June 2024

# CSI Communication

## Monthly Newsletter of Catalysis Society of India

## Circulated to all CSI Member

### Important Announcement:

**CSI newsletter shall be pleased to publish a page write-up under the title, Centre of Excellence in Catalysis Research in India from any Indian Academics, Research Laboratories, or Industrial Organizations. You may send your brief write-up on your research activities to us which will be published in one of the coming issues of CSI.**

**You can also share your recent happy moments like publications, granted patents, technology commercialization, fellowship, awards with Catalysis Community through CSI Communication.**

### Highlights of This Issue :


- **Research Group Activities: Dr. Sanjib Banerjee, IIT Bhilai**
- **Commercial & Policies**
- **Scientific Updates**
- **Catalysis Research out of India**
- **Upcoming Symposium/Conferences/Seminars/Workshop**
- **List of New CSI Life Members**
- **CSI Members: Awards/Recognitions**


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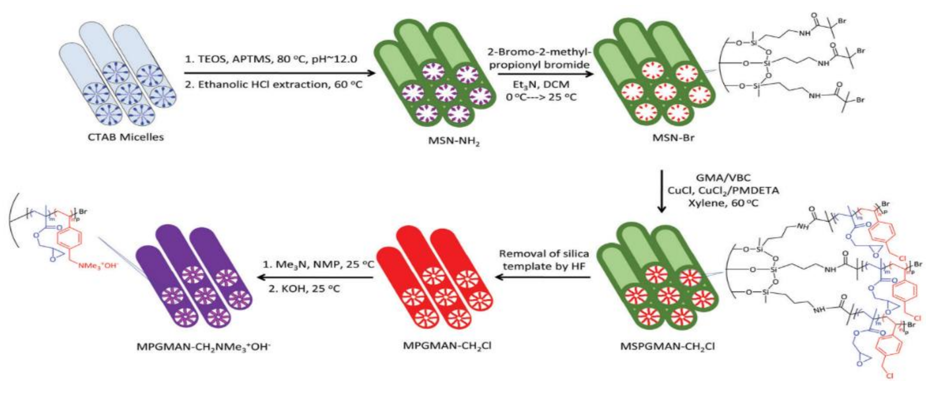
## Functional Mesoporous Nanomaterials for $CO_2$ Capture @ Dr. Sanjib Banerjee Group, IIT Bhilai

Dr. Sanjib Banerjee Group works on the development of functional porous nanomaterials for $CO_2$ capture to mitigate "climate changes". The $CO_2$ uptake performance of nitrogen-rich porous carbon nanospheres is better than the contemporary benchmark porous materials, including carbons, zeolites, and metal-organic frameworks. This approach, with (i) greater sustainability, including but not limited to carbon neutrality, and (ii) simpler and cost-effective preparation routes, leads to the preparation of nitrogen-rich mesoporous carbon nanomaterials with improved properties for specific applications in $CO_2$ capture and contaminant removal, introduces a new avenue for the fabrication of unique advanced porous materials for a wide range of potential applications in adsorption, energy, catalysis, and medicine. The group has developed template-shape-replicated nitrogen-rich porous carbon nanospheres for highly efficient $CO_2$ capture and contaminant removal. The uniqueness of nitrogen-rich porous carbon nanospheres with high surface area, pore volume, and ordered pore geometry via a combination of in situ co-condensation (*Mater. Adv.,* **2022,** *3,* 665-671). His group also developed $-CH_2Cl$-functionalized mesoporous polymer nanoparticles, which were subsequently converted to $-CH_2NMe_3^+ OH^-$ functionalized mesoporous polymer nanoparticles, appropriate for $CO_2$ capture investigation. Depending on the amount of $-CH_2NMe_3^+ OH^-$ functionality, the $CO_2$ absorption capability can be tuned (*Ind. Eng. Chem. Res.* **2022***, 61,* 1140−1147). The $CO_2$ adsorption capability can be tuned by controlling the amount of $–CH_2NMe_3^+OH^-$ functionality in the functional polymer (*Polym. Chem.,* **2022***, 13,* 2165–2172).




**Synthesis of multifunctional porous polymer nanomaterials**

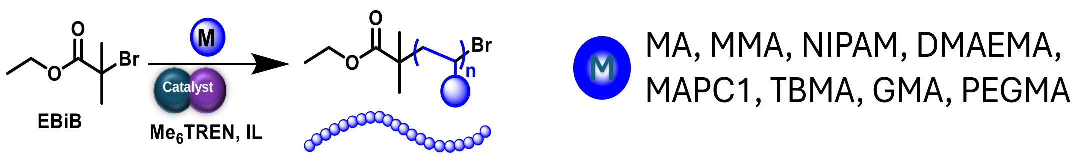
- **Development of Recyclable Catalyst Mediated Controlled Polymerization towards Smart Polymeric Materials**

Dr. Sanjib Banerjee and the group have developed his research field on recoverable and recyclable nanocatalyst-mediated reversible deactivation radical polymerization (RDRP) of a wide range of acrylates/methacrylates/acrylamide/bio-sourced monomers at ambient temperature. The group is focused on solving some critical disadvantages of the traditional RDRP process.

These issues include, but are not limited to undesired odor, color, and toxicity in RAFT polymerization, catalyst leaching in ATRP, and difficulty in removal of the residual Cu(I) and/or Cu(II) in SET-LRP. This necessitated the need to develop a RDRP process with efficient recovery and recyclability of the catalyst, leading to clean polymer and an increase in the process efficiency and circular economy via recycling of the key reaction component. The group has developed a magnetically recyclable Ni-Co nanocatalyst-mediated room temperature RDRP process of methyl methacrylate (*Polym. Chem.,* **2020***, 11,* 287–291). Furthermore, they achieved Ni-Co alloy-mediated ambient temperature RDRP methyl acrylate and the prepared PMA-Br was used as a macroinitiator to synthesize of well-defined poly(methyl acrylate)-*block*-poly(2-dimethylamino)ethyl methacrylate), poly(methyl acrylate)-*block*-poly(tert-butyl methylacrylate) and poly(methyl acrylate)-*block*-poly(2,2,3,3,4,4,5,5-octafluoropentyl acrylate) diblock copolymers with low dispersities (*Polym. Chem.,* **2021***, 12,* 3042–3051). They reported, for the first time, ambient temperature RDRP of N-isopropylacrylamide (NIPAM), mediated by Ni–Co alloy nanoparticles and synthesis of multi stimuli-responsive PNIPAM-*b*-PLysMAM-UMB block copolymer thereof, combining the thermo-responsive nature of PNIPAM with pH responsive poly(lysine methacrylamide) (PLysMAM) and light responsive properties of umbelliferon (UMB) (*Macromol. Rapid Commun.* **2021**, *42,* 2100096). The synthesis of a novel ABA-type amphiphilic dual pH/thermoresponsive poly(histidine methacrylamide)-*block*-polybutadiene-*block*-poly-(histidine methacrylamide) (PHisMAM-*b*-PB-*b*-PHisMAM) triblock copolymer biohybrid, via recyclable Ni-Co alloy-mediated ambient temperature RDRP of an L-histidine-derived monomer (*Biomacromolecules* **2021,** *22,* 3941−3949). Compared to conventional thermal RDRP processes, photoRDRP may offer improved molar mass and spatiotemporal control. The group has also developed Ni-Co alloy-mediated ultrafast photoRDRP of glycidyl methacrylate (GMA) at ambient temperature in a recyclable ionic liquid solvent and synthesised a multi stimuli-responsive (pH/temperature) amphiphilic poly(glycidyl methacrylate)-*block*-poly(poly(ethylene glycol)methacrylate) (PGMA-*b*-PPEGMA) diblock copolymers (*Polym. Chem.,* **2021,** *12,* 4954–4960). A simple, inexpensive and recyclable photoRDRP of a phosphorus-containing monomer, dimethyl(methacryloyloxymethyl) phosphonate (MAPC1) in ionic liquid (without the need for any conventional photoinitiators or dye sensitizers) is developed for the first time to produce low dispersity ($Đ \leq 1.24$) phosphorus-containing polymer, PMAPC1 (at least up to 20200 g $mol^{-1}$) and a series of well-defined multifunctional PMAPC1-*b*-poly(M) diblock copolymers (where "M" represents polyethylene glycol methacrylate (PEGMA), 2,2,3,3,4,4,5,5-octafluoropentylacrylate (OFPA) and 2-hydroxyethyl methacrylate (HEMA)) thereof (*Eur. Polym. J.* **2022,** *181,* 111646). The synthesis of an amphiphilic and multi-stimuli responsive poly(cysteine methacrylamide)-*block*-poly(2-(dimethylamino)ethyl methacrylate)-*block*-polybutadiene-*block*-poly(2-(dimethylamino)ethyl methacrylate)-*block*-poly(cysteine methacrylamide) (PCysMAM-*b*-PDMAEMA-*b*-PB-*b*-PDMAEMA-*b*-PCysMAM) pentablock copolymer biohybrids composed of L-cysteine (ampholyte, pH and redox responsive), DMAEMA (pH and temperature responsive) and butadiene (hydrophobic) via a combination of living anionic polymerization and Ni-Co alloy mediated RDRP (*Polym. Chem.,* **2022,** *13,* 1960–1969). The synthesis of unprecedented amphiphilic poly(2-thioethyl vinyl ether)-*block*-poly(poly(ethylene glycol) methacrylate) (PTEVE-*b*-PPEGMA) BCPs via sequential ionic liquid-mediated cationic polymerization of CEVE and recyclable alloy-mediated photoRDRP of PEGMA, followed by post-polymerization modification of the pendant -$CH_2CH_2Cl$ functionality to -$CH_2CH_2SH$ (*Eur. Polym. J.* **2022,** *175,* 111348).

Furthermore, the group has recently developed nano zero valent iron (nZVI)-mediated recyclable photoRDRP (without the need of any photo activator) of DMAEMA in ionic liquid and synthesis of multi-stimuli responsive poly(2-(dimethylamino)ethyl methacrylate)-*block*-poly(vinyl phenyl boronic acid) (PDMAEMA-*b*-PVPBA) diblock copolymers thereof via efficient reactivation of the chain ends. (*Eur. Polym. J.* **2023,** *199,* 112443). Subsequently they synthesized poly(*tert*-butyl methacrylate) (PTBMA), amphiphilic PTBMA-*block*-poly(poly(ethylene glycol)methacrylate) diblock copolymer and double hydrophilic poly(methacrylic acid)-*block*-poly(poly(ethylene glycol)methacrylate) (PMAA-*b*-PPEGMA) diblock copolymers thereof via nZVI mediated photoRDRP (*Macromol. Rapid Commun.* **2023,** *2300500*).

Dr. Sanjib Banerjee and his group have also developed recyclable Ag-Pd nanocatalyst mediated photoRDRP of methyl acrylate (MA) in a recoverable green solvent, ionic liquid. They synthesized poly(methyl acrylate)-*block*- poly(*tert*-butyl methacrylate) (PMA-*b*-PTBMA) and poly(methyl acrylate)-*block*- poly(vinyl phenyl boronic acid) (PMA-*b*-PVBC) diblock copolymers. These synthesized diblock copolymers were modified via post-polymerization modification and were used for heavy metal and contaminant removal from water (*ACS Appl. Polym. Mater* **2024**).





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## Commercial & Policies

- **Coal gasification project in Odisha**

Bharat Coal Gasification & Chemicals Limited (BCGCL), a joint venture company of Coal India Ltd and BHEL has floated a tender for the selection of an LSTK-2 (lump sum turnkey) to start work on a portion of its Coal to Ammonium Nitrate project in Odisha which is coming up with an investment of Rs 1,1782 crores, according to a statement issued by the Ministry of Coal on Friday. The project involves the setting up of a Syngas Purification Plant and ammonia Synthesis gas plant

that will purify the raw syngas produced from the coal gasifier and make it suitable for ammonia synthesis. CIL and BHEL have entered into an agreement for setting up India's first commercial-scale coal-to-ammonium nitrate plant through a surface coal gasification (SCG) technology route.
Source: https://business.ians.in/detail/bcgcl-floats-tender-for-rs-11782-crore-coal-gasification-project-in-odisha--20240531193638

- **Engineering plastics and PU capabilities boost in India**

BASF India Ltd is increasing the production capacity of its Ultramid branded polyamide (PA) and Ultradur branded polybutylene terephthalate (PBT) compounding plant in Panoli (Gujarat) and Thane (Maharashtra). The company is also opening a new Polyurethane Technical Development Centre India, near Mumbai, to support market development of polyurethane (PU) applications in industries such as transportation, construction, footwear, appliances, and furniture.
Source: https://globalflowcontrol.com/newsroom/basf-boosts-engineering-plastics-and-pu-capabilities-in-india/

- **50-kW alkaline electrolyzer system** by **BHEL on BARC technology**

Bharat Heavy Electricals Limited (BHEL) has signed a technology transfer agreement with Bhabha Atomic Research Centre (BARC) for a 50 kilowatts (kW) alkaline electrolyser system for hydrogen production. BHEL stated that the well-proven technology offered by BARC is indigenously developed and has a high local material content.
Source: https://www.projectstoday.com/News/BHEL-signs-technology-transfer-agreement-with-BARC-for-electrolyser-system

- **10 MW Green Hydrogen Plant in Madhya Pradesh y GAIL**

GAIL (India) Ltd. inaugurated its first 10 MW Green Hydrogen Plant under the National Green Hydrogen Mission in Madhya Pradesh's Vijaipur. The Green Hydrogen Plant has a capacity of producing 4.3 Tonnes Per Day (TPD) of Hydrogen through its Electrolyzer units, by electrolysis of water, using renewable power. Hydrogen produced from this plant will have a purity of 99.99% and will be produced at a pressure of 30 Kg/ $cm^2$. For the initial phase, the hydrogen produced from this unit will be used as fuel, along with natural gas for captive purposes in the various processes and equipment running at GAIL's Vijaipur plant. It is planned to dispatch the Hydrogen to retail customers in nearby geographies, through high-pressure cascades lator.
Source: https://www.cnbctv18.com/market/gail-share-price-commissions-green-hydrogen-plant-madhya-pradesh-fuel-captive-capacity-19417863.htm

- **India's first solid oxide electrolyzer commissioned by HPCL**

HPCL has commissioned India's first solid oxide electrolyzer for green hydrogen production at its Green R&D Centre in Bengaluru, Karnataka. The solid oxide electrolyzer developed at HPCL's Green R&D Centre is part of their efforts to advance green hydrogen production. Solid oxide electrolyzer (SOE) technology is significant for its potential to efficiently produce hydrogen by using high-temperature electrolysis of steam. This process operates at temperatures typically between 700°C and 1,000°C, which allows the electrolyzer to leverage thermal energy from industrial waste heat or renewable energy, to split water molecules into hydrogen and oxygen. One of the key advantages of SOE technology is its reliance on readily available materials, such as ceramics, for the construction of its cells, avoiding the need for rare or expensive metals typically used in other electrolyzer technologies such as PEM electrolyzers.

https://hydrogentechworld.com/hindustan-petroleum-corporation-limited-commissions-indias-first-solid-oxide-electrolyser

- **Synthetic bio cocktail EN3ZYME by Fermbox Bio to break down waste plant materials to biofules and bioproducts**

Fermbox Bio, a company specializing in developing and producing solutions using synthetic biology, has launched a new product called EN3ZYME. EN3ZYME is a special mixture of enzymes (called a cocktail) that helps break down waste plant materials like corn stalks and leaves into usable sugars. These sugars can be fermented to create second-generation (2G) ethanol, a biofuel that can be used in cars and helps reduce reliance on fossil fuels. The demand for 2G ethanol and bio-based products is growing rapidly, driven by concerns about climate change and government initiatives.

Source: https://worldbiomarketinsights.com/fermbox-bio-unveils-synbio-cocktail-en3zyme-a sustainable-solution-for-biofuels-and-bioproduct

- **Two World-Scale Production Lines for Polyethylene by BPCL**

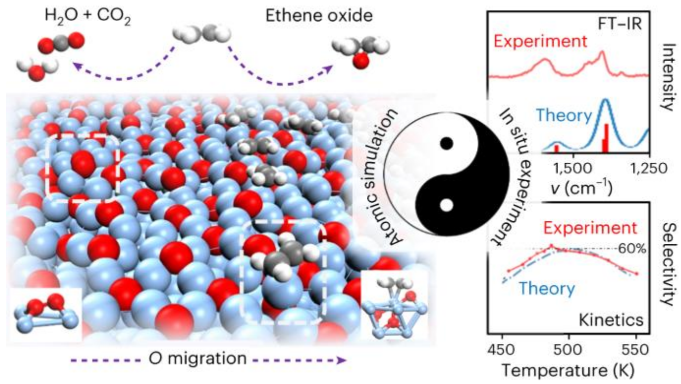
BPCL has selected Univation's UNIPOL™ PE Process Technology for two world-scale production lines to be located at BPCL's Bina Refinery site in MP. The two units are designed to achieve a combined nameplate production capacity of 1,150,000 tons per annum of polyethylene (PE). The two BPCL reactor lines will enable the production of high-density polyethylene (HDPE) and linear low-density polyethylene (LLDPE). BPCL is accessing Univation's advanced HDPE platforms, including advanced PRODIGY™ Bimodal HDPE Technology and advanced ACCLAIM™ Unimodal HDPE Technology, to satisfy the high-performance needs of HDPE end-use applications including high-pressure PE100 and PE80 pipe, small part blow molding (SPBM), and large part blow molding (LPBM).

Source: https://www.prnewswire.com/news-releases/bharat-petroleum-corporation-ltd-selects-univations-unipol-pe-process-for-two-world-scale-production-lines-in-india-302178671.html

## Scientific Updates

- **Selective ethene epoxidation on silver square-pyramidal subsurface oxygen [$Ag_4OAg$]**

Ag-catalyzed ethene epoxidation is the only viable route for making ethene oxide (EO) in industry. Still, the active site remains elusive due to the lack of tools to probe this reaction under high temperature and high-pressure conditions. Aided by advanced machine-learning grand canonical global structure exploration and in situ experiments, a unique surface oxide phase, namely the O5 phase, grown on Ag(100) under industrial catalytic conditions is identified. This phase features square-pyramidal subsurface O and strongly adsorbed ethene, which can selectively convert ethene to EO. The other Ag surface facets, although also reconstructing to surface oxide phases, only contain surface O and produce CO2. The complex in situ surface phases with distinct selectivity contribute to an overall medium (50%) selectivity of Ag catalyst to EO.

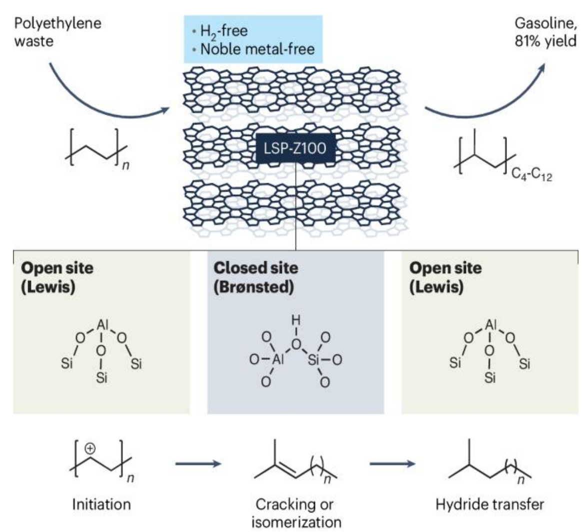



In situ infra-red spectroscopy experiments confirm the theory-predicted infra-red-active C=C vibration of adsorbed ethene on O5 phase and the microkinetics simulation results.

Source: Nature Catalysis **7**, 536–545 (2024) https://doi.org/10.1038/s41929-024-01135-2

- **Layered self-pillared zeolites convert polyethylene to gasoline**

The researchers attribute the high yield of saturated hydrocarbons to the unique layered structure of the self-pillared zeolite. In contrast to other hydrogen-free depolymerization studies authors did not observe substantial fractions (<12%) of aromatic and polyaromatic hydrocarbons over LSP-Z100. The researchers observed that within micropore regions of LSP-Z100, Brønsted acid sites associated with nearby framework Al atoms stabilize and bind polyethylene and create reactive carbenium intermediates. They noted that this carbenium ion formation may also occur over Lewis acid sites via a hydride abstraction step. The less restrictive regions of LSP-Z100 offer opportunities for larger polyethylene fragments to form, enabling the production of liquid-range $C_7$–$C_{12}$ products. This prevents coke formation and subsequent catalyst deactivation. The catalyst is reported to be recoverable for multiple reaction cycles, demonstrating the potential industrial utilization of these materials.




Source: Nature Chemistry, 16, 841–842 (2024)

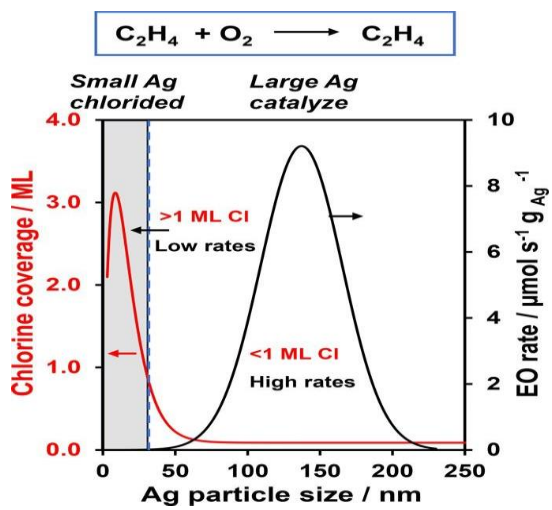
- **Photocatalytic ethylene production by oxidative dehydrogenation of ethane with dioxygen on ZnO-supported PdZn intermetallic nanoparticles**

Typically, thermocatalysts operating at high temperatures are needed for C–H activation in ethane for producing ethylene. Low-temperature ( < 140 °C) photocatalytic route for ODHE, using O2 as the oxidant is reported. A photocatalyst containing PdZn intermetallic nanoparticles supported on ZnO is prepared, affording an ethylene production rate of 46.4 mmol g–1 h–1 with 92.6% ethylene selectivity under 365 nm irradiation. With a simulated shale gas feed, the photocatalytic ODHE system achieves nearly 20% ethane conversion while maintaining an ethylene selectivity of about 87%. The robust interface between the PdZn intermetallic nanoparticles and ZnO support plays a crucial role in ethane activation through a photo-assisted Mars-van Krevelen mechanism, followed by a rapid lattice oxygen replenishment to complete the reaction cycle.

Source: Nature Communication, 15, 789 (2024), https://doi.org/10.1038/s41467-024-45031-6

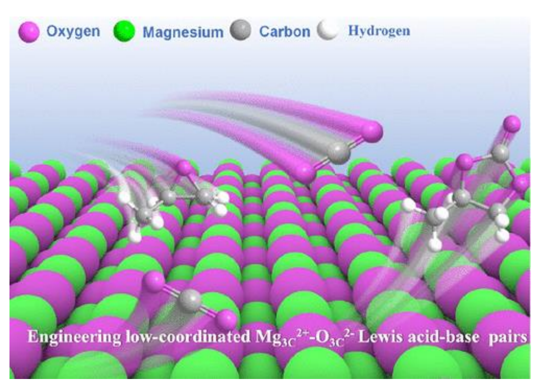
- **The role of chlorine promoters in silver-catalyzed ethylene epoxidation**

Measured chlorine coverages over Ag/α-$Al_2O_3$ catalysts with varying Ag weight loadings (1.3–35 wt%) and different Ag particle size distributions reveal that Ag particles of size below ∼30 nm are covered in more than 1 monolayer (ML) of chlorine in presence of 3.5 ppm C2H5Cl. Fully chlorided small Ag particles exhibit low rates of epoxidation and only large Ag particles which exhibit sub-monolayer Cl coverages catalyze ethylene epoxidation with high ethylene oxide (EO) rates and selectivity. The Ag particle size dependence of Cl coverages plausibly explains why ≥ 100 nm Ag particles are typical in promoted Ag/α-$Al_2O_3$ ethylene epoxidation catalysts.




Source: Journal of Catalysis, 2024, https://doi.org/10.1016/j.jcat.2024.115583=

- **Engineering Interfacial Low-Coordinated $Mg_{3C}^{2+}$-$O_{3C}^{2-}$ Lewis Acid–Base Pairs on MgO for Cycloaddition of $CO_2$ with Epoxides**




Interfacial low-coordinated $Mg_{3C}^{2+}$-$O_{3C}^{2-}$ Lewis acid-base pairs on highly defective MgO by modulating the local coordination environment of the central Mg species for effective $CO_2$ activation is reported . Through various in situ techniques, significantly enhanced CO2 adsorption strength and capacity (∼80%) were detected qualitatively on the low-coordinated $Mg_{3C}^{2+}$-$O_{3C}^{2-}$ pairs, where $O_{3C}^{2-}$ and $Mg_{3C}^{2+}$ function as Lewis base and acid sites,

respectively. The MgO catalysts with rich $Mg_{3C}^{2+}$-$O_{3C}^{2-}$ Lewis acid-base pairs delivered 6.18 times higher activity compared to commercial MgO catalysts for propylene epoxide cycloaddition with $CO_2$ in the absence of solvent and cocatalyst. Also, the selectivity of propylene carbonate reached 99.3%. The MgO catalysts were also demonstrated successfully for cycloaddition between $CO_2$ and various epoxides. This work paves the way for the rational construction of active sites in oxide catalysts for $CO_2$ activation.
Source: ACS Catal. 2024 https://doi.org/10.1021/acscatal.4c03326

## Catalysis Research out of India


1. M. Kamali, M. Arun Kumar, P. Sudarsanam, B.M Reddy "Nanostructured ceria-based catalysts for the conversion of lignocellulosic biomass to fuels and chemic**als, Catalysis Today, 2024,** 114814, https://doi.org/10.1016/j.cattod.2024.114814
2. S.BPutla, M. Kamali, B. Swapna, BM Reddy, P. Sudarsanam "Review of Shape-Controlled CeO2 Nanocatalysts for Purification of Auto-Exhaust Pollutants" **ACS Applied Nano Materials, 2024, 7(7)** 6749-6771
3. I. R Warkad, R. Paul, S Parthiban, Manoj B Gawande, "Highly Selective Oxidation of Biomass-Derived Alcohols and Aromatic Alcohols to Aldehydes Over Ti3C2-TiO2 Nanocomposites Under Visible Light" **Journal of Environmental Chemical Engineering,** 12 (4) 2024, 113128, https://doi.org/10.1016/j.jece.2024.113128
4. NK Paengjun, Vivek Polshettiwar, M. Ogawa "Designed Nanoarchitectures of a BiOBr/BiOI Nanosheet Heterojunction Anchored on Dendritic Fibrous Nanosilica as Visible-Light Responsive Photocatalysts" **Inorganic Chemistry 2024,** 63(25), 11870–11883 https://doi.org/10.1021/acs.inorgchem.4c01756
5. S. P. Kulkarni, AA Kulkarni "Continuous flow ozonolysis of cardanol for greener synthesis of bio-based monomers" **Journal of Flow Chemistry, 2024**, 14 ( 2), 417-426
6. R. Watanabe, H. Suganuma, Y. Yoda, F. Karasawa, P Verma, C. Fukuhara, "Deactivation of a Fe-based catalyst in the dehydrogenation of light alkanes under H2S co-feeding: A case study", **Applied Catalysis A: General, 2024, 119848**
7. T. Selvaraj, P. Aghalayam, Jithin John Varghese "Unraveling the Effect of Mo Dopant in Fe2O3 Catalyst for Selective Catalytic Reduction of Nitric Oxide with NH3" **Industrial & Engineering Chemistry Research, 2024, 65(15)** 6591-6599
8. M. Bhavisha, S. Balamurugan, C S. Gopinath & A Sakthivel, "The ex-situ exsolved Ni–Ru alloy from nickel–ruthenium co-doped SrFeO3−δ perovskite as a potential catalyst for C=C and C=O hydrogenation" **Sustainable Energy & Fuels 2024,** https://doi.org/10.1039/D4SE00170B
9. K K Shabana, s B Narendranath, NN P, N. J. Venkatesha, S G and Sakthivel A, "Temperature-Programmed Reduction Method for Stabilization of Inorganic Framework of SAPO-37 Materials: Promising Catalysts for MTBE Production" **Chemical Communications, 2024** https://doi.org/10.1039/D4CC01839G

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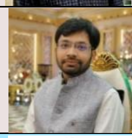
## Upcoming Symposium/Conferences/Seminars/Workshop

1. Conference on **Catalysis for Energy, Environment & Sustainability (CEES-2024)** & 3rd $CO_2$ India Network Meet organized by the Catalysis Society of India from 18th-20th September 2024 at IICT, Hyderabad.
   **The last date for abstract submission is 31st July 2024.**
2. "Catalysis And Reaction Engineering" Symposium (CARE) at the Indian Institute of Technology Madras (IITM) on 27th-28th, September 2024.
3. 18th **International Congress on Catalysis** from 14th -19th July 14-19, 2024, LYON, France.
4. XXIII International Symposium on Homogeneous Catalysis at Trieste, 21st July 21-26, 2024.
5. "19th Edition of **Global Conference on Catalysis,** Chemical Engineering & Technology" at Rome, Italy, from September 19th-21st, 2024.
6. **18th Edition of International Conference on Catalysis, Chemical Engineering, and Technology"** (CCT 2024) during June 17-19, 2024, at Paris.
7. 19th Edition of **Global Conference on Catalysis, Chemical Engineering & Technology,** September 19-21, 2024, | Rome, Italy | Hybrid Event
8. 5th International Symposium on **Catalysis for Clean Energy and Sustainable Chemistry** from 21st -23rd July 2024 at Bilbao (Spain).

## List of New CSI Life Members


The Catalysis Society of India welcomes new life members who recently joined.

| Sr.No. | Name | | Institute /Orgnaization |
|---|---|---|---|
| 1 | Dr. Priyanka Verma |  | Assistant Professor, Department of Chemistry, Indian Institute of Technology Delhi<br>Email:pverma@chemistry.iitd.ac.in |
| 2 | Dr. Phani B. S. Rallapalli |  | Senior Research Scientist, R&D, Reliance Industries Ltd. Vadodara, Gujarat<br>Email:drphanirallapalli@gmail.com |
| 3 | Dr. Selvamani Arumugam Selvamani A |  | Scientist, CSIR – Indian Institute of Petroleum, Dehradun<br>Email: selvamani.ana@gmail.com |

| | | | |
|---|---|---|---|
| 4 | Dr. Anup Tathod |  | Scientist, CSIR – Indian Institute of Petroleum, Dehradun<br>Email: anup.tathod@gmail.com |
| 5 | Dr. Rupak Kishor |  | Assistant Professor, National Institute of Technology, Bhopal<br>Email: kishorerupak@gmail.com |
| 6 | Dr. Piyush Pratap Singh |  | Research Scientist, R&D, Reliance Industries Ltd. Mumbai<br>Email: piyushsingh.nitb@gmail.com |
| 7 | Dr. Jithin John Varghese |  | Associate Professor,Indian Institute of Technology Madras<br>Email: Jithinjv@iitm.ac.in |
| 8 | Dr.Venkata Rama Mohan Talla |  | Assistant Professor<br>Adikavi Nannaya University campus Tadepalligudem<br>Emial tvenkataramamohan@gmail.com |
| 9 | Dr. Arunagiri A |  | Associate Professor, Department of Chemical Engineering, National Institute Of Technology<br>Tiruchirappalli, Tamil Nadu,<br>Email: aagiri77@gmail.com |
| 10 | Dr. Amjad Ali |  | Professor & Head, Department of Chemistry, Thapar Institute of Engineering and Technology, Patiala<br>Email: amjadali@thapar.edu |
| 11 | Dr. Mallesham Baithy |  | Assistant Professor, GITAM University Hyderabad, Telangana, India<br>Email: baithy.m@gmail.com |
| 12 | Dr. Abir B Majumder |  | Assistant Professor (Stage II) and Head, Department of Chemistry, KGT Mahavidyalaya (Affiliated to North Bengal University) Bagdogra, Darjeeling.<br>Email: aabir.majumder@gmail.com |
| 13 | Dr. Ujjwal Pal |  | Senior Principal Scientist, CSIR-Indian Institute Of Chemical Technology, Hyderabad<br>Email: ujjwalpal@iict.res.in |
| 14 | Dr.Sreekala Rugmini |  | Former AVP ( R&D), Sud-Chemie India Pvt. Ltd. Kochi<br>Email: sreekalarugmini@gmail.com |
| 15 | Dr.Govinda Perumal |  | Research Faculty, Department of Chemistry, Chennai Institute of Technology, Chennai<br>Email: govindche83@gmail.com |

## Awards/Recognitions


- *CSI Congratulates the following life members on the recognition they have received recently.*

| Name | Awards/Recognitions |
|---|---|
| **Professor Ganapati D. Yadav,** *FTWAS, FNA, FNASc, FRSC (UK), FIChemE (UK), FIIChE,* Emeritus Professor of Eminence & Former Vice Chancellor & R.T. Mody Distinguished Professor J.C. Bose National Fellow (Govt. of India), ICT, Mumbai  | ▪ Chirantan Rasayan Sanstha (CRS) Life Time Achievement Award 2024<br>▪ Appointed as **Chairman** of the Green Hydrogen Advisory Committee, Ministry of New and Renewable Energy, Government of India |
| **Prof. B.M. Reddy**<br>Sr. Professor Emeritus, Department of Chemistry, Birla Institute of Technology & Science, Pilani Hyderabad Campus  | Elected as a Life Fellow of the Indian Chemical Society (ICS) -July 2024 |

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## Quote of the Month

***" People who are truly strong lift others up. People who are truly powerful bring others together."***
*— Michelle Obama*

**Editorial Team**

**Dr. Sharad Lande**

**Dr. Raksh Vir Jasra**

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