14 - 17<sup>th</sup> 2015, Visakhapatnam, India.
- 46) **N. R. Peela**, W. Zheng, I. C. Lee, A. M. Karim, and D. G. Vlachos, “Rational Design of Bimetallic Catalysts for Total Oxidation Reactions”, presented (oral) at AIChE-2013 Annual Meeting, November 3 - 8<sup>th</sup> 2013, San Francisco, USA.
- 47) **N. R. Peela**, J. E. Sutton, I. C. Lee, and D. G. Vlachos, “Density Functional Theory Based Microkinetic Modeling of Ethane Total Oxidation Over Pt(111)”, presented (oral) at AIChE-2013 Annual Meeting, November 3<sup>rd</sup> – 8<sup>th</sup> 2013, San Francisco, USA.
- 48) **N. R. Peela**, W. Zheng, I. C. Lee, A. M. Karim, and D. G. Vlachos, “Design of Bimetallic Catalysts for Propane Total Oxidation”, presented (oral) at 3<sup>rd</sup> North American Symposium on Chemical Reaction Engineering, March 17 - 20<sup>th</sup> 2013, Houston, USA.
- 49) **N. R. Peela**, A. S. Sandupatla and D. Kunzru, “Hydrogen Production from Ethanol in a Microchannel Reactor”, presented at *Int. Conference on Sustainable Energy and Environmental Protection*, June, 5 – 8<sup>th</sup> 2012, Dublin, Ireland.
- 50) **N. R. Peela**, A. Mubayi and D. Kunzru, “Steam Reforming of Ethanol Over Rh/CeO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> Catalysts in a Microchannel Reactor”, poster presented at 11<sup>th</sup> *Int. Conference on Microreaction Technology*, March 8 – 10<sup>th</sup> 2010, Kyoto, Japan.
- 51) **N. R. Peela**, A. Mubayi and D. Kunzru, “Washcoating of  $\gamma$ -alumina on stainless steel microchannels”, poster presented at 3<sup>rd</sup> *International Conference on Structured Catalysts and Reactors*, September 27 - 30<sup>th</sup> 2009, Ischia, Naples, Italy.
- 52) M. K. Moharana, **N. R. Peela**, S. Khandekar and D. Kunzru, “Producing Hydrogen from Ethanol in a Microfuel Processor: Recent Developments and Challenges”, presented at 6<sup>th</sup> *International Symposium on Multiphase Flow, Heat Mass Transfer and Energy Conversion*, July 11 - 15<sup>th</sup> 2009, Xi’an, China.

#### INVITED TALKS

1. “Optofluidic microreactors for green hydrogen production” Catalysis and Reaction Engineering Symposium (CARES) 2024; held at IIT Madras, Chennai during September 26-28, 2024.
2. “Novel Catalysts for Waste Management and Energy Conversion” at a conference on “Recent Advances in Waste Minimization and Utilization,” LPU Phagwara, Punjab (India) – 144411, during April 23<sup>rd</sup> – 24<sup>th</sup> 2024.
3. “Energy Conversion: Fuel Cells and Optofluidic Devices” at ChemEEE 2024, Visakhapatnam, during Feb 19<sup>th</sup> – 21<sup>st</sup> 2024.
4. “Green Hydrogen Production Using Optofluidic Devices” at Energy Environment Summit “Hydrogen Energy Resource & Opportunity (HERO-2023),” IPE, Visakhapatnam, during July 24<sup>th</sup> – 26<sup>th</sup> 2023.
5. “Engineering of photocatalytic overall water splitting to produce green hydrogen.” at the international conference ‘Recent Advances and Innovations in Solar Energy (RAiSE-2021)’, IIT Madras, Chennai (Virtual Mode), during December 02<sup>nd</sup> – 04<sup>th</sup> 2021.
6. “Lignocellulosic Biomass to Specialty Chemicals and Fuels” at the International Webinar on “Recycling and Solid Waste Management” at Andhra University, Visakhapatnam, India (Virtual Mode) on September 16<sup>th</sup> 2021.
7. “Advanced Photocatalysts for the Water Splitting Reaction to Produce Green Hydrogen” at the International Conference on 'Materials Chemistry and Catalysis' Tezpur University, Tezpur, India (Virtual Mode) March 4<sup>th</sup> – 5<sup>th</sup> 2021.
8. “Photocatalysis for the Hydrogen Production” in the TEQIP Short-term Training Program on “Sustainable Engineering for Industrial Development” at AICTE-ATAL Sponsored Online Faculty Development Program organized by GMR Institute of Techonolgy, Rajam, during September 9<sup>th</sup> – 13<sup>th</sup> 2020.

9. “Lignocellulosic Biomass Conversion to Bio-Products” in the TEQIP Short-term Training Program on “Emerging Technologies for Next-Generation Bio-fuels and Bio-products” at Dr. B. R. Ambedkar National Institute of Technology, Jalandhar, during February 21<sup>st</sup> – 25<sup>th</sup> 2020 (I was the chief guest of this program).
10. Plenary-talk on “Lignocellulosic Biomass Conversion to Value-Added Chemicals and Fuels” in the National Conference on “Recent Advances in Chemical Engineering” held in the Department of Chemical Engineering, Andhra University during January 21<sup>st</sup>–22<sup>nd</sup> 2020.
11. “Hydrogen Production from Renewable Energy Resources” in the TEQIP Training Program on “Recent Trends in Renewable Energy Utilization Technologies” at IIT Guwahati, Guwahati, during May 8<sup>th</sup> – 12<sup>th</sup> 2019.
12. “Process Intensification Using Microstructured Reactors” in the TEQIP Training Program on “Process Intensification in Chemical Industries” at SVNIT, Surat, Surat, during February 6<sup>th</sup> – 10<sup>th</sup> 2017.
13. “Catalyst Design for Complex Reactions” at JNT University, Kakinada on November 30<sup>th</sup> 2016
14. “Overview of Bio-oil Upgradation” at Vignan’s University, Guntur on November 29<sup>th</sup> 2016
15. “Rational Catalyst Design” at Andhra University, Visakhapatnam on October 14<sup>th</sup> 2016
16. “Metal Encapsulated Zeolites: Synthesis, Characterization and Applications” at KIC-TEQIP Short Term Course On “Recent Trends In Catalysis” at IIT Guwahati during May 13 – 14<sup>th</sup> 2016
17. “Zeolites” at NEQIP (AICTE) Sponsored Short Term Course on Advance Materials for Engineering Applications at Assam Engineering College, Guwahati, during April 25 – 29<sup>th</sup> 2016.
18. “Biomass Conversion into Bio-fuels: Prospects and Challenges” at KIC-TEQIP short-term course on advanced clean fuel technologies and alternative energy systems” at IIT Guwahati during March 7 – 11<sup>th</sup> 2016
19. “Bio-fuels” at KIC-TEQIP short-term course on Recent Trends in Renewable Energy Systems at IIT Guwahati during January 23 – 24<sup>th</sup> 2015

## RESEARCH EXPERIENCE

**Professor (August 2023 – Present); Associate Professor (October 2018 – August 2023) and Assistant Professor (July 2014 – October 2018), Department of Chemical Engineering, Indian Institute of Technology Guwahati, Assam, India 781039.**

Current areas of research:

- Heterogeneous Catalysis and reaction engineering.
- Biomass conversion to value added chemicals using process intensification techniques.
- Optofluidic devices for green hydrogen production via photocatalytic water splitting.
- Direct alcohol fuel cells (DAFCs).
- Carbon dioxide activation to valuable chemicals.
- Metal encapsulated zeolites.

**Post-Doctoral researcher (April 2011 – July 2014), Department of Chemical and Biomolecular Engineering, University of Delaware, Newark, DE 19711.**

Advisers: Prof. D.G. Vlachos and Prof. R.F. Lobo

- Designed bimetallic catalysts for hydrocarbon oxidation by combining high-throughput experiments and first principle Density Functional Theory (DFT) calculations based on Bronsted-Evans-Polanyi (BEP) relations and volcano curves.
- Developed a microkinetic model for catalytic total oxidation of ethane over Pt(111).
- Designed a nine channel high-throughput experimentation system using COMSOL MULTYPHYSICS and eventually fabricated and tested the same for catalyst screening for high temperature gas phase reaction (propane oxidation).
- Involved in design and integration of a microreactor for steam reforming of methane with combustion of methane.

**Senior Project Associate (December 2010 – March 2011), Indian Institute of Technology, Kanpur, INDIA 208016.**

Adviser: Prof. Deepak Kunzru

- Integrated ethanol steam reformer with heat exchanger and water-gas shift reactor.

**Research Scholar (August 2005 – November 2010), Indian Institute of Technology, Kanpur, INDIA 208016.**

Adviser: Prof. Deepak Kunzru

Title: Development of Microchannel Reactor for Steam Reforming of Ethanol.

- Developed chemical etching technique to fabricate microchannels on stainless steel. Designed and fabricated microreactors using laser micromachining and laser spot welding method.
- Developed a washcoating method for an adherent catalyst coating on non-porous substrates (e.g. stainless steel).
- Tested the microreactor for steam and oxidative steam reforming of ethanol to produce hydrogen with high selectivity at high temperatures and ambient pressure using various catalysts. Compared the microreactor performance with that of a conventional packed bed reactor.
- Estimated the kinetic parameters for steam reforming of ethanol. Simulated the reactor system in 2D using CFD software (COMSOL MULTIPHYSICS).

**Senior Project Associate (January 2005 – July 2005), Indian Institute of Technology, Kanpur, INDIA 208016.**

Adviser: Prof. Jai P. Gupta

- Estimated kinetic parameters for reactions of methyl isocyanate with water in presence of small amounts of chloroform and phosgene, using genetic algorithm.

**Masters research (January 2003 – July 2004), Indian Institute of Technology, Kanpur, INDIA 208016.**

Adviser: Prof. Deepak Kunzru

Title: Pyrolysis of Jet-1A and JP-10: Determination of Kinetics and Effect of Initiators

- Studied the product distribution and kinetics of thermal (gas phase) cracking of Jet-1A and JP-10 fuels in an annular tubular reactor at atmospheric pressure.
- Investigated the effect of initiators on the cracking of these fuels.

### TEACHING EXPERIENCE

**Professor (August 2023 – Present); Associate Professor (October 2018 – August 2023) and Assistant Professor (July 2014 – October, 2018), Department of Chemical Engineering, Indian Institute of Technology Guwahati, Assam, India 781039.**

- Courses:
  - Chemical Reaction Engineering I (CL208)
  - Chemical Reaction Engineering II (CL302)
  - Fluid Mechanics (CL202)
  - Process Intensification and Integration (CL641)
  - MTech seminar course (CL599)
  - Nano Device: Fabrication, Productization and Patent Writing (NT601)
  - Laboratory Safety and Risk Management: Principles (NT602)
- Tutor for Engineering Drawing (ME111)
- Chemical Reaction Engineering laboratory (CL 417)
- Mass transfer laboratory (CL313)

**Teaching Assistant (August 2005 – November 2010), Indian Institute of Technology, Kanpur, INDIA 208016.**

- Assisted in course work in tasks such as assignment grading, invigilation during exams, preparation of lecture notes, organizing external seminars, laboratory course conduction, etc.

**Lecturer (August 2004 – January 2005), National Institute of Technology, Warangal, Andhra Pradesh, INDIA 506004.**

- Taught two courses (Chemical Engineering Thermodynamics II and Mass Transfer I) to undergraduate students.
- Handled two laboratory courses (Fluid and Particle Mechanics; Instrumentation and Process Control) for undergraduate students.

### ACTIVITIES

- Member of the departmental (ChE, IITG) committee for recommending candidates who apply to the department to host them for DST INSPIRE/Ramanujan/Ramalingaswami Fellowships for a period of 3 years from 01/08/2022 to 31/07/2025.
- Member-Secretary of DPPC committee of Department of Chemical Engineering, IIT Guwahati from 19/04/2024 to 18/04/2026.
- External member of DPPC committee of Department of Electronics and Electrical Engineering, IIT Guwahati from 01/04/2022 to 31/03/2024.
- Warden, Manas hostel, IIT Guwahati for a period of ONE year from 01/08/2022 to 31/07/2024.
- Associate Warden, Manas hostel, IIT Guwahati for a period of TWO years from 01/08/2020 to 31/07/2022.
- Member of DUPC committee of Department of Chemical Engineering, IIT Guwahati from 01/04/2015 to 31/03/2018 and from 01/04/2022 to 31/03/2024.
- Faculty Advisor for the B.Tech. Chemical Engineering batch 2020 at IIT Guwahati.
- In-charge of analytical laboratory, Department of Chemical Engineering, IIT Guwahati for a period of 2 years from 01/04/2018 to 31/03/2020.
- Member of organizing committee of BSB2-2022 - International Conference on Biotechnology, Sustainable Bioresources and Bioeconomy, held at IIT Guwahati, during 7 – 11<sup>th</sup> Dec 2022.
- Member of Scientific committee of the HYdrogen Power Theoretical & Engineering Solutions International Symposium (HYPOTHESIS XVII) 2022 held at Taipei (Taiwan), during 26<sup>th</sup> – 29<sup>th</sup> Sep 2022. ([www.hypothesis.ws](http://www.hypothesis.ws))
- Member of Scientific committee of the HYdrogen Power Theoretical & Engineering Solutions International Symposium (HYPOTHESIS XV) 2020 held at Cape town, South Africa during 3<sup>rd</sup> – 6<sup>th</sup> May 2020. (<http://hypothesis.ws/index.php>)
- Organized 4<sup>th</sup> National Workshop on NEMS/MEMS and Theranostics Devices (NWNTD – 2018) in the Center for Nanotechnology, IIT Guwahati during 26<sup>th</sup> – 28<sup>th</sup> of February 2018.
- Member of organizing committee of CHEMCON 2015 held at IIT Guwahati, during 27<sup>th</sup> – 30<sup>th</sup> Dec 2015.
- Organized a KIC-TEQIP short-term course on “Novel Catalysts for Industrial Use” at IIT Guwahati during 24 – 26<sup>th</sup> of August 2016.
- Organized a KIC-TEQIP short-term course on “Advanced Clean Fuel Technologies and Alternative Energy Systems” at IIT Guwahati during 7 – 11<sup>th</sup> of March 2016.
- Reviewer for more than TEN journals.
- Life member of Indian Institute of Chemical Engineers (IChE), Member ID: 56567.

#### **HONORS, AWARDS AND ACHIEVEMENTS**

- Young Scientist Start up award from SERB-DST (File No. YSS/2015/000911)
- Young Researcher award for the 3<sup>rd</sup> North American Symposium on Chemical Reaction Engineering Conference, 2013, Houston, USA.
- MHRD scholarship for the doctoral program at IIT Kanpur, Aug 2005 – July 2010.
- MHRD scholarship for the master’s program at IIT Kanpur, Aug 2002 – July 2004.
- Travel grant from the Department of Science and Technology, Government of India for attending 3<sup>rd</sup> International Conference on Structured Catalysts and Reactors, 2009, Ischia, Naples, Italy.
- Travel grant from the Council of Scientific and Industrial Research, Government of India for attending 11<sup>th</sup> International Conference on Microreaction Technology, 2010, Kyoto, Japan.
- Awarded first prize for best oral presentation at Chemference-2010, 13 – 14<sup>th</sup> July 2010, IIT Kanpur, INDIA.
- Awarded second prize in a technical quiz conducted in TECNOQUEST-2002 (A National level technical symposium held at Osmania University, Hyderabad).
- Secured an All India Rank of 109 (among 8,000) in Graduate Aptitude Test in Engineering (GATE)-2002, a national level admission test for admission into master’s program in top institutes in INDIA.
- My article entitled "Fabrication of microchannels on stainless steel by wet chemical etching", published in J. Micromech. Microeng., 17 (2007) N99, has been downloaded more than 250 times in the first quarter of its

publication. Across all Institute of Physics journals, only 10% of articles were accessed over 250 times this quarter.

#### **PERSONAL DETAILS**

- Date of Birth: 18<sup>th</sup> June, 1980
- Place of birth: Visakhapatnam, India
- Nationality: Indian
- Marital status: Married, one child.