



**K.K. Wagh Education Society's**

**K.K. Wagh Institute of Engineering Education and Research, Nashik.**

**Chemical Engineering Department**

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TECHNICAL NEWS LETTER

**January 2024 - June 2024**

The Department of Chemical Engineering was established in 1999 with the objective of creating a center of excellence in Chemical Engineering, with an annual intake of 60 students. The department has been accredited twice by the National Board of Accreditation (NBA), AICTE, New Delhi and got the NBA extension for 3 years from July 2022 to June 2025. The department boasts experienced faculty members with several years of academic expertise and veteran supporting staff with strong research interests in both conventional and emerging areas of Chemical Engineering. Emphasizing continuous knowledge enhancement, the department has been sponsoring faculty members for postgraduate and research programs in recent years. It is equipped with state-of-the-art infrastructure and laboratories designed to meet the requirements of the university syllabus. Additionally, the department has an adequate number of computers with the latest configurations and internet facilities. To support teaching and learning, the department provides advanced computational tools, including professional software such as UNISIM, DWSIM, BricsCAD, and MATLAB. It also maintains an in-house library with reference books for all subjects and a comprehensive Chemical Engineering encyclopedia. The department has an excellent track record of academic results. Students have secured top ranks in university examinations and achieved success in competitive exams such as GATE, GRE, and others. They have also been recruited by leading national and international Chemical industries. In addition to focusing on basic sciences and engineering subjects, the department encourages students to participate in various national events such as project exhibitions, paper presentations, model-making competitions, and sports activities. Association of Chemical Engineering Students (ACES), a student's association, functions in the department and provides a strong platform for overall development of the students. The students get a chance to interact in Seminars, Workshops, Cultural Programmes, Expert Lectures on various topics like Personality Development, Preparation for competitive examination, study abroad etc. through ACES. The department is proactive for good industry institute interaction. Department has signed MoUs with various industries for mutual benefit. Industry experts are regularly invited, and industrial visits are organized each year to bridge the gap between theory and practice. The department organizes internships for third-year students every year in various renowned industries in the region.

#### ■ Details of Faculty of Chemical Engineering:

S.N.	Name of Faculty	Qualification	Area of specialization	Designation
1.	Prof. Dr.Venkat S. Mane	Ph.D.	Chemical Engineering	Professor & H.O.D.
2.	Prof. Dr. Suyog N. Jain	Ph.D.	Chemical Engineering	Assistant Professor
3.	Prof. Vijay N. Mawal	Ph.D. Pursuing	Chemical Engineering	Assistant Professor
4.	Prof. Dr.Gaurav B.Daware	Ph.D.	Chemical Engineering	Assistant Professor
5.	Prof. Sandeep N. Derle	Ph.D. Pursuing	Chemical Engineering	Assistant Professor
6.	Prof. Piyush P. Joshi	M.Tech.	Chemical Engineering	Assistant Professor
7.	Prof. Zameer K. Deshmukh	M.Tech.	Chemical Engineering	Assistant Professor
8.	Prof. Tejmal B. Mahale	M.Tech.	Chemical Engineering	Assistant Professor
9.	Dr. Yennam Rajesh	Ph.D.	Chemical Engineering	Assistant Professor
10.	Dr. Neha B. Gautam	Ph.D.	Chemical Engineering	Assistant Professor
11.	Dr. Prashant Kumar	Ph.D.	Chemical Engineering	Assistant Professor
12.	Dr. Rajasekhar Ravula	Ph.D.	Chemical Engineering	Assistant Professor

#### ■ CHEMFEST 2K24

Department of Chemical Engineering organized a two-day online National Level Technical Symposium, CHEMFEST 2K24, on the 4<sup>th</sup> and 5<sup>th</sup> of April 2024. The program featured a variety of engaging activities, including technical paper presentations, a creative poster competition, an impressive Project-Expo, a challenging technical quiz, and lively cultural performances that highlighted the diverse talents of the participants. Dr. V.S. Mane, Head of the Chemical Engineering Department, delivered the welcome speech for the event, while Dr. Yennam Rajesh, ChemFest Coordinator, proposed the vote of thanks for the inaugural function. The ChemFest-2K24 was an excellent platform for promoting innovation, research, and collaboration in chemical engineering. The event began with an inspiring inaugural ceremony featuring Chief Guest Dr. V. G. Pangarkar, Retd. Professor, Department of Chemical Engineering, ICT Mumbai. The event was further enriched by the presence of respected judges from academia and industry: Dr. P. S. Bhandare, Head of the Department, Chemical Engineering, K. K. Wagh Polytechnic College, Nashik; Mr. Chetan Khairnar from Graphite India, Nashik; Dr. Sharda Patil, Professor at K. K. Wagh Arts and Science Senior College; and Er. Ishwar Wagh from Graphite India, Nashik. The valedictory ceremony was honored by the presence of Mr. Sandip Deshmukh, Director of Delta Finochem Pvt. Ltd., whose participation added great value to the event. With over 400 students taking part, including 70 from other colleges, ChemFest-2K24 was a great success, encouraging learning, creativity, and technical excellence, and leaving a lasting impact on everyone involved.





### ■ Expert Lectures and Career Guidance Sessions Organized:

- Expert talk on "Process Intensification: Pathways to Innovation" was delivered by Er. Ishwar Pardersh, Manager, Graphite India Ltd., Nashik, on 5<sup>th</sup> April 2024.
- Expert talk on "Case studies of Solid Catalytic Reactions" was delivered by Dr. V. G. Pangarkar, Retd. Professor, Department of Chemical Engineering, ICT Mumbai, on 4<sup>th</sup> April 2024.
- Expert talk on "Piping Engineering" was delivered by Mr. Sadaphale, Asian Academy Pune, on 14<sup>th</sup> February 2024.
- Expert talk on "Abroad Education Guidance" was delivered by Ms. Shalini Menon, Unique Education and Migration Services India, on 12<sup>th</sup> February 2024.
- Expert talk on "Ethanol Dehydration" was delivered by Dr. V. G. Pangarkar, Retd. Professor, Department of Chemical Engineering, ICT Mumbai on 9<sup>th</sup> February 2024.
- Expert talk on "Entrepreneurship" was delivered by Dr. Ajay K. Goswami, HoD, Department of Chemical Engineering, UIC, NMU, Jalgaon, on 5<sup>th</sup> February 2024.
- Expert talk on "Global Cooling" was delivered by Mr. C. R. Mohikar, Petro-Project Consultant, Nashik, on 23<sup>rd</sup> January 2024.
- Expert talk on "Let's Talk Money" was delivered by Mr. Makrand Soman, Personal Finance Professional (PFP), Soman's Magnum Investment, Nashik, on 18<sup>th</sup> January 2024.

### ■ Training and Placements :

Sr. No.	Student Name	Name of Company
1	Miss Chawda Deesha Jayant	FinIQ Consulting Pvt. Ltd., Pune
2	Mr. Pardhi Ganesh Gajanan	Adani Group, Mumbai
3	Mr. Ghorpade Pravin Gajanan	
4	Mr. Brahmanekar Teckchand B.	
5	Mr. Deshmukh Varad Pravinrai	
6	Mr. Jadhav Vaibhav Somnath	JNK India Pvt. Ltd., Thane
7	Mr. Rajput Jaspal Karansing	SNF Flopam India Pvt. Ltd., Gandhidham
9	Miss Sali Astha Amar	Technip Energies, Noida
10	Miss Vidhate Tanuja Vijay	NOCIL Limited, Navi Mumbai
11	Miss Shinde Pooja Dipak	
12	Mr. Pardhi Ganesh Navnath	
13	Mr. Ghorpade Pravin Gajanan	
14	Mr. Bagul Bhushan Chhotu	Aarti Pharmed Lab Ltd., Tarapur
15	Mr. Walke Sunny Shivaji	
16	Mr. Valwe Sarvesh Nitin	
17	Miss Gole Sakshi Sunil	
18	Mr. Rathod Rahul Ganesh	
19	Mr. Lande Pratik Deepak	
20	Mr. Sanap Sagar Santosh	
21	Mr. Patil Yash Anil	
22	Mr. Wahule Adesh Kerba	
23	Mr. Kajale Pritam Dinkar	
24	Mr. Agrawal Krishna S	Lupin Ltd., Tarapur, Boisar
25	Mr. Birkhade Gaurav Vijay	
26	Mr. Shinde Aditya Pravin	
27	Mr. Malak Faek Nisar	
28	Mr. More Smita Ram	
29	Miss Nirgude Pragati Rajaram	

30	Mr. Ahire Vivek Dilip	Macleods Pharmaceuticals Ltd., Vapi
31	Mr. Bagul Bhushan Chhotu	
32	Mr. Patil Rakesh Rahul	
33	Mr. Malunekar Harshal B.	
34	Mr. Nagare Vinit Dnyaneshwar	
35	Mr. Wahule Adesh Kerba	Emerson Measurement Systems and Solutions Pvt. Ltd., Pune
36	Mr. Walke Sunny Shivaji	
37	Mr. Kale Saurabh Dagadu	
38	Mr. Deore Kundan Manohar	Federal Bank Ltd.
39	Miss Upasani Tanaya Hemant	
40	Mr. Shende Kalpak Vijay	DMCC Speciality Chemicals Limited, Roha
41	Mr. Barahate Rahul Shankarrao	
42	Mr. Pardeshi Pratik Narendra	Chemisight Consulting, Thane
43	Mr. Bairagi Shrikant Manoj	
44	Mr. Shinde Omkar Arun	
45	Ms. Singh Nidhi Avnishkumar	Singhania System Technologists Pvt Ltd., Mumbai
46	Mr. Valwe Sarvesh Nitin	
47	Mr. Joil Omkar Milind	Orchid Polycoats, Musalgaon MIDC, Sinnar, Nashik
48	Mr. Kharche Vishvesh D.	

### ■ Industrial Visits :

S.No.	Class	Name of Industry	Date
1.	SY	Abelin Polymers, Nashik	13/03/2024
2.		Sewage Treatment Plant, Tapovan	02/02/2024
3.	TE	Delta Finchem Private Limited, Nashik	13/03/2024
4.		Kadwa Sahakari Sakhar Karkhana Materewadi, Dindori.	04/03/2024
5.	BE	Sewage Treatment Plant, Tapovan	16/03/2024

### ■ FDP/ Workshop/STTP attended by Faculty:

- Dr. Prashant Kumar successfully attended an online master class on "Teaching Gen Z Using Generative AI" on 13<sup>th</sup> April 2024.
- Prof. P. P. Joshi successfully participated in a three-day Face-to-Face FDP on the theme "Inculcating Universal Human Values in Technical Education" organized by Karmaveer Kakasaheb Wagh Polytechnic, Nashik from 4<sup>th</sup> to 6<sup>th</sup> April 2024.
- Prof. P. P. Joshi successfully attended an FDP on "Green Horizon: Advancement in Environmental Engineering" (five days), organized by Sinhgad College of Engineering, Pune from 1<sup>st</sup> to 5<sup>th</sup> April 2024.
- Prof. V. N. Mawal and Prof. P. P. Joshi successfully completed a course on "Complete Personal Development & Personal Transformation" on 27<sup>th</sup> March 2024 on Udemy (29 hours).
- Dr. Yennam Rajesh and Dr. N. B. Gautam successfully attended a workshop on "AI Tools for Teaching and Research" on 18<sup>th</sup> March 2024, conducted online by DIGISKILL CENTER, ACT Academy, Kerala.
- Dr. G. B. Daware successfully completed a course on "Personal Development & Personal Transformation" on 18<sup>th</sup> March 2024 on Udemy (29 hours).
- Dr. G. B. Daware successfully completed a course on "Workplace Communication: You Can Speak Up at Meetings" on 16<sup>th</sup> March 2024 on Udemy (29 hours).
- Prof. V. N. Mawal successfully completed a course on "Personal Development & Personal Transformation" on 14<sup>th</sup> March 2024 on Udemy (29 hours).

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- Prof. S. N. Derle successfully participated in an FDP on "CFD Using ANSYS Fluent and Multi-body Dynamics" from 13<sup>th</sup> to 17<sup>th</sup> March 2024 at KKWIEER, Nashik.
- Dr. S. N. Jain and Prof. P. P. Joshi successfully completed a course on "Personal Development & Personal Transformation" on 12<sup>th</sup> March 2024 on Udemy (29 hours).
- Prof. P. P. Joshi successfully participated in an IP Awareness/Training Program on 5<sup>th</sup> March 2024, organized by National Intellectual Property, GOI.
- Dr. Prashant Kumar successfully participated in a one-week Faculty Development Programme on "Online Short-Term Course on AI/ML and Data Science for Industry 4.0 (Advanced Level)", conducted by the National Institute of Technical Teachers Training & Research, Chandigarh from 26<sup>th</sup> February to 1<sup>st</sup> March 2024.
- Dr. N. B. Gautam successfully attended a workshop on "Vedic Mathematics and Advanced Applications", organized by DIGISKILLS CENTER, ACT Academy, Kerala from 23<sup>rd</sup> to 27<sup>th</sup> February 2024.
- Prof. V. N. Mawal, Dr. G. B. Daware, and Prof. P. P. Joshi successfully participated in a Faculty Development Program on "Process Intensification in Chemical Engineering", organized by Vishwakarma Institute of Technology, Pune from 5<sup>th</sup> to 9<sup>th</sup> February 2024.
- Dr. Prashant Kumar successfully participated in an eight-week Faculty Development Programme on "Enhancing Soft Skills and Personality" conducted by NPTEL from 1<sup>st</sup> February to 14<sup>th</sup> April 2024.
- Dr. Ravula Rajasekhar successfully participated in a one-week online FDP on "Empowering Educators: AI Tools for Engineering and Technology" (AITET-2024) from 29<sup>th</sup> January to 2<sup>nd</sup> February 2024.
- Prof. S. N. Derle, Prof. P. P. Joshi, Dr. Prashant Kumar, and Dr. Ravula Rajasekhar successfully participated in a one-week online FDP on "Current Science and Developments in Nanobiotechnology", organized by Department of Biotechnology, Chaitanya Bharathi Institute of Technology, Gandipet, Hyderabad from 29<sup>th</sup> January to 2<sup>nd</sup> February 2024.
- Dr. Prashant Kumar successfully attended a three-webinar series on "Soft Skills for Success" from 28<sup>th</sup> January to 25<sup>th</sup> February 2024.
- Dr. S. N. Jain successfully completed industrial training at SVAAR Process Solutions Pvt. Ltd. Nashik from 20<sup>th</sup> January to 3<sup>rd</sup> February 2024.

■ **Papers Presented in Conference by Staff and students :**

**Title of Paper:** Remediation of Pollutants from Wastewater Using Batch Study

**Name of Conference:** National Conference on Advance design and optimization techniques in Engineering applications, NIT Jalandhar, Punjab

**Names of Authors:** Dr. S. N. Jain, Tanaya Upasani and Abhishek Kavhar

**Date of Conference:** 5<sup>th</sup> to 6<sup>th</sup> April 2024

**Abstract:** The present study focuses on the removal of

pollutants from wastewater. The pollutant selected in the present work is an Acid Green 25 dye. Dyes have adverse effects on the ecosystem and hence required to be removed from the industrial wastewater before discharge into the water bodies. Amongst the various available techniques for wastewater treatment, the adsorption approach is applied in the present work due to its versatile advantages. The adsorbent in the present work is synthesized from Parthenium Hysterophorous, a solid waste. Adsorption experiments are conducted in batch mode to study the effect of pH, adsorbent dose, contact time, concentration, and temperature on Acid Green 25 removal. Kinetic studies are performed in the 50 to 200 mg/L of Acid Green 25 concentration. Based on the performed experiments, Acid Green 25 removal was noted to be 94.33% at optimum conditions of pH 2, adsorbent dose of 0.125 gm, and contact time of 90 minutes for 100 mg/L of Acid Green 25 concentration. Isotherm studies are performed in the temperature range of 278 to 323 K. Better removal was noted at the higher temperature, which confirmed the endothermic nature of the adsorption. Artificial Neural Network modeling using the MATLAB simulation technique is applied to determine various adsorption parameters after performing experiments. The objective of the present work is thus to synthesize adsorbent from the solid waste of Parthenium Hysterophorous and its subsequent application for Acid Green 25 remediation from the wastewater followed by simulation studies.

■ **Title of Paper:** Synthesis of dhoop from orange peels

**Name of Conference:** International Chemical Engineering Conference-Prakalp-2024, MIT Alandi Pune

**Names of Authors:** Dr. Yennam Rajesh, Shradha Pansare and Himani Chaudhari

**Date of Conference:** 12<sup>th</sup> to 13<sup>th</sup> March 2024

**Abstract:** The utilization of fruit waste for sustainable product development is gaining significance in the field of green chemistry. This study focuses on the synthesis of eco-friendly dhoop (incense) using orange peels, a rich source of essential oils and natural bioactive compounds. The process involves drying, grinding, and blending the peels with natural binders such as cow dung, wood powder, or gum resin to enhance combustion and aroma. The prepared dhoop exhibits pleasant citrus fragrance, antimicrobial properties, and minimal smoke emission, making it an excellent alternative to synthetic incense sticks, which often contain harmful chemicals. This innovation not only promotes waste valorization but also contributes to sustainable environmental practices by reducing agricultural waste. The study further evaluates the burning time, fragrance retention, and air-purifying properties of the formulated dhoop. The findings suggest that orange peel-based dhoop can serve as a natural, biodegradable, and eco-friendly incense alternative with commercial potential. excellent selectivity.

■ **Title of Paper:** Comparative study of fiber synthesis using sisal and banana

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**Name of Conference:** International Chemical Engineering Conference-Prakalp-2024, MIT Alandi, Pune

**Names of Authors:** Dr. Yennam Rajesh, Jai Shah and Saloni Panchal

**Date of Conference:** 12<sup>th</sup> to 13<sup>th</sup> March 2024

**Abstract:** Natural fibers have received a lot of coverage as reinforcements in polymer matrix composites. Out of all the reinforcing fibers, hybrid composites made of natural fibers have been attracting the attention of researchers as high-potential reinforcement materials for composite materials. These fibers are easily available as agriculture-based products. Natural fibers are low cost, bio-degradable, sustainable, and lightweight materials for composite applications. In this experimental work, banana pith and sugar palm fibers were used as reinforcement in different ratios to fabricate hybrid composites by the compression moulding technique while maintaining a total fiber loading of 30wt%. Tensile tests using a UTM INSTRON machine, flexural tests using a UTM DTRX machine, impact tests using an IZOD IMPACT D256 machine were conducted, and water absorption was also determined. The obtained results show that the composite made of a banana pith 20% and sugar cane fiber 10% combination exhibits better tensile properties with a stress value of 6.67 N/mm<sup>2</sup>, and an Izod impact value of 42.461J/m. While the composite with a banana pith 10% and sugar cane fiber 20% showed a better flexural stress value of 67.29N/mm<sup>2</sup>, the water absorption test was carried out for four days with a 96-hour analysis. This research addresses that specimen-2 with banana pith 20% and sugar cane fiber 10% absorbs less water compared to other composites.

- **Title of Paper:** Plant Design and optimization for production of Benzoic acid from PTA

**Name of Conference:** International Chemical Engineering Conference-Prakalp-2024, MIT Alandi, Pune

**Names of Authors:** Dr. G. B. Daware, Rahul Rathod and Krishna Agrawal

**Date of Conference:** 12<sup>th</sup> to 13<sup>th</sup> March 2024

**Abstract:** The production of benzoic acid, a versatile aromatic compound with numerous industrial applications, holds significant importance in the chemical manufacturing sector. This project aims to develop a comprehensive plant design and optimization strategy for the efficient production of benzoic acid from purified terephthalic acid (PTA) residue, a by-product generated during the production of polyethylene terephthalate (PET). The plant design phase involves the development of a process flow diagram (PFD) and a piping and instrumentation diagram (P&ID) that outline the various unit operations and equipment required for the benzoic acid production process. Reactor design, separation methods, heat exchanger selection, and waste management strategies are integrated into the design, ensuring a well-rounded and sustainable production process. The optimization aspect of the project employs process simulation software to model and analyze the proposed plant design. Through iterative simulations and sensitivity analyses, various operational parameters are adjusted to maximize product yield, minimize energy consumption, and reduce waste generation. The optimization process also

takes into account economic considerations, including capital and operating costs, to ensure the feasibility and economic viability of the designed plant. In conclusion, this project presents a holistic approach to the design and optimization of a benzoic acid production plant using PTA residue as a feedstock. By integrating chemical engineering principles, process simulation, and economic and environmental assessments, the project aims to provide a comprehensive framework for the efficient and sustainable production of benzoic acid, contributing to the circular economy and advancing the field of chemical process engineering.

- **Title of Paper:** Bioplastic from Biomass Based Substrate

**Name of Conference:** International Chemical Engineering Conference-Prakalp-2024, MIT Alandi, Pune

**Names of Authors:** Dr. S. N. Jain, Akshay Deore and Gaurav Chavan

**Date of Conference:** 12<sup>th</sup> to 13<sup>th</sup> March 2024

**Abstract:** The market for biodegradable bioplastic has experienced a recent upsurge in demand. Bioplastic have a lower carbon footprint than traditional plastic, as they do not release harmful greenhouse gases during production. Although numerous biopolymers such as starch, honey, lime juice, etc., have been used to produce bioplastic, but the outcomes need more improvement to suit the different application. Plastics are mainly known for their properties such as tensile strength, transparency and decomposition period. Glycerol and sorbitol are the widely used chemical plasticizer because it has the best interaction ability compared to other plasticizer when combined with starches. In the present work, banana peels and similar agro/fruit waste will be used for the bioplastic production. The present study will improve the properties of the bioplastics. The proposed work will check the efficiency of aloe vera and honey, other alternatives as transparency or plasticizer combined with other possible raw material for producing the bioplastic. The objective of the proposed work is to create sustainable and environmental friendly approach for bioplastic production that can help to reduce the environmental plastic waste.

- **Title of Paper:** Bioethanol production from Water Polluting Water Hyacinth

**Name of Conference:** International Chemical Engineering Conference-Prakalp-2024, MIT Alandi, Pune

**Names of Authors:** Prof. P. P. Joshi

**Date of Conference:** 12<sup>th</sup> to 13<sup>th</sup> March 2024

**Abstract:** With industrial development growing rapidly, there is a need for environmentally sustainable energy sources. Ethanol from biomass, bioethanol, is an attractive, sustainable energy fuel source for transportation. Based on the premise that fuel bioethanol can contribute to a cleaner environment and with the implementation of environmental protection laws in many countries, demand for this fuel is increasing. Efficient ethanol production is based on optimized processes where utilization of cheap substrates is highly demanding. Utilization of different types of lignocellulosic materials can be considered for production of ethanol. Among various types of lignocellulosic substances water hyacinth (Eichhornia

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crassipes) is a potential resource available in many local regions. It is a noxious aquatic weed which grows fast. Thus, the bioconversion of water hyacinth to ethanol is required..

- **Title of Paper:** Plant Design and optimization for production of Benzoic acid from PTA

**Name of Conference:** International Chemical Engineering Conference-Prakalp-2024, MIT Alandi, Pune

**Names of Authors:** Dr. G. B. Daware, Rahul Rathod and Krishna Agrawal

**Date of Conference:** 12<sup>th</sup> to 13<sup>th</sup> March 2024

**Abstract:** The production of benzoic acid, a versatile aromatic compound with numerous industrial applications, holds significant importance in the chemical manufacturing sector. This project aims to develop a comprehensive plant design and optimization strategy for the efficient production of benzoic acid from purified Terephthalic acid (TPA) residue, a by-product generated during the production of polyethylene terephthalate (PET). The plant design phase involves the development of a process flow diagram (PFD) and a piping and instrumentation diagram that outline the various unit operations and equipment required for the benzoic acid production process. Reactor design, separation methods, heat exchanger selection, and waste management strategies are integrated into the design, ensuring a well- rounded and sustainable production process. The optimization aspect of the project employs process simulation software to model and analyze the proposed plant design. To maximize production, reduce energy consumption, and minimize waste formation, several operational parameters are tuned using sensitivity assessments and repeated simulations. The optimization process also takes into account economic considerations, including capital and operating costs, to ensure the feasibility and economic viability of the designed plant.

- **Title of Paper:** Development of Al(BDC) Metal Organic Frameworks: Applications towards Gas Sensors

**Name of Conference:** International Conference on "Separation & Purification Techniques: Environmental Applications" (ICSPT-2024), Department of Chemical Engineering at NIT Raipur, India

**Names of Authors:** Dr. Prashant Kumar, Dr. Yennam Rajesh, Kundan Deore, Abhay Mahajan

**Date of Conference:** 19<sup>th</sup> to 20<sup>th</sup> January 2024

**Abstract:** The current study focuses on Synthesis of MOF and its application towards gas sensing. MOFs are new class of hybrid materials constructed from metal ions with well-defined coordination geometry and organic bridging ligands. Over the past few years MOFs have attracted a great deal of attention due to their intriguing framework architecture, topology, high degree of tunability and structural diversity. On synthesis, structures and properties of MOFs have indicated that they are promising materials for various types of gas sensors. MOFs also have been used as precursors for preparation of various functional gas-sensing nanomaterials, which showed high gas-sensing response, stable repeatability and required accuracy. The synthesis of metal organic framework will be done by using solvo thermal process under necessary conditions. By reacting Aluminium (Al) metal ion with benzene dicarboxylate (BDC) the

required MOF Al(BDC) will be formed. The formed MOF will be further drawn into the thin film by using crystallization techniques. The MOF film will be heated up to desired temperature to sense the presence of target gases. The presence of target gases will be detected by using variable resistance techniques by setting up the threshold resistance value for the resistance across the circuit. As soon as the concentration of the target gas reaches threshold value, the sensor resistance will be reduced, resulting in a decrease of circuit resistance below threshold value. Because of the decrease in circuit resistance, the current will start flowing across the circuit which will trigger the alarm. To analyze the change in performance of a MOF based gas sensor, the performance affecting factors such as surrounding temperature, concentration of target gas, load resistance provided will further be studied with the help of sensitivity characteristics given by graph of surrounding gas concentration versus sensor resistance.

- **Papers Published by Staff/Students in SCI/Scopus Journal**

**Title of Paper:** Evaluation of Activated Biochar from Sustainable Sterculia foetida Shells for the Removal of AB 158 Dye

**Name of Journal:** Journal of Environmental Nanotechnology

**ISSN Number:** 2051-8161

**Names of Authors:** Yennam Rajesh, Neha Gautam, Jai Shah, Sakshi Gole, Pragati Nirgude, and Ganesh Dabhade

**Abstract:** The escalating concern over environmental pollution, particularly stemming from industrial effluents like textile dyes, has necessitated the development of sustainable wastewater treatment methods. This study focuses on utilizing agricultural waste, specifically sterculia foetida shells, to synthesize activated carbon for the removal of Acid Blue 158 (AB 158) dye from aqueous solutions. Through a comprehensive investigation, activated carbon samples were produced using various chemical activating agents and characterized using techniques such as BET surface area analysis, Fourier-transform infrared (FT-IR) spectroscopy, and scanning electron microscopy (SEM). Results indicate that the SFS-AC-K-13 adsorbent exhibited superior adsorption performance, with a maximum dye uptake of 388 mg/g and a removal efficiency of 97.89%, respectively. Equilibrium sorption data were analyzed using Langmuir and Freundlich isotherm models, with the Freundlich model demonstrating the best fit ( $R^2=0.9896$ ) to the experimental data. Comparison with literature values confirms the effectiveness of the synthesized adsorbent in AB 158 dye removal. Overall, this research contributes to sustainable wastewater treatment strategies and highlights the potential of agricultural waste-derived activated carbon for textile dye removal applications.

- **Title of Paper:** Experimental investigation of thermo-physical properties of hybrid Nanofluid: Application in heat transfer enhancement

**Name of Journal:** Materials Today Proceedings (Elsevier)

**ISSN Number:** 2214-7853

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**Names of Authors:** Priyanka B Shivde, Yennam Rajesh, Deepali R Sonawane and Venkat S Mane

**Abstract:** Current study highlights the earlier research and more recent developments in the enhancement of heat transfer using hybrid nanofluid (HNF). By exploiting novel mixture of two different nanoparticles for the synthesis of HNF made of  $\text{Al}_2\text{O}_3\text{-Co}_3\text{O}_4$  nanoparticles suspended in a glycerol (GLY) as a green base fluid. The current study suggests potential uses of synthesized nanofluid. The thermo-physical characteristics of HNF, including density, stability, thermal conductivity (TC), electrical conductivity (EC) and viscosity, are currently being studied for  $\text{Al}_2\text{O}_3\text{-Co}_3\text{O}_4$  /GLY hybrid nanofluid. HNF was synthesized in the volume fraction of nanoparticles of 0.05 – 0.4 % and tested in the temperature range from 30 to 70 °C. the result demonstrated that thermal conductivity of HNF increase from 0.30 to 0.34 W/mK which is higher than the TC of base fluid along with EC also increases from 0.05 to 0.1 S/cm. Recent results also reveal that the viscosity and density of HNF decreases from 7 to 5 cP and 545 to 543 Kg/m<sup>3</sup> with increasing temperature of HNF. The concentrations of nanoparticles also play a major in the thermo – physical properties of HNF.

■ **Title of Paper:** Synthesis of handmade craft-paper from agricultural waste

**Name of Journal:** Indian Journal of Chemical Technology

**ISSN Number:** 0971-457X

**Names of Authors:** Yennam Rajesh, Priyanka Shivde, Gaurav Daware, Venkat Mane, Vijay Mawal and Sandip Derle

**Abstract:** The present work is to promote the use of agricultural waste (sugarcane bagasse, banana fibers, and rice husk) in the creation of handcrafted paper. This work alters the manufacturing process by utilizing various cellulose ratios derived from different agricultural residues. Craft papers have been made with the use of a fairly straightforward and environmentally benign process known as the handmade technique, which includes these raw residues in various ratios. The physico-mechanical properties are measured for synthesized sheets with an appropriate basis weight (63–80 g/m<sup>2</sup>), thickness (20–300 m), burst strength (58.9–105.2 kPa), burst index (1.03–1.67 kPa m<sup>2</sup>/g), and bulk (1.06 – 3.12 cm<sup>3</sup>/g), respectively. It is demonstrated that the used ingredients are cost-effective and eco-friendly. In addition, it is found that the quality of the handmade paper sample composition formed with a blend of 20% rice husk, 30% sugarcane bagasse, and 50% banana fiber, is relatively high. This study demonstrates that agricultural waste can provide viable alternatives for the industries that produce handmade paper.

■ **Title of Paper:** Optical  $\text{CuAl}_2\text{O}_4$  used as photocatalyst for IC dye degradation

**Name of Journal:** Water Practice and Technology

**ISSN Number:** 1751-231X

**Names of Authors:** Gaurav Daware and Yennam Rajesh

**Abstract:** The nanocrystalline copper aluminate ( $\text{CuAl}_2\text{O}_4$ ) has been successfully synthesized by a simple, economical, and environmentally friendly solid-state mechanochemical (MCH) method. The prepared sample was characterized by a variety of suitable methods employed, including scanning electron microscopy (SEM), ultraviolet-visible diffuse reflectance spectroscopy (UV-DRS), Fourier transform infrared spectroscopy (FT-IR), and X-ray powder diffraction (XRD). The material's average particle size was 55 nm and stoichiometric.  $\text{CuAl}_2\text{O}_4$  has been found to exhibit potent photocatalytic activity toward indigo carmine (IC) when subjected to UV light. Under UV radiation, 10 mg  $\text{CuAl}_2\text{O}_4$  leads to  $99 \pm 1\%$  degradation of an 8 ppm IC dye solution among 2 ppm, 4 ppm, 6 ppm, 8 ppm, and 10 ppm in 25 min. In addition, a prospective liquid chromatography-mass spectrometry (LC-MS) technique is identified in the current work, which provides potential routes for the photocatalytic breakdown of IC. Even after five consecutive cycles, the photocatalyst showed remarkable reusability and stability.

#### ■ Achievements

- Rohit Dholi, a third-year student, secured 3rd rank in the Technical Quiz Competition at CHEMFEST 2K24, KKWIEER, Nashik, on 5<sup>th</sup> April 2024.
- Jai Shah and Pankaj Shinde, final-year students, secured 1st prize in the Project Expo category at CHEMFEST 2K24, KKWIEER, Nashik, for the project "Silver Nanoparticle Extraction from Geranium Leaves", on 5<sup>th</sup> April 2024.
- Jai Shah, a final-year student, won the "Best Paper" award in the Paper Presentation category at Prkalp 2024, MIT Pune, for the project "Synthesis of Fiber-Based Hybrid Reinforced Composite from Banana Pith and Sugarcane", on 13<sup>th</sup> March 2024.
- Jai Shah, a final-year student, won the "Best Paper" award in the Paper Presentation category at ICGWE 2024, PVGCOET, Nashik, for the project "Comprehensive Technical Approach for Women Empowerment and Safety in the Digital Landscape", on 9<sup>th</sup> March 2024.
- Rahul Barahte, Omkar Joil and Gaurav Birhade, final-year students, secured 2<sup>nd</sup> prize in the Project Presentation category at IIC, Mechanical Dept., KKWIEER, for the project "Enzymatic Digestion of Biomass for the Production of Bio-Hydrogen", on 28<sup>th</sup> February 2024.
- Jai Shah, a final-year student, secured 1<sup>st</sup> prize in the Research Paper Presentation category at Dr. Moonje Institute, Nashik, for the project "Ramrajya in Kaliyuga: Finding Your Ram", on 22<sup>nd</sup> January 2024.

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