



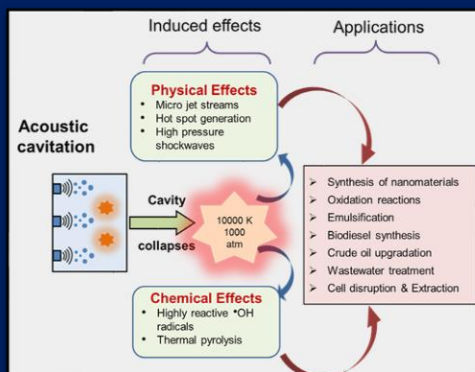
MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

TEMPUS

Chemical Engineering Department Newsletter

VOLUME - 3

JULY 2023



Technical Articles | Pg. 3



CHEMIGNITE – 2023 | Pg. 6



Faculty Achievements | Pg. 13

Contents

Contents	1
From the HOD's Desk	2
From the Students	3
Department Events	6
Faculty Achievements	13
Student Achievements	15
Fun Zone	16
TEMPUS Archives	19
Editorial Board	20
Advisory Board	21

From the HOD's Desk

Dear Readers,

I am delighted to present the July issue of our department's newsletter. In this issue we showcase the latest updates, accomplishments and highlight the talent and dedication within our department. In these pages, you will find insightful articles, research updates, faculty and student achievements, and exciting event highlights. I encourage you to read, engage, and share your thoughts with us.



I am pleased to announce the resumption of our third, fifth, and seventh semester B Tech classes, starting from July 31, 2023. The regularization and synchronization of the schedule happening after a significant period following the pandemic is expected to enhance and smoothen the academic process.

Moreover, I am happy to inform you about the upcoming "Advanced Materials for Environmental Sustainability-AMES 2023" conference, scheduled for 12th & 13th of Oct, 2023. This two-day national conference, hosted by our department at MIT Manipal, promises to be a platform for fostering knowledge exchange and discussions on vital subjects related to environmental sustainability.

Additionally, I am excited to share that our department is shifting to new premises in the Academic Block-2, formerly occupied by the Manipal School of Architecture and Planning (MSAP). This move marks an important step towards expanding and enriching our facilities to better serve our academic community.

Let us continue to embrace progress and excellence together.

Best regards,

Dr K Balakrishna Prabhu
Professor & Head, Department of Chemical Engineering
Manipal Institute of Technology MAHE, Manipal-576104.
Email: balakrishna.prabhu@manipal.edu

From the Students

ULTRASONICATION: AN INTENSIFYING TOOL FOR CHEMICAL TRANSFORMATIONS

Devangshi Debraj (B.Tech. Batch of 2023)

Sonochemistry is the unique area to study the application of ultrasound for the intensification of various chemical processes in chemical industries. The cavitation process generated by ultrasound waves of frequencies ≥ 20 kHz propagate through a medium, inducing pressure variations and cavitations. The cavities grow until a threshold value and then collapse, transforming the acoustic waves into mechanical energy. When these cavities or bubbles collapse, they form regions of instantaneous high temperature (1000- 5,000 K) and pressures (100 - 1000 bar) that favour reaction chemistry, enhance mass transfer, and improve interphase mixing (1). The instantaneous nature of these extreme conditions makes ultrasonication superior to other related processes as it requires lower operating pressure and temperature conditions.

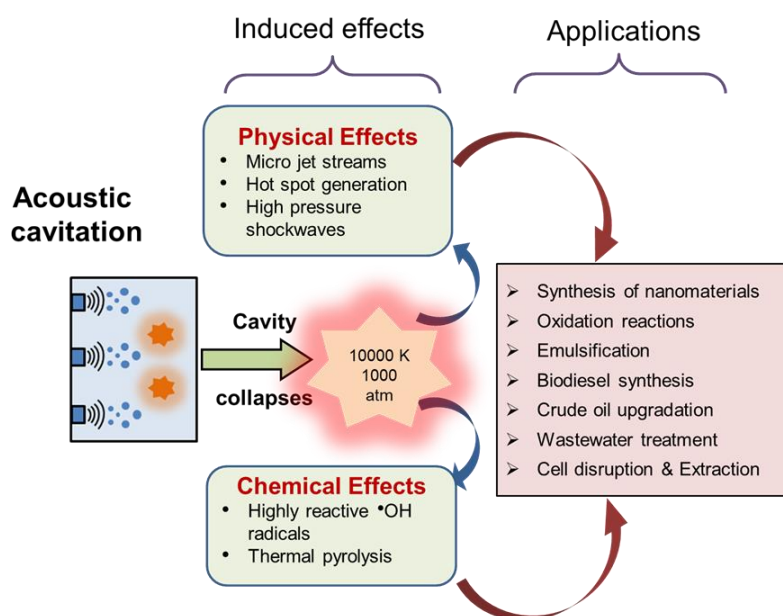


Fig.1: Overview of ultrasonication, its effects and applications

Sonochemistry have recently become popular in numerous industrial processes. An example of this advantage lies in the use of ultrasonication in the petroleum industry. In order to upgrade petroleum residue, conventional methods such as thermal and catalytic cracking are used. These processes require extremely high temperatures of the range of 400 to 500°C. However, with ultrasound and its principle of acoustic cavitation, the cracking of heavier hydrocarbons can be done at ambient conditions and may be without the catalyst (1).

Ultrasonic irradiation is a novel approach for depolymerisation as the intense frequencies result in the splitting of chemical bonds and thus, a reduction in molecular weight and in viscosity of polymeric solution (2). Ultrasonically induced emulsification has been well explored as a technique for producing highly stable food- and pharmaceutical-grade emulsions with long shelf lives (3). Such emulsions have been studied for their physicochemical stability, as well as their ability to encapsulate drugs for controlled and targeted release (4).

Researchers have also suggested the use of ultrasonication for the synthesis of biodiesel from waste cooking oil (5). Ultrasonication has ability to dissipate the cavitation energy at the molecular level and directly at the interface of the two immiscible liquid layers. In the liquid-liquid system, the mechanical effects of cavitation enhance the mass transfer rate which increases the overall reaction rates and therefore a higher yield is obtained.

Similarly, ultrasound-assisted extraction has been used as an alternative technique in various applications, from the extraction of seed oil and antioxidants in plants, to the extraction of metal ions from e-wastes (6).

From wastewater treatment to applications in soil and sediment remediation, sonochemistry can play a significant role in sub-fields of chemical engineering, enhancing reactions, affecting properties, and altering characteristics of solutions and samples (7). Overall, ultrasonication is a cost effective approach in the advancement of Green Chemistry.

References:

1. Sawarkar, Ashish N., et al. "Use of ultrasound in petroleum residue upgradation." The Journal of Chemical Engineering 87.3 (2009): 329-342.
2. Gogate, Parag R., and Amrutlal L. Prajapat. "Depolymerization using sonochemical reactors: A critical review." Ultrasonics sonochemistry 27 (2015): 480-494.
3. McClements, David Julian. Food emulsions: principles, practices, and techniques. CRC press, 2004.
4. Carpenter, Jitendra, Suja George, and Virendra Kumar Saharan. "Curcumin encapsulation in multilayer oil-in-water emulsion: synthesis using ultrasonication and studies on stability and antioxidant and release activities." Langmuir 35.33 (2019): 10866-10876.
5. Bargole, Swapnil, et al. "Process intensification of synthesis of biodiesel using a novel recirculating flow ultrasonication reactor." Chemical Engineering and Processing: Process Intensification 122 (2017): 21-30.
6. Jadhav, Ananda J., et al. "Acoustic cavitation as a novel approach for extraction of oil from waste date seeds." ACS Sustainable Chemistry & Engineering 4.8 (2016): 4256-4263.
7. Chatel, Gregory. Sonochemistry: new opportunities for green chemistry. World Scientific Publishing Company, 2016.

GREEN SOLVENTS: TRANSFORMING CHEMICAL PROCESSES IN SUSTAINABLE WAY

Adyasha Kar (B.Tech. Batch of 2024)

Solvents play an integral role in chemical industries in regulating the eco-friendliness of chemical processes and cost, health, and safety concerns. Recently significant importance for the development of sustainable chemistry has gained momentum, leading to the search for sustainable alternatives to the toxic chemicals used by industries. Green solvents are the preferred feasible solution to replace harmful solvents used by the chemical industry and encourage a greener manufacturing approach.

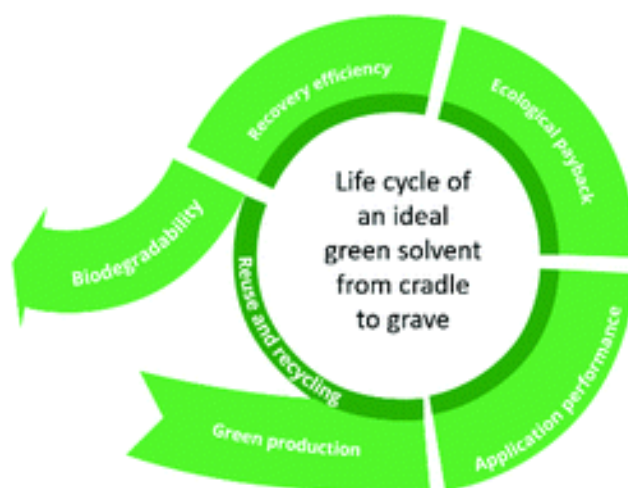
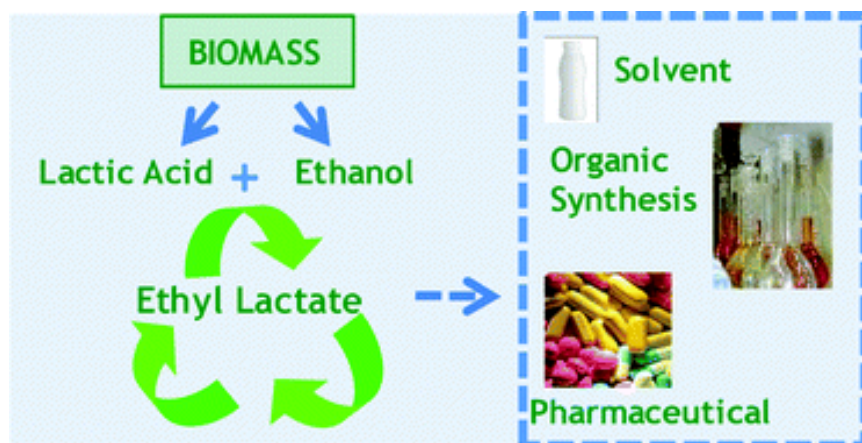


Fig. 1: Life cycle of green solvent

Green solvents/ bio-solvents are environmentally friendly and created as a sustainable substitute for conventional petrochemical solvents, emphasising to reduce environmental impact. These solvents are selected based on their unique properties and suitability for specific applications.



Following green solvents are used in industries that offer specific properties concerning the process. Supercritical carbon dioxide (scCO₂), a non-toxic and abundant byproduct of industrial processes, is widely used to selectively extract active pharmaceutical ingredients (APIs). Water, known for its excellent dissolving capabilities, finds applications in skin care

Fig. 2: Processing of Ethyl Lactate from Biomass

products, cosmetics, industrial cleaning, and degreasing. Ionic liquids offer stability and versatility as green solvents. Bio-based solvents like Ethyl lactate, derived from corn processing, are biodegradable and commonly used in paints and coatings. Green solvents also play a significant role in pesticide formulation, providing efficient products with reduced environmental impact.

Green solvents and adherence to green chemistry principles support various Sustainable Development Goals, such as ensuring clean water and sanitation, providing affordable and clean energy, promoting responsible consumption and production, and taking action on climate change. These joint efforts can lead to a more sustainable future by balancing economic growth with environmental stewardship and safeguarding the welfare of current and future generations.

References

1. Nanda, B., Sailaja, M., Mohapatra, P., Pradhan, R., & Nanda, B. B. (2021). Green solvents: A suitable alternative for sustainable chemistry. *Materials Today: Proceedings*, 47, 1234-1240. <https://doi.org/10.1016/j.matpr.2021.06.458>
2. Doble, M., & Kruthiventi, A. K. (2007). Alternate Solvents. *Green Chemistry and Engineering*, 93-104. <https://doi.org/10.1016/B978-012372532-5/50006-7>
3. Musarurwa, H., & Tavengwa, N. T. (2021). Emerging green solvents and their applications during pesticide analysis in food and environmental samples. *Talanta*, 223, 121507. <https://doi.org/10.1016/j.talanta.2020.121507>

Figures

1. Hessel, V., Tran, N. N., Asrami, M. R., Tran, Q. D., Van Duc Long, N., Escribà-Gelonch, M., ... Sundmacher, K. (2022). Sustainability of green solvents – review and perspective. *Green Chemistry*, 24(2), 410–437. doi:10.1039/d1gc03662a
2. Pereira, C. S., Silva, V. M., & Rodrigues, A. E. (2011). Ethyl lactate as a solvent: Properties, applications and Production Processes – A Review. *Green Chemistry*, 13(10), 2658.

Department Events

CHEMIGNITE-2023

A National Symposium Chemignite-2023 was jointly organized by the chemical engineering department, MIT, Manipal, in association with the Student Chapter of the Indian Institute of Chemical Engineers (IIChE), MIT, Manipal, on March 3rd and 4th, 2023. It was jointly sponsored by ONGC-MRPL Ltd and IIChE Mangalore Regional Centre. The event featured various competitions and events such as guest lectures, Prof. P.K. Karanth memorial quiz, and paper presentations, providing a platform for students to showcase their skills and knowledge.

Inaugral of Chemignite & Prof. P K Karanth memorial quiz

The symposium started with an inauguration function, followed by a keynote speech by Dr. Sathyanarayana Gummadi, a professor from IIT, Madras. As a part of the event, a technical paper presentation, Professor P K Karanth memorial quiz competition and invited guest lectures were organized.

In the technical paper presentation category, there were nine teams coming from MIT, adjacent colleges and Tamil Nadu. The Prof P K Karanth memorial quiz competition saw keen participation with thirty-one students competing.

The organizing Secretary of CHEMIGNITE - 2023, and HOD of Chemical Engineering Dr Balakrishna Prabhu, welcomed the gathering. Mr. Aakhash, the student secretary of IIChE Student Chapter presented the annual report of the chapter activities for the previous year. Dr Gautham Jeppu, the convenor of Chemignite-2023 and the faculty advisor of the IIChE Student Chapter proposed the vote of thanks.

During the event, four distinguished guest speakers enlightened the participants on many current and emerging topics of chemical engineering. On 3rd March, Prof Sathyanarayana Gummadi from IIT Madras spoke during his keynote address on the topic of "Trends in Chemical Engineering".



Presidential remarks by Dr Somashekara Bhat



Keynote speech at Chemignite'2023 by Prof. Sathyanarayana Gummadi



Prof. P.K.Karant memorial quiz

On 4th March, guest lectures from three distinguished speakers were delivered. Mr P.V.R. Sathish, Dy. General Manager, IOCL, Mumbai, spoke on topic "Petroleum Industry - An Outlook". Dr Himanshu Goyal, Assistant Professor, IIT Madras delivered a lecture on "Scientific Computing in Chemical Engineering" and Prof. M. B. Saidutta, NITK, Surathkal delivered lecture on "Chemical Engineering: the enabling discipline for a better future".



In accordance with the theme of the symposium, "Chemical Engineering in the 21st Century", the distinguished speakers touched upon some of the burning issues faced by the world related to sustainability, energy, health, water, environment, food, and others. They outlined how chemical engineering was uniquely positioned to solve many of the challenges of this century.

During the valedictory function held on 4th March, Prof. M. B. Saidutta, Professor, NITK Surathkal was the chief guest and the function was graced by the Director, MIT Manipal, Cdr Dr Anil Rana as the President.



Dr. M.B. Dutta guest of Valedictory

During the valedictory function, prizes were distributed to the winners of technical paper presentation and Prof. P. K. Karanth memorial quiz competition. The event witnessed excellent interest and participation from students during all sessions.

In the technical paper presentation category, the following were the prize winners: Ist prize - Akshatha (MIT Manipal), IInd prize - Ramyashree M S (MIT Manipal), IIIrd prize - Saksham Mamtani (MIT Manipal); Manthan Ravindra Mohite (Kongu College, Tamil Nadu) and Pranav Balaji K (NITK Surathkal) were awarded consolation prizes. In the Prof. P. K. Karanth memorial quiz competition, Sivasubramani S, Shodhan T Shetty and Samridh Bag, all from MIT Manipal secured prizes.

The event was concluded with a valedictory function, where the winners of various competitions were announced. The Director of MIT Manipal, Cdr. (Dr.) Anil Rana, distributed the prizes and motivated the young budding Chemical Engineers in the audience with a few words. The HOD of Chemical Engineering Department, Dr. K. Balakrishna Prabhu, delivered the vote of thanks. The symposium was a grand success, providing a platform for students from various colleges to showcase their technical skills and learn from experts in the field.



Cdr. (Dr.) Anil Rana at Valedictory function



1



Guest Lectures

Dr Anil Kumar Sinha, Senior Principal Scientist, Head, Biofuels Division, CSIR-Indian Institute of Petroleum (IIP), Dehradun delivered a lecture on topic "Drop-in Liquid Sustainable Aviation and automotive Fuels" on 09-02-2023

Prof (Dr) Leon Ittiachen, Director of the Sahrdaya College of Engineering and Technology, Thrisur. Adjunct Professor, Alumnus of 1994 MIT Chemical Eng Department, delivered lectures on 12-05-2023 on topic "Translational Research: Stages in Putting a relevant research project idea together" and topic: Cellulosic Ethanol for Fuel Blending: "The Answer to India's Oil Crisis?"



Dr. Leon Ittiachen was presented memento by Dr Krishna Bandaru

New Faculty Addition



Dr. Ranjeet Kumar Mishra
Associate Professor-Research

Education: PhD in Chemical Engineering, Indian Institute of Technology Guwahati (IITG), Assam, India

Previous Employment: MS Ramaiah Institute of Institute, Bengaluru, India.

Research Interest: Biomass and Bioenergy, Biofuel, Biochar, Carbon sequestration, Waste Management, thermochemical process (Hydrothermal Liquefaction, and Pyrolysis), Plunging Jets, Water and Wastewater treatment.

Awards: Won the 2018, and 2021-2022 Bioresource Technology Award for Highly Cited Research Article from Journal of Bioresource Technology (Elsevier). Received "Young Scientist International Travel Award" from SERB for attending 2nd International Conference organized by Elsevier on BIORECTEC2018 on September 16-19, 2018, at Sitges, Spain.

Native Place: Basti, Uttar Pradesh.

Industrial Visit Report – May 2nd, 2023

The IChE Manipal Student Chapter organized an industrial visit for the VI semester Chemical Engineering students on May 2nd, 2023. Thirty-six students participated in the visit to three establishments:

- Western India Chemicals in Hangarakatta, a renowned manufacturer and supplier of formaldehyde. Students learned about formaldehyde production, its applications, and safety measures.
- Janatha Fish Meal and Oil Products in Kota, a fish meal industry. Students observed the entire fish processing and production cycle, including handling, cooking, drying, and packaging.
- KMF Nandhini, a milk packaging and products company at Uppoor. Students gained insights into milk processing, pasteurization, homogenization, and modern packaging techniques.



Western India Chemicals explaining students the process of formaldehyde production

The visit enhanced practical knowledge and provided exposure to different industries.



IChE Student Chapter

IChE Board Transfer

On February 27, 2023, the new board of the IICHE Manipal Student Chapter successfully organized the "Board Transfer" event at Sir M.V Seminar Hall. The event was attended by Dr. Balakrishna Prabhu, the HOD of the Chemical Engineering Department, and Dr. Gautham Jeppu, a faculty advisor of the club.

The event began with the general secretary of the outgoing board presenting an annual report of all the events conducted during her tenure. The report highlighted the achievements and challenges faced by the club during the previous year. The outgoing board members were recognized for their contributions and dedication to the club.

Overall, the event was a success, and the new board members demonstrated their organizational skills and enthusiasm to take the club to new heights.



UPCOMING EVENT

**A National Level Conference
on
Advanced Materials for Environmental Sustainability (AMES - 2023)
12th & 13th October 2023.**

The Department of Chemical Engineering, MIT, Manipal is organizing a **Two-day National Level Conference on Advanced Materials for Environmental Sustainability-AMES-2023 from 12th – 13th October 2023**. This conference is intended to provide an opportunity for the participants in promoting discussions and collaborations to enhance and widen the knowledge of advanced materials research for environmental applications and surge innovation for the technological needs in this field. The conference covers a broad spectrum of materials science research like functional materials, synthesis and processing, theoretical analyses, and characterization, properties and the functions of all types of materials. The conference provides a platform for discussing all aspects of advanced materials, exchanging ideas, fostering collaborations, and building new networks. The conference boasts exceptional keynote speakers who will explore the fascinating elements of advanced materials for environmental applications. Keynote speeches, oral presentations, poster sessions, and discussion forums constitute the scientific gathering. This presents an excellent opportunity to showcase your research findings to a broad audience and facilitate information sharing.

Keynote Speakers

S.No	Name	Affiliation
1	Dr. Nitin Labhsetwar	Chief Scientist & Head, ERMD Division NEERI
2	Dr. Vidya Shetty	Dean (Academics), Professor, Department of Chemical Engineering, NITK, Surathkal
3	Dr. K Ganapathy Ayappa	Professor, Department of Chemical Engineering, IISc
4	Dr. T S Viswanathan	Technical Facilitator- Services Division, Ion Exchange (India) Ltd
5	Mr. Vishnu Sharma	Director, Aapaavani Environmental Solutions Pvt Ltd

The website for the conference: <https://conference.manipal.edu/AMES2023/>

Faculty Achievements

Grants Awarded to Faculty



Dr. Shanmugh Priya, (Principal Investigator) Additional Professor, Department of Chemical Engineering, received research grant in the year 2023 of Rs 40 lakhs for a period of 2 years from VGST, Govt of Karnataka for establishment of Centre of Excellence in solar fuels for the project titled "Development of low cost and bio-based MOF for photocatalytic reduction of carbon dioxide to solar fuels".



Dr. Nethaji S., Assistant Professor-Selection grade, as Principal Investigator I and Dr. Harshini Dasari, Associate Professor, (Co- Principal Investigator) Department of Chemical Engineering, received a project funding in the year 2023 of Rs 2.5 lakhs from VGST for the research project titled "Development of metal-oxide-based nanocomposites for the adsorption and oxidation of asphaltenes and valorization of the adsorbed asphaltenes into value-added products".

Faculty Sports Achievements

Our faculty have participated in various sports events and won trophies. Following are few glimpses of their achievements.



Dr Lavanya receiving trophy



MIT Women team receiving trophies

MIT-MSAP-Faculty Cricket CUP 2023

MIT-MSAP- Faculty Cricket CUP 2023 Tournament for staff was conducted on 5th March, 2023 at MIT cricket ground. The tournament was played among 8 teams. The final match of the tournament was played between teams Chemical Sciences and Electrical streams and the team Chemical Sciences which includes faculty members from Chemical Engineering, Biotechnology, Physics and Chemistry were the title winners.



Chemical Sciences cricket team with winning trophies



Chemical Sciences cricket team receiving the trophy

Student Achievements

Devangshi Debraj, B. Tech. Batch of 2023

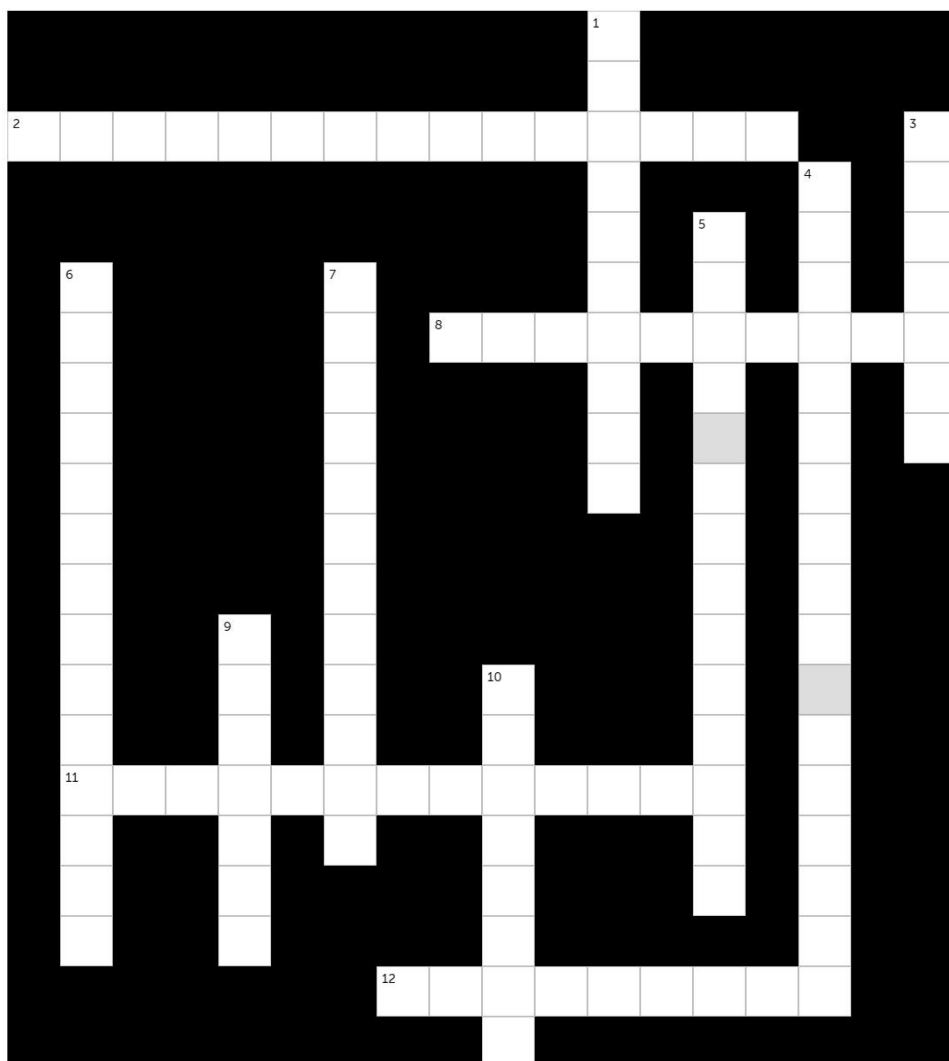
Devangshi presented a poster on "Synthesis of Oil-in-Water Nanoemulsions using Ultrasonication - Evaluation of Physical and Oxidative Stability" at Manipal Research Colloquium, Manipal, under the Technical Sciences category during April 12-14, 2023.

Mahima Ganguly, M. Tech. Batch of 2023

Mahima presented a paper on "A Critical Review on Ultrasound-assisted Oil-in-water Emulsification: Insights into the Formation, Stabilities of Emulsion, and Limitations" at Manipal Research Colloquium, Manipal, under the Technical Sciences category during April 12-14, 2023.

Fun Zone

CROSS WORD PUZZLE



Down:-

1. A process in which molecules or ions from a fluid are attracted and adhere to the surface of a solid material, creating a layer or film.
3. The flow regime characterized by smooth, orderly fluid motion with parallel layers.
4. The minimum energy required for a reaction to occur
5. A device used to transfer heat between two fluids at different temperatures.
6. The enchanting alchemy of fats and lye, a soap-making dance under the sky. When they merge, in a reaction grand, glycerol and soap take a stand. What am I?

7. The process of separating components of a mixture based on their boiling points.
9. In the puzzle of disorder, I hold the key, a measure of randomness, you'll surely see.
10. A substance that increases the rate of a chemical reaction without being consumed itself.

Across:-

2. The branch of thermodynamics that deals with the relationships between heat, work, and chemical reactions.
8. Like a sorcerer's spell, I work unseen, removing particles, so surfaces gleam. Through sieves and meshes, my secrets unfold, purifying mixtures with magic untold. What am I?
11. A polymer that is obtained by irreversibly hardening ("curing") a soft solid or viscous liquid prepolymer.
12. The measure of a fluid's resistance to flow.

SOLVE THE CASE STUDY

You are tasked with designing a chemical process for the production of a specialty biodegradable polymer used in various industries - Polylactic Acid (PLA), including packaging, agriculture, and biomedical applications. The specialty polymer is currently produced using conventional petrochemical-based methods that generate significant waste and environmental pollution.

In your response, outline your proposed process, starting from the selection of suitable raw materials (e.g., plant-derived feedstocks, biomass, or waste materials). Explain how your design ensures minimal waste generation, reduces energy consumption, and achieves a closed-loop circular economy approach.

Send your response to tempus.chemical@manipal.edu

CROSS WORD PUZZLE ANSWERS

Down		Across
1. Adsorption	2. Thermochemistry	
3. Laminar	8. Filtration	
4. Activation Energy	11. Thermosetting	
5. Heat Exchanger	12. Viscosity	
6. Saponification		
7. Distillation		
9. Entropy		
10. Catalyst		

Alumni Reminiscences

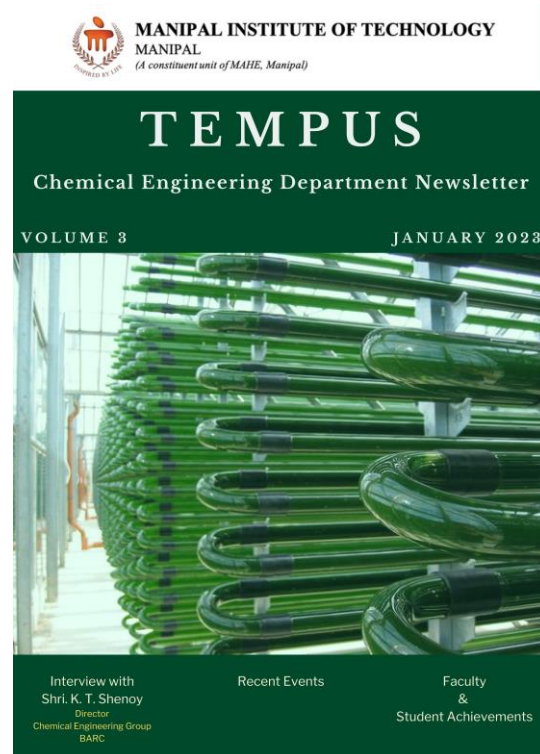
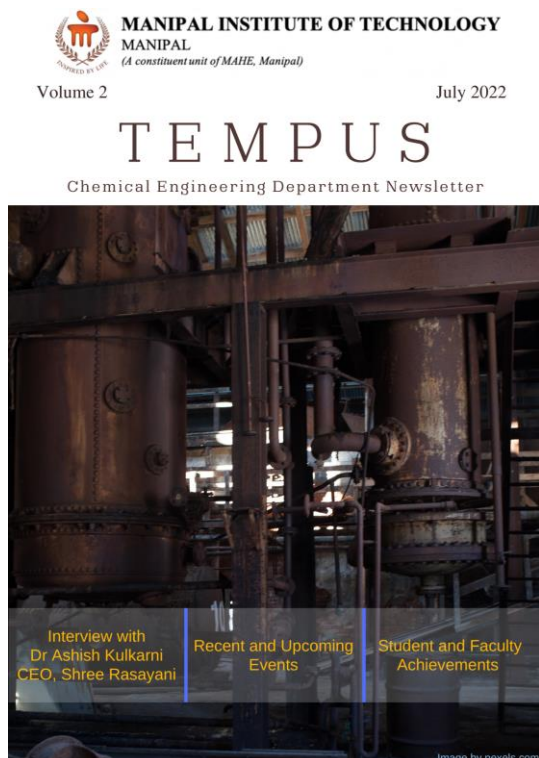
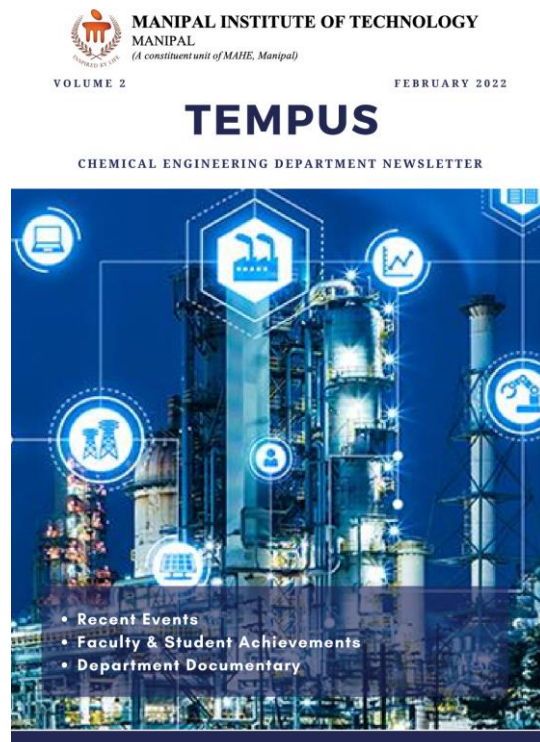
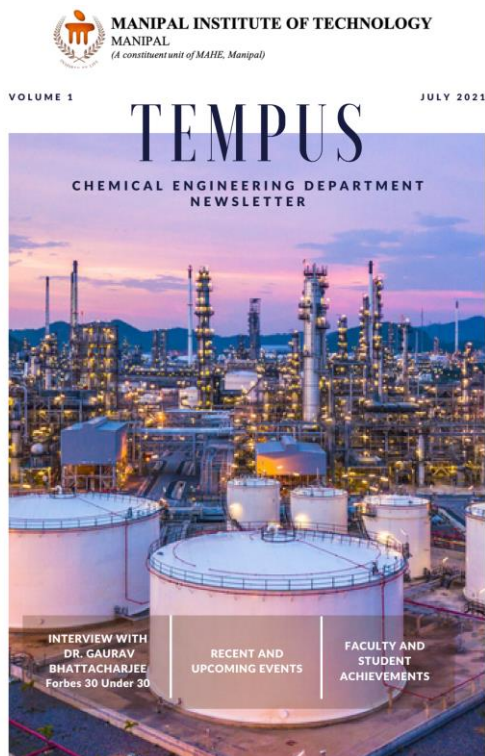
Here comes a fantastic opportunity for our MIT alumni. Pen down your best memories, thoughts, lessons, and experiences you have had on our campus in your college days and get them published in our next Tempus issue! Hoping to read the mind-boggling stories and epic pictures



<https://forms.office.com/r/rS8rY7SWf3>

TEMPUS Archives

Take a deep-dive into our previous edition [here!](#)



Editorial Board



Dr Muddu Madakyaru



Dr Srikanth Divi



Dr Jitendra Carpenter



Nabhanya Chouhan



Devangshi Debraj



Koena Maji



Adyasha Kar



Aditya Gupta



Dhruv Agarwal



Kushaan Choksi



Kriti Rustagi



Chinmay Kulkarni

Advisory Board

Mr. Bharat Muralidharan

Graduate of 2011 Batch, B.Tech. Chemical Engineering, MIT, Manipal.

M. S. Chemical Engineering, Rutgers University

Strategy Consultant – Deloitte USA

Dr. Oishi Sanyal

Graduate of 2011 Batch, B.Tech. Chemical Engineering, MIT, Manipal.

Assistant Professor, Department of Chemical and Biomedical Engineering, West Virginia University, USA

Dr Madhuwanthi Buddhadasa

Graduate of 2012 Batch, B.Tech. Chemical Engineering, MIT, Manipal.

Postdoctoral Researcher, ChemSIN, Universite Libre de Bruxelles, Brussels, Belgium

Dr Ashish Kulkarni

Graduate of 1990 Batch, B.E. Chemical Engineering, MIT, Manipal, Mangalore University.

Ph.D., Leeds Univeristy, U.K.,

Dr Leon Ittiachen

Graduate of 1994 Batch, B.Tech. Chemical Engineering, MIT, Manipal.

(Adjunct Faculty, Dept. of Chemical Engineering, MIT, Manipal)

Director, Sahrada College of Engineering & Technology, Trichur, Kerala.

Mr. Sandeep Kattamuri

Graduate of 2005 Batch, B.Tech. Chemical Engineering, MIT, Manipal.

M.S Chemical Engineering – Stanford, 2007

Strategic Advisor, Social Entrepreneur, Student of Law



Department of Chemical Engineering, Manipal Institute of Technology,
Manipal, Karnataka, India - 576104.
Ph. No. +91 820 2924316 | Email Id: chemical@manipal.edu