Dr. Koustuv Ray

Assistant Professor

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EDUCATION

Degree	Specialization	Year	Institution	Rank
Doctor of Philosophy	Catalysis, Density Functional Theory	July 2013 - June 2018	IIT Kanpur	-
Master of Technology	Chemical Engineering	July 2011 - May 2013	IIT Kanpur	1
Bachelor of Engineering	Chemical Engineering	July 2007 – May 2011	Jadavpur University	2

PROFESSIONAL EXPERIENCE

Designation	Year	Department	Institution
Assistant Professor	December 2018 - Present	Chemical Engineering	IIT Kharagpur
Project Engineer	August 2018 - November 2018	Chemical Engineering	IIT Kanpur

TEACHING RESPONSIBILITIES

SUBJECTS

Reaction Engineering, Petroleum Refinery Engineering, Computer Aided Process Engineering, Engineering Thermodynamics

LABORATORIES

Fuel, Fluid Flow, Process Equipment Design, Reaction Engineering

RESEARCH INTERESTS

Heterogeneous Catalysis, Process modelling and Reactor design, Machine learning models

RESEARCH STUDENTS

Doctorate of Philosophy curriculum (4 on-going)
Master of Technology curriculum (5 guided, 3 on-going)

ACADEMIC ACHIEVEMENTS

PROJECTS as PI

1. Title: Development of SiO_2 supported Fe catalyst for CO_2 methanation: A combined investigation using DRIFTS and DFT, (2020-2022), Total Cost – 33 Lakhs, Sponsor: SERB, Govt. of India **(completed)**.
2. Title: Development of efficient catalyst using transition metals for CO2 hydrogenation, (2019-2022), Total Cost - 28 Lakhs, Sponsor: SRIC, IIT Kharagpur **(completed)**.

SCIENTIFIC COLLABORATION

Memorandum of Understanding (MoU) established effective since January, 2023 with Professor Dr.-Ing. Robert Güttel, Institute of Chemical Engineering, Ulm University, Germany and Dr. Koustuv Ray, Chemical Engineering Department, IIT Kharagpur.

LIST OF PUBLICATIONS (Last Three Years):

1. "Selective photo-reduction of CO_2 to methanol using Cu-doped 1D-Bi_2S_3/rGO nanocomposites under visible light irradiation", by A Mandal, S Maitra, S Roy, B Hazra, **K Ray**, K Kargupta; New Journal of Chemistry, 47 (2023), 1422–1434.

2. *"Modelling of Anaerobic Digester for the conversion of Organic Waste into Hydrogen & Methane"*, by S K Sahoo, **K Ray**; *aterials Today: Proceedings, 72 (2023), 299-305*.

3. *"Density Functional Theory Insights on Photocatalytic Ability of CuO/TiO_2 and CuO/ZnO"* by B Singha, **K Ray**; *Materials Today: Proceedings, 72 (2023), 451-458*.

4. *"$NaBH_4$-Assisted Synthesis of B–(Ni–Co)/$MgAl_2O_4$ Nanostructures for the Catalytic Dry Reforming of Methane", by* Md. Shakir, M Prasad, **K Ray**, S Sengupta, A Sinhamahapatra, S Liu, H B Vuthaluru; *ACS Applied Nano Materials, 5 (2022), 10951-10961*.

5. *Ni/$Ce_xZr_{1-x}O_2$ catalyst prepared via one-step co-precipitation for CO_2 reforming of CH_4 to produce syngas: Role of oxygen storage capacity (OSC) and oxygen vacancy formation energy (OVFE)* by M Prasad, **K Ray**, A Sinhamahapatra, S Sengupta; *Journal of Materials Science*, *57 (2022) 2839-2856*.

6. *"Activity and stability descriptors of Ni based alloy catalysts for dry reforming of methane: A density functional theory study"* by **K Ray**, A S Sandupatla, G Deo; *International Journal of Quantum Chemistry, 121:e26580 (2021) 1-7*.

7. "*Thermodynamic equilibrium analysis on oxidative dehydrogenation of propane using CO_2: finding a suitable reactant ratio for propylene formation*" by A Pattnaik, S Sehgal, G Kumar, **K Ray,** D Pandey; *Journal of the Indian Chemical Society, 97 (2020) 1-5*.

8. *"Oxidative dehydrogenation of propane over alumina supported vanadia catalyst - Effect of carbon dioxide and secondary surface metal oxide additive"* by A S Sandupatla, **K Ray**, P Thaosen, C Sivananda, G Deo; *Catalysis Today, 354 (2020) 176-182*.

CONFERENCE PROCEEDINGS (Last Three Years):

1. Mohd. Arif, Rahul Kumar, **Koustuv Ray**, " A Comparison between Sol-Gel and Impregnation Methods for Al_2O_3 Supported Ni and Ni-Fe Alloy Catalyst on CO_2 Methanation", presented in **CHEMCON**, Harcourt Butler Technical University Kanpur, Uttar Pradesh, India, December 2022.

2. Athira P., Aditya S. Sandupatla, **Koustuv Ray**, "First-principles based study on adsorption and activation of oxides of carbon on Ni and Ni-alloy catalysts", **6th National Symposium on Shaping the Energy Future: Challenges & Opportunities**, CSIR - Indian Institute of Petroleum Dehradun, India, August, 2022.

3. Sunil K Sahoo, Mohd. Arif, **Koustuv Ray**, "Modelling of Anaerobic Digester for the conversion of Organic Waste into Hydrogen & Methane", **International Conference on Novel Materials and Technologies for Energy and Environment,** Hyderabad, India, February, 2022.

4. Biplab Singha, **Koustuv Ray**, "Density Functional Theory Insights on Photocatalytic Ability of CuO/TiO_2 and CuO/ZnO", **International Conference on Novel Materials and Technologies for Energy and Environment,** Hyderabad, India, February, 2022.

5. Manohar Prasad, **Koustuv Ray**, Siddhartha Sengupta, "Oxygen vacancy formation in Zr -doped Ceria support for DRM reaction: A density functional theoretical study", **CHEMCON**, CSIR-IMMT, Bhubaneswar, India, December, 2021.

INVITED LECTURE/PANEL DISCUSSION:

1. Co-chaired a Panel Discussion Session on "**Contemporary Challenges and Emerging Trends in Energy and Environment Research**" during *International Conference on Novel Materials and Technologies for Energy and Environment (NMTE2A),* organized by **Birla Institute of Technology & Science, Pilani - Hyderabad Campus, February, 2022**.

2. Delivered a talk entitled as "**In-silico characterization of bimetallic catalysts for energy and environmental application**" during an *Online Workshop on Synthesis, Characterization and Performance of Advanced Materials (SCPAM – 2021)*, organized by **National Institute of Technology Bhopal, India, May 2021**.

ACADEMIC RESPONSIBILITIES

1. Faculty Adviser of Y22 Chemical Engineering B.Tech (IV) & Dual Degree (V) year batch
2. Faculty-in-charge of Fluid Flow Laboratory, January 2020-December 2023.
3. Co-PIC of Department Research Facility (Chemical Engineering), March 2022 – present
4. Adviser Society, Chemical Engineering

ADMINISTRATIVE RESPONSIBILITIES

1. Assistant Warden, LLR Hall of Residence, IIT Kharagpur, January 2023 – present.
2. Member, Administrative Committee, Department of Chemical Engineering, IIT Kharagpur