Indian Chemical Engineering Congress
&
73rd Annual Session of Indian Chemical Engineers

CHEMCON-2020

(online mode)

December 27-29, 2020

"Exploring Recent Trends in Chemical Engineering"

SOUVENIR

Jointly Organized by
Indian Institute of Chemical Engineers (IIChE)
Headquarters
&
IIChE - Hyderabad Regional Centre

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11) Shri A. Bhasker Reddy, Former President, IIChE
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INDIAN INSTITUTE OF CHEMICAL ENGINEERS

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PREFACE

CHEMCON is not just annual flagship event of the Indian institute of Chemical Engineers (IIChE), it is the face of chemical engineering in India, it is our stage to showcase and celebrate our successes, share learnings, and set an example for the coming generations of Chemical Engineers. A series of presentations by eminent chemical engineers in multifarious domains with strong linkages to the field of chemical engineering such as fertilizers, pharmaceuticals, petrochemicals, textile industry, polymers, food-processing in addition to presentation of papers by promising young students, will bring to you the latest trends and developments from our chosen and cherished field-Chemical Engineering.

CHEMCON has acquired prestige and pre-eminence as a platform for bringing together students, faculty and professionals in the field of chemical engineering for sharing knowledge, expertise and experiences and providing an inspiring opportunity to youngsters to gain unique insights in chemical engineering.

This year, due to the pandemic, it was not possible to hold the CHEMCON in normal mode with participants being present physically.

And so, about a month ago, a special committee meeting along with IIChE HQ, decided to continue the legacy of holding this annual event albeit virtually to satisfy the pandemic precautions. Immediately after the decision, various committees were formed with clear earmarking of the responsibilities for each and every activity, right from call for papers to getting messages from past presidents, advertisements for raising funds, organising council meetings, AGM, Planning of technical sessions, special session for Dhirubhai Ambani birth anniversary celebrations followed by a talk by eminent personality, panel discussions, printing of souvenir , brochures etc. With the short planning window and a new format to plan and execute, the journey has been a bit of a challenge then again an absolute honour to organize this 73rd edition of **CHEMCON 2020** in the last week of December 2020.

I congratulate and as also thank one and all for their dedication and commendable efforts for successfully completing their respective tasks successfully within such a short time, as against almost year's time which was at hand of the regional centres for organizing the event.

The theme chosen for this year's conference is '***Exploring Recent Trends in the field of Chemical Engineering***'. Our special thanks to **Prof. G.D. Yadav,** our chief patron, for ensuring outstanding personalities as chief guest and speaker for Dhirubhai Ambani Commemorial Celebrations Lectures.

We hope you will enjoy the conference and **CHEMCON 2020** will enrich our knowledge with latest information in the field of chemical engineering and technology including allied topics.
Have a great time.

Sheela
(Chairman publication committee)
& Past chairman HRC

INDIAN INSTITUTE OF CHEMICAL ENGINEERS

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Prof. V V Basava Rao
President, IIChE

MESSAGE

As we stand at the threshold of a new year with new hopes and bid farewell to a year of incredible disasters for humanity around the globe, I consider myself greatly fortunate to be able to greet the distinguished guests, esteemed colleagues, renowned academics and industry personalities as well as the IIChE fraternity at large on the occasion of the 73rd Annual Session of the Indian Chemical Engineering Congress - CHEMCON 2020. It is the first time that CHEMCON is being organised on the digital platform jointly by the IIChE Headquarters and the Hyderabad Regional Centre of the Institute during 27 – 29 December 2020.

The extraordinary crisis that has been plaguing us all for the last 10 months threw life into complete disarray. As far as CHEMCON 2020 was concerned, our original plans had to be abandoned as it proved to be near-impossible to host the annual event with its usual fanfare. However, our collective commitment to the IIChE and our resolve not to leave the ground in the face of a crisis inspired us to find alternative means to carry on. As a result, with utmost effort, labour and drive, the Headquarters and the Hyderabad Regional Centre have succeeded in planning the event to near perfection. I ought to say the Organising Secretaries did a commendable work while the venerated Chief Patron, Co-patrons, the IIChE Council and the respected Advisory Committee were there to lend their valuable support.

The central theme, chosen for this year's CHEMCON, 'Exploring Recent Trends in Chemical Engineering' would aptly set the tone for the whole session. As we gradually emerge from the ravages of the pandemic that has destroyed millions of lives, demolished livelihood and battered economies across the world; we would need to discover new paths for leading us to a better world. The renowned academics and scholars as well as industry captains of repute, who will be delivering the three Memorial Lectures and the Dhirubhai Ambani Commemoration Lecture, will enlighten us – the Chemical Engineering fraternity – with new insights, wisdoms and knowledge about how to build that world, which will be greener, cleaner and more liveable for the whole mankind.

I wish a big success to CHEMCON 2020 and look forward to engaging sessions ahead. It will, indeed, be a rewarding experience for all of us.

(Prof. V V Basava Rao)

Professor Ganapati D. Yadav

B. Chem. Eng., Ph.D.(Tech.), D.Sc. (Hon. Causa, DYPU Kolhapur), D. Eng. (Hon. Causa, NIT-A)
FTWAS, FNA, FASc, FNASc, FNAE, FISTE, FRSC (UK), ChE, FIChemE (UK), FIIChE, FICS FMASc, FIIChE

Emeritus Professor of Eminence
J.C. Bose National Fellow (DST Govt. of India)
Former Vice Chancellor & R.T. Mody Distinguished Professor
and Tata Chemicals Darbari Seth Distinguished Professor of Leadership & Innovation

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MESSAGE

I am indeed pleased that despite many hurdles due to the unrelenting COVID 19 pandemic, IIChE has decided to ensure that the grand tradition of over seven decades remains unbroken and that CHEMCON 2020, the most prestigious event in the realm of Chemical Engineering in India, is organised virtually. Compliments to the Council and the Organizer, the Hyderabad Regional Centre. I am further happy that among other events, it will feature the three prestigious Memorial Lectures, namely, Jacobs Dr. H.L. Roy Memorial Lecture, Aker Solutions Prof. N.R. Kamath Memorial Lecture and C.K. Murthy Memorial Lecture on 27 December 2020.

The Dhirubhai Ambani Commemoration Day, to be held on 28 December 2020 to mark the 88th birth anniversary of the late Shri Dhirubhai Ambani, will be the other great event of the virtual conference. Padma Vibhushan The Late Shri Dhirubhai Ambani, the Founder Chairman of Reliance Industries Ltd, was an exceptional soul and an outstanding leader, who epitomized the dauntless entrepreneurial spirit. He dared to dream on a scale unimaginable before in Indian industry. His life's achievements prove that backed by confidence, courage and conviction, one can achieve the impossible. In recognition of his unparalleled contributions to the industry and India at large, the IIChE has been celebrating since 2004, the 28th December as the Dhirubhai Ambani Commemoration Day and an individual of exceptional qualities and achievement is chosen to deliver the Dhirubhai Ambani Oration. Dr. Renu Swarup, Secretary, Department of Biotechnology, Govt. of India, will be the Dhirubhai Ambani Orator for 2020.

We will have to wait for another year to meet personally in Bhubaneswar for CHEMCON 2021, but the virtual mode will be equally exciting, educative and rewarding .

I wish the Conference a grand success.

Professor G. D. Yadav
Former President, IIChE (2001)
12. 12. 2020

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Adjunct Professor, University of Saskatchewan, Saskatoon,Canada
Padmashri Awarded by President of India

MESSAGE

I am extremely delighted that the **73rd** Annual Session of Indian Institute of Chemical Engineers, called **CHEMCON-2020** is being organized jointly by Indian Institute of Chemical Engineers (IIChE) with Hyderabad Regional Centre of IIChE. Event, scheduled during **27-29 December, 2020, is being conducted virtually for the first time** due to pandemic situation. This is the 4th Annual Session jointly organized by Hyderabad Regional centre after the 3rd joint Session in **2002**. 2nd joint Annual Session was held in **1984** and 1st in **1969**.

This **CHEMCON-2020** comprises with many events such as Memorial lectures, Plenary Lectures, Panel Discussions, Technical Presentations on emerging areas of **Chemical engineering and allied subjects** etc. I am sure that this Conference will address and provide realistic solutions to variegated problems in Society, Environment, Chemical Industry and Research & Development.

More so, it is the unified platform to share knowledge, experiences and exchange of ideas amongst academicians, researchers, professionals and managers of industry from different parts of the country and outside.

I hope that this **CHEMCON-2020** disseminate information on recent technological developments in various disciplines to address the problems of the society and act as **nuclei** in the field of Chemical Engineering in particular and Engineering in large.

I wish the **Organisers of the CHEMCON-2020 a grand success** and **memorable CHEMCON-2020** that brings laurels to IIChE and Hyderabad Regional Centre during this pandemic situation.

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Dr. SREERANGAM VENKATESHWAR **14th December, 2020**
Retd Professor of Chemical Engineering, UCT, OU.,
Past Principal UCT, OU.,
Past President, IIChE

Dr. Avijit Ghosh
Honorary Secretary

MESSAGE

The stage is set for CHEMCON 2020 as the IIChE Headquarters and the Hyderabad Regional Centre have come together to host the Annual Session of the Institute at its 73rd year during 27 – 29 December 2020. As one of the two Organising Secretaries for this year's CHEMCON, I feel very happy that despite many uncertainties and reservations, finally we have been able to pull all the stops so that this grand tradition of more than seven decades goes on uninterrupted.

Even though unlike other years, CHEMCON is to be held on the digital platform this year, the event will not be short of its characteristic attractions. Distinguished academic personalities and industry leaders will be part of the signature events like the three Memorial Lectures and the Dhirubhai Ambani Commemoration Lecture. Technical Lectures, encompassing different strands of the Chemical Engineering discipline, to be delivered by distinguished speakers from India and beyond the national boundary, will also be a treasure trove of knowledge, expertise and skill.

The world is still fighting its war against the Covid-19 pandemic, which has taken away millions of lives and wiped out means of living for millions of others. It is time now for the mankind to join hands and fight this battle together so that we can soon come out of the tunnel and build a new world of well being. The Chemical Engineers the world over has a tremendous role to play at this critical time. I am looking forward to the interactions, communications and discourses during the three days of CHEMCON, which may well show us the way to build that new world.

It would not have been possible to organise CHEMCON this year without such a sound collaboration and cooperation between the Headquarters and the Hyderabad Regional Centre. I am very thankful to my Hyderabad colleagues for this teamwork. I am, indeed, very thankful to the IIChE President, Prof. V.V. Basava Rao, my other colleagues in the IIChE Council and many of the respected veteran members of the Institute, whose constant backing and support helped in planning and implementing the necessary work for organising such a big event. Last but not the least; the Headquarters team also came up with all the necessary assistance, which needs to be acknowledged wholeheartedly. I am hopeful of keen participation by professionals, academics, research scholars and students during the three days of stimulating sessions of dialogues, discourses and discussions at CHEMCON. Thank you and best wishes.

MESSAGE

Development, demonstration and commercialization of new products, processes and services require convergence of multiple technologies. Chemical Engineering and related technologies, by their intellectual prowess, are increasingly contributing to sectors like healthcare, energy, aerospace, automotive, food, water, national security and many others. Translation of 'engineering and technological capital' to 'socially relevant and nationally important purposes' has to occur keeping in view the economic, safety and environment aspects so that sustainable development goals are realized. Accordingly, collaborative efforts of academia, industry and R & D shall be crucial. Theme "Exploring Recent Trends in Chemical Engineering" of the 73rd annual session of Indian Chemical Engineering Congress captures aforementioned ethos so well.

It provides me immense pleasure that Indian Institute of Chemical Engineers (IIChE) Headquarters and Hyderabad Regional Centre (HRC) of IIChE are jointly organizing the CHEMCON 2020 (27th to 29th December 2020) virtually to promote technical deliberations amongst eminent professionals representing academia, industry and R & D as well as students on several facets associated with CHEMCON 2020 theme. Virtual format is adopted due to unprecedented pandemic of COVID19. We are grateful to IIChE National Council for providing us the honour of co-hosting the CHEMCON 2020, the most prestigious event in the field of Chemical Engineering in India. Event has maintained its rich legacy of featuring highly acclaimed achievers / speakers for Dhirubhai Ambani Commemoration Day Oration Award Lecture, Dr. H.L. Roy Memorial Lecture, Aker Power gas Prof. N R Kamath and Ruzena Kamath Memorial Lecture and Inventaa C K Murthy Memorial Lecture along with lectures by recipients of prestigious IIChE Awards.

As one of the two Organizing Secretaries, I express gratitude to IIChE National Council, Prof. V.V. Basava Rao –IIChE President, Prof. G.D. Yadav - Chief Patron Chemcon2020, Former IIChE Presidents and Former IIChE-HRC Chairpersons, Dr. Avijit Ghosh, Honorary Secretary IIChE and my colleague Organizing Secretary, who encouraged, supported and guided us in all phases right from initiating our association as Co-host till implantation of our ideas. It is appropriate to mention here that duration, of ideation to implementation phase for CHEMCON 2020 was approximately six weeks only. Keeping this in view, IIChE Headquarters officials, Chairs /Co-chairs / Convenors/ Members of different committees, and my IIChE – HRC Executive Committee colleagues deserve wholehearted appreciation for their dedicated efforts to complete all the assigned responsibilities at a short notice. Last but not the least, I am indebted to technical session chairs, authors of submitted abstracts, our sponsoring organizations and advisors for their cooperation and support.

I sincerely hope, all the participants shall have a great learning experience during the CHEMCON 2020. Wishing the New Year 2021 that brings health, happiness and prosperity to you and your families!

Dr. Sanjay Bhardwaj
FIE, FSTEM, LMIIChE
Organizing Secretary, CHEMCON 2020
Chairman, IIChE– Hyderabad Regional Centre

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MESSAGE

It is a matter of great pleasure for me to note that IIChE Head Quarters, Kolkata and Hyderabad Regional Centre (HRC) are jointly organizing the 73rd edition of CHEMCON on vitual platform during 27-29th December 2020. During this pandemic IIChE strived hard to conduct several programs like internships for the under graduate students, SCHEMCON, Webinars, etc and I appreciate the efforts of all the concerned office bearers and council members. The (HRC) is one of the most active and dynamic Regional Centres of IIChE, regularly organising various skill enhancement programmes for professional empowerment of the Chemical Engineering fraternity with great competence and thoroughness. I am proud to be part of this regional center. HRC has conducted CHEMCON 2002 in a grand manner and won the accolades of many.

The theme of this year's conference, "Exploring Recent Trends in the field of Chemical Engineering", is more relevant as we look at global situation currently. As our world continues to become more complex, and the challenges faced by society, academia, industry and government become more difficult. Chemical Engineering profession, with its depth and diversity of knowledge and applications, combined with its immense intellectual capacity, will continue to play a key role in developing solutions for a better world. To continue the tradition, this year CHEMCON 2020 is planned for three days rather than usual four days by including plenary lectures, award ceremony, Dhirubhai Ambani commemoration day, etc, Technical sessions are also planned to give an opportunity for the researchers to share their ideas. An exchange of interdisciplinary knowledge is highly solicited and "CHEMCON" is one good platform to think, discuss the most important and fascinating problems that can influence the national GDP. Further, an opportunity is created to listen to eminent speakers who will address the issues of relevance at CHEMCON.

I am looking forward for enthusiastic and active participation of delegates as this will provide opportunity for them to interact with the cream of professional fraternity and will help them to keep abreast with the latest technological and conceptual developments happening around the globe. I hope the conference will provide directions to Industry and society for sustainable existence of clean and safe environment. I would like to congratulate and recognize the extensive work undertaken by the organizing and technical committees in developing an outstanding program for this year's conference. As past president of IIChE it will be pleasure to be part of this conference.

I wish the conference a grand success

Prof. S.V. SATYANARAYANA

Prof. S.K. Sharma
Emeritus Professor
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MESSAGE

I am extremely delighted to know that Chemcon 2020 is being organized jointly by IIChE headquarters and IIChE — Hyderabad regional Centre from 27 to 29 December 2020, in the virtual mode due to Covid pandemic. The theme chosen for the conference "Exploring recent trends in Chemical Englneering" is very appropriate and timely.

Today the key issue of business in the chemical process industry is understanding the importance of emerging technologies and how they can help in improving business value after technology integration. The chemical industry is one of the prominent industries and globally, this industry is growing at a slow pace. The accountability in the growth of the chemical industry can be increased with the implementation of Artificial Intelligence, Machine Learning and Data Analytics. These innovative tools can help us in arriving at cost-effective solutions and revolutionize the industry scalability.

The technology disruption and advances in the digital environment has helped the global chemical industry to reach a new level of functional excellence by leveraging machine learning.

Further, use of digitization, smart sensors. IOT, real time analytics, Artificial Intelligence and networking capabilities can help in improving the inter connectivity between digital and physical realm. This will help create more flexible operations to manufacture different products on existing equipment and to modify raw materials to achieve sustainability in our goals. It will also help in the creation of a real time integrated value chain, even in the stressed situation like pandemics.

I am sure experts from India and abroad will deliberate on use integration of digital technology and other vital issues concerning chemical process industry during their deliberations.

I complement the office bearers, council Members and members of llChE HRC for their commendable efforts under the dynamic leadership of Prof. V. Venkata Basava Rao in organising this flagship mega event in the virtual mode for the first time in the history of llChE.

Prof. S.K Sharma
Past President,
Indian Institute of Chemical Engineers

MESSAGE

Dear co-chemical Engineers,
The professional bodies like IIChE have to play a facilitating role in developing the Indian chemical sector's foresight and long-term vision. A deep understanding of the emerging global trends, drivers and inhibitors for its growth, and opportunities in new areas through industry-academic-professional body synergy becomes a necessary element of foresight development exercise. The technology forecasting and similar exercises will be of help to develop long term vision. The IIChE is keen to become an important partner in any national endeavor which may be formed to develop foresight and vision for this industrial sector. In future, the Indian chemical industry will undergo structural as well as competence related transformations to meet diverse demands of global markets. Its output will contain more middle and higher end chemical, biological or their combination specialty products. A significant growth is anticipated in medium scale process units which maybe better equipped to deal with environmental challenges related to greener products and enhanced public concerns. The future specialty and knowledge intensive chemical products are likely to face much more rigorous environmental regulations with extensive data submission requirements from national and international regulatory bodies.

The future R&D chemical sector will have to be based on sustainable chemistry, biology and process/product engineering. Research efforts have to be directed towards the generation of scientific models and data on diffuse emissions such as those from road traffic, industrial establishments, households and land use activities and their interactions. Indian researcher has to generate scientific data on atmospheric emissions which can distinguish between safer and riskier chemical products of commercial importance. The chemical engineers have to focus on process-oriented research to design new reaction media and contact systems that ensures process intensification to achieve minimum pollution and energy demands and environment tally cleaner products. The safety analysis will become more research oriented to develop an array of hazard and risk management techniques in case of cascade and domino type of unwanted events with catastrophic damage potential. A strong chemistry – chemical engineering synergy is required to find viable solutions in environmental areas.

Among knowledge chemicals, bulk drugs have taken lead. In Telangana & Andhra Pradesh states themselves, bulk drug industries are around 500, value of total production approximately Rs 60,000 C with exports about Rs 20,000 crores. Thanks to IIChE for giving opportunity to conduct 55th IIChE Annual session for the year 2002 at Hyderabad, and we could have full financial support from leading bulk drug companies of Hyderabad Dr. Reddy's labs etc, and had at Viceroy hotel one of the best hotels of city as on that date. All the delegates from all over country appreciated and complimented that its best CHEMCON till date.

May I request all participant chemical engineers to work and contribute towards synergistic growth by emphasizing on the synergy between research, education and industry and make our nation proud through our contributions. Wishing all the success for CHEMCON-2020

With warm regards,
A. Bhasker Reddy,
President IIChE – 2011

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(Ex-Chairman and Former Dean Engg. Faculty, P.U.)
(Former Dir. Energy Res. Cen. PU & SSG PU Reg.Cen., Hoshiarpur)
(Editor, Indian Chemical Engineer 2016, 17)

MESSAGE

I am immensely pleased to welcome you all to this grand conference of Indian Institute of Chemical Engineers, CHEMCON- 2020. This 73rd edition of CHEMCON has been scheduled to take place in the last week of December 2020 on the theme "Emerging Dimensions and Challenges Ahead".

Chemical Engineering Congress, CHEMCON is the four-day annual flagship event of IIChE, wherein students, teachers, researchers and industry practitioners from India and abroad share their knowledge and expertise and discuss the current trends and future developments in the field of Chemical Engineering/Technology.

A large number of national and International experts, eminent researchers/ professionals/ academicians/ young professionals in Chemical Engineering and allied fields from Industry, R & D organizations and academics will deliberate on the main theme. This conference will provide an opportunity and platform to exchange their views, experiences and research findings in turn will lead to desired goals of positive development and challenges in Chemical Engineering.

I am sure the deliberations of the conference will also prove a step forward to inspire the young researchers. I send my good wishes for the success of this event

V.K.Rattan
Vice Chancellor,
GNA University, Phagwara
Past president IIChE

MESSAGE

At the outset, I express my deep admiration for IIChE 2020 council for commendable manner in facing unforeseen pandemic challenge and making online events a grand success. I also congratulate IIChE-HRC a trendsetter among regional centres to join hands with IIChE headquarters to conduct first virtual CHEMCON 2020. I had the privilege of being the chairman of HRC when it last hosted CHEMCON 2002.

In these perilous times of a raging pandemic which had engulfed the entire world this year, we have come to realize the power of indigenization of technologies and its benefits. Chemical Engineering fraternity has again shouldered the responsibility of serving the mankind through innovation and quick scale up of processes for manufacturing of essential commodities like sanitizers, PPEs, medicines and vaccines. India has emerged as the largest vaccine manufacturing hub in the world with leading COVID vaccine candidates being manufactured in India and majority in Hyderabad.

The year 2020 has accelerated the trend and highlighted the need for integration across various science and engineering disciplines to find rapid and effective solutions. A single discipline or a siloed mindset restricts the pace of innovation. Various companies and sectors are integrating the sciences and engineering to bring forth new perspectives from various fields such as chemistry, chemical engineering, material science and engineering, biochemistry, polymer science and genetics to tackle the emerging challenges. Success in developing new products and solutions requires successful interaction and engagement among various fields to develop solutions to today's complex problems.

I hope the technical discussions will be deeply insightful, thought provoking and drive new solutions. The synergy between research and industry is crucial for building a healthy technical ecosystem and making the country self-reliant.

I wish the Congress a grand success.

Best Regards

G. V. Sethuraman
President IIChE 2015

MESSAGE

A man has not created anything. The God has created this world. However , man has the capability to convert matter from one form to another . With this capability man has created millions of products for the use of mankind . Chemistry is a science , which explains the process of converting matter from one form to another . To make this process of conversion sustainable , the science of chemical engineering evolved . For a process to be sustainable , it should be economical , it should not cause damage to the environment and it should be beneficial for the entire human society . Keeping these aspects of sustainability in mind , chemical engineers have developed so many different technologies , and constantly working on them to make them more and more sustainable. In India also there is a large pool of chemical engineers , who have worked relentlessly in the past , and continuing to work the same way , to make a wide range of products , which have improved living conditions of entire population . Chemical industry in India has grown over the years . At the time of globalization of Indian economy , chemical industry had several challenges , like scale of operation , shortage of feed stock , poor infrastructure and unavailability of capital. However , competence and commitment of chemical technologists and chemical engineers, has taken the industry forward and brought global recognition to Indian chemical industry.

Chemical industry in India has consistently maintained high growth rate and contributed substaintially to India's GDP and exports . Chemical exports from India have grown from 20 billion USD to 45 billion USD in last ten years . This has resulted in the increase of share of chemicals export in total exports from 8% to 14% in the same period . This clearly indicates that Indian chemical industry is globally competitive . This has been made possible by the chemical engineers of India . Besides this , India has become a hub for design and engineering of chemical process plants . All global engineering companies have set up operations in India for carrying out design and engineering work related to chemical plants being set up in different parts of the world. This also indicates competence and commitment of chemical engineers in India. Indian Institute of Chemical Engineers brings all chemical engineers on one platform to facilitate sharing of knowledge amongst them . Chemical engineers are engaged in different activities like; teaching, research , designing , industry operations , application development and business management etc. This platform of IIChE brings chemical engineers engaged in different activities together, and facilitates transfer of science from laboratory to industry and ultimately to society. Chemical Engineering Congress in an annual event to bring chemical engineers together for knowledge sharing . Every chemical engineer participating in Chemcon , should keep this purpose and spirit in mind and take maximum advantage from it . I wish Chemcon 2020 proves to be a successful event in meeting its objective .

Shyam Bang
President IIChE,2016
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MESSAGE

It gives me immense pleasure to mention that the 73rd Annual Session of Indian Institute of Chemical Engineers and Indian Chemical Engineering Congress (CHEMCON 2020) 2020 with the theme Exploring Recent Trends in Chemical Engineering is going to be organized by the Institute Hd. Qtrs. in association with its Hyderabad Regional Centre during December 27 – 29, 2020.

I congratulate President and members of the Council of IIChE for the year 2020 for taking unprecedented decision towards organization of Institute's mega event CHEMCON 2020 on digital platform in the midst of Covid pandemic.

I would also thank the organizers for their untiring efforts to make the congress a memorable one.
I wish all round success of the event.

Prof. P. De
Past President, IIChE

CHEMCON-2020

Day 1: December 27, 2020 (Sunday)

Time (hrs)	Program	Name of the program / Guests/ Chair Persons/ Coordinators	Name of Coordinator(s) / Volunteer (s)	Meeting Link
9:30-10:30	Inauguration: CHEMCON 2020	**Chief Guest:** **Prof. K. Vijay Raghavan, Principal Scientific Adviser to the Government of India** **Guest of Honours:** Prof. V. V. Basava Rao, President, IIChE Padma Shri Prof. G.D Yadav, Former President & Former Vice Chancellor ICT Mumbai Prof. S. Venkateshwar, Former President, IIChE Shri. Ch. Satyanarayana, Chairman, Inventaa Industries Pvt. Ltd Organizing Secretaries Dr. Avijit Ghosh & Dr. Sanjay Bhardwaj	Ms. Piyali Chakraborty and Mrs. Subha Samajdar	**Join Zoom Meeting** https://us02web.zoom.us/j/82639198742 Meeting ID: 826 3919 8742 Passcode: 559970 YouTube: https://youtu.be/hogrkDYCms0
10:30-12:00	10:30-10.40 10:40-12:00	Introductory speech by CEO, Excel Tech, Pune **IIChE Award Function** Dr. B. P. Godrej Lifetime Achievement Award will be conferred to Shri. P. K. N Panicker, Former President IIChE. pknpanicker@gmail.com All others Awards **Moderators** Dr. Avijit Ghosh, Honorary Secretary, IIChE	Ms. Piyali Chakraborty Mrs. Subha Samajdar	**Join Zoom Meeting** https://us02web.zoom.us/j/82639198742 Meeting ID: 826 3919 8742 Passcode: 559970 YouTube: https://youtu.be/hogrkDYCms0

NMN (01): Nanomaterials and Nanotechnology, Polymers & Composites; **EEN (02):** Energy and Environment: Solar/Biomass/Fuel Cell/Hydrogen Energy/Li-ion Battery/Conventional and Non-conventional energy, Wastewater Treatment; **BFT (03):** Bio-process Engineering, Biomedical Engineering, Food Technology; **PRP (04)**: Petroleum Refining & Petrochemicals; **PMS (05):** Process Modeling, Simulation & Optimization; **GCH (05):** Green Chemistry and Industrial Chemistry; **OCH (06):** Others area of Chemical Engineering like Advanced Separation Processes, Catalysis Process Intensification & Process Automation (OCH)

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Parallel Technical Sessions-I **12:00-14:00**	Parallel Awards lectures 12:00-12:20	**Award lectures by Prof. Bishnupada Mandal, IIT Guwahati**	Aniruddha Hore aniruddhahore02@gmail.com 6290278304 Busam Krishna Murthy busam.krishnamurthy@gmail.com 7893968254	https://global.gotomeeting.com/join/614982853 **Access Code:** 614-982-853
	NMN -I Abstract ID: **OP-01:** 01-10	**Chairpersons:** **Prof. (Dr.) Alpana Mahapatra, Council Member** Mobile: 9920832421; alpana.mahapatra@djsce.ac.in **Prof. A Venu Vinod, NITW** Mobile:9440764497 : avv@nitw.ac.in			
	Parallel Awards lectures 12:00-12:20	**Award lectures by Mr. D. M. Butala**	Sk Md Shahriar Alam rubelmemari@gmail.com 7063089310 P.Krishna Chaithanya krishnachaithanyap99@gmail.com 7731898694	https://global.gotomeeting.com/join/129028925 **Access Code:** 129-028-925
	NMN – II Abstract ID: **OP-01:**11-20	**Chairpersons:** **Dr C Karthikeyan, Council Member** 9865356561; drcktech@rediffmail.com **Dr. Sarang Gumfekar, IIT Ropar** Mobile: 7620063191; sarang.gumfekar@iitrpr.ac.in		
	Parallel Awards lectures 12:00-12:20	**Award lectures by Mr. Tarun Naya, IIT ISM Dhanba**	Salil Narvekar salilnarvekar03@gmail.com 9969524579 Yerragunta Sahaja yerraguntasahaja@gmail.com 9573252173	https://global.gotomeeting.com/join/322721869 **Access Code:** 322-721-869
	EEN- I Abstract ID: **OP-02:** 01-10	**Chairpersons:** **Prof. S. K Gupta, HBTU Kanpur** Mobile: 7081300512, skgupta@hbtu.ac.in **Dr VM Bhandari, NCL, Pune** Mobile: 9423207083 vm.bhandari@ncl.res.in		

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	Parallel Awards lectures 12:00-12:20	**Award lectures by Mr. Dhawal Saxena, Blast Carbo Blocks Pvt. Ltd, Mumbai**	Jagriti Tiwari Tiwarijagritioffic@gmail.com +91 6388 155 781 Himanshu Chauhan him1189900@gmail.com 8573834008, +91 87659 82589	https://global.gotomeeting.com/join/479559997 **Access Code:** 479-559-997
	EEN- II Abstract ID: **OP-02:**11-20	**Chairpersons:** **Dr. M. Venkateswara Rao, Council Member** 9440010190; mvrao79@gmail.com **Dr. Balaji Krishnamurthy, BITS Pilani** Mobile: 040-66303552; balaji@hyderabad.bits-pilani.ac.in		
	EEN- III Abstract ID: **OP-02:** 21-30	**Award lectures by Prof. S.H. Sonawane**	Aniruddha Mondal aniruddha0266@gmail.com 8013292565 Srishti Mishra srishti7234942356@gmail.com 96518 12126	https://global.gotomeeting.com/join/933027253 **Access Code:** 933-027-253
		Chairpersons: **Dr M K Jha, Council Member** 9417290668, jhamkin@yahoo.co.in **Prof.Dr.Sachin Shrisath, HOD** **Dept.of Chem.Engg.Sinhgad College of Engineering,** **Pune.**		
	Parallel Awards lectures 12:00-12:20	**Award lectures by Dr. Sundergopal Sridhar**	Abhiram Subramanian abhiram.s1812@gmail.com 9704946433 Lalith kumar chinnuyadav1999@gmail.com 7997740285	https://global.gotomeeting.com/join/656080557 **Access Code:** 656-080-557
	BFT-I Abstract ID: **OP-03**: 01-10	**Chairpersons:** **Dr. Gaurav Rattan, Council Member** Mobile: g_rattan1107@yahoo.co.in **Prof. A. Ravindra Nath, OUCT** Mobile: 9849144243; dranisetti@yahoo.co.in		
	Parallel Awards lectures 12:00-12:20	**Award lectures by Prof. V. C. Srivastava**	K.V.S.G.SRIVANI girijasrivani123@gmail.com 8008003091	https://global.gotomeeting.com/join/356247589 Meeting ID: 356 247 589

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	PRP – I Abstract ID: **OP-04:** 01-09	**Chairpersons:** **Dr Madhu Agarwal, Council Member** 9413349429; madhunaresh@gmail.com **Dr. Ratnadip Joshi, MIT, Pune** Mobile:9423332754; joshiratnadip@yahoo.com	Yasser Mirza Baig yasserbaig8@gmail.com +917989487471	
	Parallel Awards lectures 12:00-12:20	**Award lectures by Dr. Vineet Aniya**	Abhishek Ganguly abhishekganguly934@gmail.com 8017002896 Meghavath Sachin 17211a0829@bvrit.ac.in 9100144598	https://global.gotomeeting.com/join/733418309 Meeting ID: 733 418 309
	PMS-I Abstract ID: **OP-05:** 01-10	**Chairpersons:** **Prof. Sudip K Das, Council Member** 9830638908; drsudipkdas@gmail.com **Prof Bharat Bhanvase, IIT Nagpur** Mobile: 09404044184; bharatbhanvase@gmail.com		
	Parallel Awards lectures 12:00-12:20	**Award lectures by Dr. Akshay Modi**	Umesh Ghorai ghoraiumesh97@gmail.com 8777648920 Srishti Sridhar srishti.twin@gmail.com 8019492710	https://global.gotomeeting.com/join/363014573 **Access Code:** 604-150-141
	PMS-II Abstract ID: **OP-05:**11-20	**Chairpersons:** **Prof. (Dr.) K.B. Radhakrishnan, Council Member** 9447205767; drkbrnair20@gmail.com **Dr. Sarath Babu, NIT Warangal** Mobile: 08702462610, sarat@nitw.ac.in		

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	GCH – I Abstract ID: **OP-06:** 01-08	**Chairpersons:** **Dr T L Prasad, Council Member** 9869879214; tlprasad63@gmail.com **Dr. N J Prameela Subhasini** Mobile: 9849941559; njsubhashini@yahoo.co.in	K Lakshmi Deepthi Mobile: 0959895102 deepthi.kurni@gmail.com Siddhi siddhisarda67@gmail.com 9192167859	https://global.gotomeeting.com/join/604150141 **Access Code:** 363-014-573
	OCH– I Abstract ID: **OP-07:** 01-10	**Chairpersons:** **Dr G S V Ratnam, Council Member** 9444464670; gsvratnam@gmail.com **Prof. Y. Pydisetty, NITW** Mobile: 09491824392; psetty@nitw.ac.in	Trishita Bhattacharjee trishita99bhattacharyya@gmail.com 8777018320 Vaishnavi Nemaniwar 17211a0831@bvrit.ac.in 83091 72297	https://global.gotomeeting.com/join/360842781 **Access Code: 360842781**
	OCH– II Abstract ID: **OP-07:** 11-20	**Chairpersons:** **Dr M P Jain, Council Member** 9867262250; mpjain2000@yahoo.com **Dr S Srinath, NIT Warangal** Mob: 08332969399; srinath@nitw.ac.in	Anwesha Pandit anweshapandit12@gmail.com 9330795318 Pothala Pallavi pallavirao2577@gmail.com 7337251589	https://global.gotomeeting.com/join/709829525 **Access Code** :709-829-525
14:00-14:30	**Lunch Break**			

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Memorial Lecture 14:30-17:00	**14:30-15:15** **15:30-16:15** **16:15-17:00**	Aker Powergas's Prof. N. R. Kamath and Mrs. Ruzena Kamath Memorial Lecture by Dr. R.R Sonde, VP, Thermax Inventaa C K Murthy Memorial Lecture by Prof. Debangsu Bhattacharya, West Virginia University, USA Dr. H. L. Memorial Lecture by Prof. Bala Subramaniam University of Kansas (KU) USA	Prof. N. Balasubramanian Dr Madhu Agarwal Mrs. Subha Samajder	**Join Zoom Meeting** https://us02web.zoom.us/j/83929485859 Meeting ID: 839 2948 5859 Passcode: 350510 YouTube: https://youtu.be/Cu5k0uDXU88
17:00-19:30	**6th Council Meeting for 2020**	Osmania University Campus	**Honorary Secretary, IIChE**	

Day 2: December 28, 2020 (Monday)

Time (hrs)	Program	Name of the program/ Chair Persons/ Coordinator	Name of Coordinator(s) / Volunteer (s)	Meeting Link
Parallel Technical sessions-II	NMN – III Abstract ID: **OP-01:**21-28	**Chairpersons:** **Mr D M Butala, Council Member** Mobile: 997985302;1 Dmbutala27@yahoo.com Dr.Shailesh Ghodke HOD D.Y. Patil Institute of Enng.,Management &Research Pune Mobile: +918275889853: saghodke@gmail.com	Vijaya Raju K kvr.gps257@gmail.com 9398569482 Yaram Sai Deepika Reddy ysdeepika7382@gmail.com 9849940030	https://global.gotomeeting.com/join/731782509 **Access Code:** 731-782-509
9:00-11:00	Parallel Awards lectures 09:00-09:20	**Award lectures by Dr. Babul Prasad**	Aditya Jain ad.2599itya@gmail.com	https://global.gotomeeting.com/join/474780101 **Access Code:** 474-780-101

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	NMN – IV Abstract ID: **OP-01:**29-35	**Chairpersons:Prof. M. Rajasimman, Annamalai University** Mobile: 9842565098; simms@rediffmail.com **Dr. T. N. Rao, ARCI, Hyderabad** Mobile: 9849546605; Email : tata@arci.res.in	9685223345 Akshitha Kairamkonda akshithanethakk@gmail.com 9133555447	
	EEN- IV Abstract ID: **OP-02:**31-42	**Chairpersons:** **Prof S V Satyanarayana, Former President, IIChE** Mobile: 9849509167; svsatya7@gmail.com **Dr. Kurella Swamy, NIT, Srinagar** Mobile: 6305 824 790, Email: kurellaswamy@nitsri.ac.in	Sushmit Ghosh sushmit.ghosh2001@gmail.com 9007975497 S.Bhavani bhavanisajjanam01@gmail.com 8074918003	https://global.gotomeeting.com/join/257585285 **Access Code:** 257-585-285
	EEN- V Abstract ID: **OP-02:**43-55	**Chairpersons:** **Mr Praveen Saxena, Council Member** Mobile: 9869606386; praveensaxena1951@gmail.com **Mr Suryaprakash, BVRIT** Mobile: 9618014351; suryaprakash.s@bvrit.ac.in	Mukul Saini mukulsaini231@gmail.com 8750102970 Md Abul Ahsaan 17h61a0827@cvsr.ac.in 9515388134	https://global.gotomeeting.com/join/348447949 **Access Code:** 348-447-949
	EEN- VI Abstract ID: **OP-02:**56-68	**Chairpersons:** **Prof. Ch.Sailu, Hon. Member TSPSC** Mobile:+919849636589: chinthasailu@gmail.com **Prof. Biswajit Mandal, HITH** Mobile: 9732961156 bmandal1977@rediffmail.com	Yukta Kakkar yuktakakkar@gmail.com 8130746220 Himanshu Saluja salujahimanshu76@gmail.com 8529579876	https://global.gotomeeting.com/join/264630181 **Access Code:** 264-630-181

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	BFT-II Abstract ID: **OP-03:** 11 to24	**Chairpersons:** **Prof. Sunil Baran Kuila** Mobile: 8972960394, sunilbarankuila@gmail.com **Mr RG Math, CFTRI (Retd.)** Mobile: 09392457009, rgmath@gmail.com	Abhinaw Kumar rayankit149@gmail.com 9097520528 M. Hemanth itsmehemi0711@gmail.com 9666687867	https://global.gotomeeting.com/join/888142781 **Access Code:** 888-142-781
	PMS-III Abstract ID: **OP-05**:21-28	**Chairpersons:** **Prof. N. M. Surana, Council Member** Mobile: 9898934606, nmsurana@yahoo.com **Dr. Naren, Sastra Deemed University** prnaren @scbt.sastra.edu	JYOTSANA RANI jyotsanaranichem@gmail.com 62054200477 SK. Ujma ujmajabbar@gmail.com 9381458694	https://global.gotomeeting.com/join/367885621 **Access Code:** 367-885-621
	PMS-IV Abstract ID: **OP-05**:29-35	**Chairpersons:** **Dr.Vikrant Kumar Surasani** Dept. of Chemical Engineering BITS, Pilani Mobile: +918331871781: surasani@hyderabad.bits-pilani.ac.in **Dr. Alka Kumari** Scientist, IICT,Hyderabad Mobile: 90144 21871, Email: alka@iict.res.in	ANJALI DASH anjalidash23548@gmail.com 6370578884 Soreddy Anil Reddy soreddy.anilreddy007@gmail.com 7032146346	https://global.gotomeeting.com/join/438855965 **Access Code:** 438-855-965
	OCH– III Abstract ID: **OP-07:** 21-30	**Chairpersons:** **Mr Kalyan Kumar Basu, Council Member** Mobile: 9007024255, kbasu2004@yahoo.co.in **Prof. D.S.Bhatkande** Vishwakarma Institute of Technology.	Sagar Patel sagpatel1999@gmail.com 9820641504 Poosa Anusha poosaanusha@gmail.com	https://global.gotomeeting.com/join/710188101 **Access Code:** 710-188-101

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		Pune.9975122887.dhananjay.bhatkande@vit.edu	70930 25088	
	OCH– IV Abstract ID: **OP-07:** 31-42	**Chairpersons:** **Dr.R.Shyam Sunder, Principal OUCT** Mobile: 91-9949979835, shyam@ouct.ac.in, prof.shyamsunder1961@gmail.com **Dr. Sanjay Patel, SVNIT, Surat** Mobile: 9904456199; srp@ched.svnit.ac.in	K.Sudheergoud 18211A0828@gmail.com 9110536976 Sai Durga saidurgaduggi70@gmail.com 8520808654	https://global.gotomeeting.com/join/921252277 **Access Code:** 921-252-277
10:00- 11:30	**Panel Discussion on :** Atma-Nirbhar Bharat: Role of Engineers towards Indigenization	**Distinguished Panelists:** Mr. P.D Samudra, MD , Thyssenkrupp India Pvt Ltd , Mumbai; pdsamudra@thyssenkrupp.com Mr. Pradip Agarwal, CEO , Heritage Group of Institutions, Kolkata; ceo@heritageit.edu Mr. S.S Rao, CEO , Laurus Lab Ltd., Hyderabad rpalaparthi@anagha.consulting Dr. Ravi Palaparthi, Founder and Principal, Anagha Consultants LLC Dr. Abhay kumar, CMD , NanOlife, Chennai (TN) abhya@nanolife.in Mr. Ranganathan, Prof Satish Dhawan Scientist,Programme Director, Capacity Building, ISRO Sriharikota	Dr. Avijit Ghosh Dr. Sanjay Bharadwaj	**Zoom Meeting Link** https://us02web.zoom.us/j/85428938143 You Tube: https://youtu.be/g-ER9gy-An0

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		Moderator: Mr. Praveen Saxena, Vice President, IIChE, Director & CEO Blast Carboblocks Pvt, Ltd praveensaxena1951@gmail.com		
12:00-14:00	Inauguration	DACD Dhirubhai Ambani Commemoration Day (DACD) **Chief Guest** Dr. Renu Swarup Secretary, Department of Biotechnology, GOI **Guest of Honours:** Prof. V. V. Basava Rao, President, IIChE Padma Shri Prof. G.D Yadav, Former President & Former Vice Chancellor ICT Mumbai	Dr. Avijit Ghosh Dr. Madhu Agarwal	**Join Zoom Meeting** https://us02web.zoom.us/j/84926373609 Meeting ID: 849 2637 3609 Passcode: 450217 **YouTube:** https://youtu.be/JDQXexktRyA
	DACD Orator	Distinguished Speakers: Dr. Renu Swarup Secretary, Department of Biotechnology, Govt. of India Title of the Talk: New Emerging Technologies & Tools : Driving the Bioeconomy Growth		
17:00-19:00	**AGM**	University College of Technology , Osmania University, Hyderabad	IIChE-HQ	

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Day 3: December 29, 2020 (Tuesday)

Time (hrs)	Program	Name of the program/ Chair Persons/ Coordinator	Name of Coordinator(s) / Volunteer (s)	Meeting Link
10:00-11:30	***Panel discussion on- Vocal for Local: A Necessity for the Country's Growth***	Dr. Paresh Trivedi, MD , CHEMBOND Polymers & Materials Ltd. Mumbai paresh.trivedi@dfpcl.com Shri. Hari Krishna Chaudhary, Chairman, Vikram Solar Chairman, Vikram India Ltd. Chairman, Heritage Group of Institutions Chairman BRCM Group of Institution Sh V.K Soni, Director (Technical) Gujarat Flurochemicals Ltd, Delhi vksoni@gfl.co.in Dr. Disha Ahuja, MD , Ahuja Green Technologies Pvt. Ltd. Hyderabad dishaahuja@aespl-india.com Sh Vijay Agarwal, MD, Macleods Pharma Mumbai vijay@macleodspharma.com Dr. Anuya Nisal, Principal Scientist - National Chemical Laboratory (NCL) and Founder , BiolMed Innovations Pvt Ltd., Pune aa.nisal@ncl.res.in	Dr. Sanjay Bharadwaj	**Join Zoom Meeting** https://us02web.zoom.us/j/83021887655 Meeting ID: 830 2188 7655 Passcode: 460731 **YouTube Link:** https://youtu.be/scH7CAMrGkU

NMN (01): Nanomaterials and Nanotechnology, Polymers & Composites; **EEN (02):** Energy and Environment: Solar/Biomass/Fuel Cell/Hydrogen Energy/Li-ion Battery/Conventional and Non-conventional energy, Wastewater Treatment; **BFT (03):** Bio-process Engineering, Biomedical Engineering, Food Technology; **PRP (04)**: Petroleum Refining & Petrochemicals; **PMS (05):** Process Modeling, Simulation & Optimization; **GCH (05):** Green Chemistry and Industrial Chemistry; **OCH (06):** Others area of Chemical Engineering like Advanced Separation Processes, Catalysis Process Intensification & Process Automation (OCH)

CHEMCON-2020

		Dr. Nilay J. Lakhka, Founder & CEO, SynThera Biomedical Pvt Ltd **Moderator: Mr. Praveen Saxena,** Vice President, IIChE, Director & CEO Blast Carboblocks Pvt, Ltd praveensaxena1951@gmail.com		
14:00-15:00	**1st Council Meeting for 2021**	University College of Technology , Osmania University, Hyderabad	IIChE HQ	
16:00-18:00	***Award Ceremony and Valedictory Program***	**Chief Guest:** **Prof. Georges Belfort, US National Academy of Engineering** **Guest of Honours:** Shri. Raj Nair, Chairman, Avalon Consulting Ltd. Email: raj.nair@consultavalon.com Dr. K. Sainath, Managing Director, Clair Engineers Pvt. Ltd. ksainath@clair.in Chairpersons: Prof. V.V. Basava Rao, President IIChE Prof. M. V. Rao, VP IIChE Mr. Praven Saxena, VP IIChE	Dr. Avijit Ghosh Dr. Sanjay Bhardwaj	**Join Zoom Meeting** https://us02web.zoom.us/j/89752250097 Meeting ID: 897 5225 0097 Passcode: 030959 YouTube Link: https://youtu.be/YLryRZqr07w

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YouTube LIVESTREAM

https://youtu.be/hogrkDYCms0

Inaugural Program: 27th December 2020 at 9:30 AM

Jointly Organized by

LIVE

Indian Institute of Chemical Engineers, Headquarters & Hyderabad Regional Centre, IIChE

Chief Guest
Prof. K. Vijay Raghavan,
Principal Scientific Adviser
Government of India

Guest of Honour
Padmshini Prof. G.D.Yadav
Former Vice Chancellor, ICT Mumbai,
Former President, IIChE

Guest of Honour
Prof. S. Venkateshwar
Former President, IIChE

Guest of Honour
Shri. Satyanarayana, Chairman,
Inventaa Industries Pvt. Ltd

zoom

https://us02web.zoom.us/j/82639198742

Prof. V. V. Basava Rao
President, IIChE

Prof. M. V. Rao
Vice President, IIChE

Shri. Praveen Saxena
Vice President, IIChE

Dr. Sanjay Bhardwaj
Organizing Secretary,
CHEMCON 2020

Dr. Avijit Ghosh
Organizing Secretary,
CHEMCON 2020

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CHEMCON 2020

Memorial Lectures

Jointly Organized by

Indian Institute of Chemical Engineers, Headquarters & Hyderabad Regional Centre, IIChE

Date: 27th December, 2020

Time: 14:30 – 17:00 Hours

Meeting Link: Join Zoom Meeting: https://us02web.zoom.us/j/83929485859

Time: 14-15:15 hrs

Aker Powergas's Prof. N. R. Kamath and Mrs. Ruzena Kamath Memorial Lecture

Dr. R.R Sonde, VP, Thermax

Time: 15:30-16:15 hrs

Inventaa C K Murthy Memorial Lecture

Prof. Debangsu Bhattacharya, West Virginia University, USA

Time: 16:15 – 17:30 hrs

Dr. H. L. Memorial Lecture

Prof. Bala Subramaniam University of Kansas (KU) USA

Prof. V. V. Basava Rao
President, IIChE

Prof. M. V. Rao
Vice President, IIChE

Mr. P.K.Saxena
Vice President, IIChE

Dr. Sanjay Bhardwaj
Organizing Secretary
CHEMCON 2020

Dr. Avijit Ghosh
Organizing Secretary
CHEMCON 2020

CHEMCON 2020

Panel Discussion on Atma-Nirbhar Bharat: Role of Engineers towards Indigenization

Jointly Organized by

Indian Institute of Chemical Engineers, Headquarters & Hyderabad Regional Centre

Distinguished Panel Members

Shri. P.D. Samudra
MD, Thyssenkrupp India Pvt Ltd
Mumbai

Shri. Pradip Agarwal
CEO, Heritage Group of Institutions
Kolkata

Dr. Disha Ahuja, MD
Ahuja Green Technologies Pvt Ltd.
Hyderabad

Dr. Ravi Palaparthi
Founder and Principal
Anagha Consultants LLC

Dr. Abhay Kumar
CMD , NanOlife
Chennai (TN)

Shri. V. Ranganathan
Programme Director
ISRO, Sriharikota

President

Prof. V. V. Basava Rao
President, IIChE

Coordinator & Moderator

Shri. Praveen Saxena
Vice President,
IIChE, Director & CEO
Blast Carboblocks Pvt, Ltd

Organizing Secretaries

Dr. Avijit Ghosh
Honorary Secretary, IIChE HQ

Dr. Sanjay Bhardwaj
Chairman, IIChE-HRC

zoom YouTube LIVESTREAM LIVE

Zoom Meeting Link: https://us02web.zoom.us/j/85428938143

28th DEC 2020 10 AM 11:30AM

Reliance
Industries Limited

"Shri. Dhirubhai Ambani Commemoration Lecture"

28th December 2020

CHEMCON 2020

Reliance
Industries Limited

"Shri. Dhirubhai Ambani Commemoration Lecture"

28th December 2020

Guest of Honour
Padmshri Prof. G.D.Yadav
Former Vice Chancellor, ICT Mumbai,
Former President, IIChE

Chief Guest
Dr. Renu Swarup
Secretary, Department of Biotechnology, Govt. of India

Guest of Honour
Prof. V. V. Basava Rao
President, IIChE

CHEMCON 2020

Panel discussion on Vocal for Local: A Necessity for the Country's Growth

Jointly Organized by

Indian Institute of Chemical Engineers, Headquarters & Hyderabad Regional Centre, IIChE

Distinguished Panel Members

Dr. Paresh Trivedi
MD, CHEMBONDPolymers & Materials Ltd., Mumbai

Shri. V.K Soni
Director (Technical) Gujarat Flurochemicals Ltd, Delhi

Dr. Rajkumar
Director, Indian Rubber Manufacturer Research Association

Shri. H K Chaudhary
Chairman, Vikram Solar Ltd., Chairman Vikram India Ltd., Chairman Heritage Group of Institutions, Chairman BRCM Group of Institutions

Dr. Anuya Nisal
Principal Scientist National Chemical Laboratory (NCL) and Founder, BiolMed Innovations Pvt Ltd., Pune

Dr. Nilay J. Lakhkar
Founder & CEO
SynThera Biomedical Pvt. Ltd.

Shri. Vijay Agarwal
MD, Macleods Pharma
Mumbai

President

Prof. V. V. Basava Rao,
President, IIChE

Coordinator & Moderator

Shri. Praveen Saxena,
Vice President, IIChE, Director & CEO
Blast Carboblocks Pvt, Ltd

Organizing Secretaries

Dr. Avijit Ghosh,
Honorary Secretary, IIChE HQ

Dr. Sanjay Bhardwaj,
Chairman, IIChE-HRC

zoom YouTube LIVESTREAM LIVE

Zoom Meeting Link: https://us02web.zoom.us/j/83021887655
YouTube Link: https: //youtu.be/scH7CAMrGkU

29th DEC 2020 10 AM 11:30AM

CHEMCON 2020

Award Ceremony and Valedictory Session

Jointly Organized by

Indian Institute of Chemical Engineers, Headquarters & Hyderabad Regional Centre, IIChE

YouTube LIVESTREAM

Date: 29th December, 2020
Time: 16:00 – 18:00 Hours
Meeting Link: Join Zoom Meeting: https://us02web.zoom.us/j/89752250097

LIVE

YouTube Link: https://youtu.be/YLryRZqr07w

Plenary Lecture By Prof. Georges Belfort, US National Academy of Engineering

Chief Guest
Prof. Georges Belfort, US National Academy of Engineering

Guest of Honour
Shri. Raj Nair, Chairman, Avalon Consulting Ltd.

Guest of Honour
Dr. K. Sainath, Managing Director, Clair Engineers Pvt. Ltd.

Guest of Honour
Prof. P. De, Former President

Prof. V. V. Basava Rao
President, IIChE

Prof. M. V. Rao
Vice President, IIChE

Mr. P.K.Saxena
Vice President, IIChE

Dr. Sanjay Bhardwaj
Organizing Secretary
CHEMCON 2020

Dr. Avijit Ghosh
Organizing Secretary
CHEMCON 2020

Indian Institute of Chemical Engineers – A Profile

Indian Institute of Chemical Engineers (IIChE) was born in the year of Indian Independence when the country was fomenting with nationalistic inspirations. Dr Hiralal Roy, the great visionary and pioneer of chemical engineering education in India, along with a few other stalwarts, mooted the idea of having such a forum in the country to rear the nascent initiatives for spreading chemical engineering education and fostering the interest of the profession.

A modest beginning was made on 18 May 1947 in one room of Jadavpur University, Kolkata, with as few as 30 members and with little fund and infrastructure. The IIChE has come a long way since. Today, with over 26,000 members on its roll, the Institute has emerged as an important national platform overseeing the interest of the academics and the industry in the multifarious fields of chemical engineering. Its activities are spread across the country through its HQ and 42 Regional Centres as well as 168 Student Chapters.

Objectives

Over the years the Institute has developed a distinct profile of its own. Even as the IIChE is always moulding itself and playing a proactive role to keep up with the ever-changing needs of the society and the economy, the basic objectives remain largely unchanged since its inception. One may shortlist them as:

- To promote advancement of Chemical Engineering Science and draw up a code of ethics in the profession.
- To maintain and widen contacts with chemical engineering professionals in India and abroad and ensure regular exchange of ideas with other national and international professional institutes in this field.
- To act as an authoritative body on matters pertaining to the teaching and the profession of chemical engineering.
- To conduct examinations and assist persons engaged in the industry to qualify as chemical engineer.
- To confer awards, diplomas and certificates to such persons as may be deemed fit.
- To undertake publication work, i.e., journal, newsletter, monographs, proceedings of seminars/symposia/workshops as well as conduct meetings and transact business on administrative, academic and technical matters relating to the profession.

Administration

The Institute is governed by a 25-member elected Council. The functionaries of the Council comprise the President, two Vice-Presidents, a Secretary and a Joint Secretary, the Treasurer, the Editor, the Registrar and the Controller of Examinations.

The day-to-day function is carried out with the assistance of the staff at the Institute headquarters in Kolkata. The HQ, located in a five-storied building of its own at the Jadavpur University campus, houses a well-stocked library, an R&D laboratory and a modern auditorium among various other facilities.

Regional Centres

Forty-two (42) Regional Centres of IIChE, spread across the country, promote and complement the activities and objectives of the Institute within their respective territorial limits. The Regional Centres are accountable to the Council while enjoying autonomy within their own realms.

The activities of the Regional Centres include organizing meetings, conferences and seminars; arranging workshops, refresher courses and counseling sessions; promoting research; guiding chemical engineering students in career planning; and initiating any other activities which are of social, technical and professional relevance to their members. They serve as open fora for their members who regularly gather for informal get-togethers and exchange of notes. The Regional Centres also confer awards, prizes and scholarships.

Student Chapters

Student Chapters of the IIChE under the auspices of the local Regional Centres can be formed at any recognized educational institute that offers undergraduate degrees in Chemical Engineering. The Student Chapters guide its members in career choice and arrange lectures, seminars, short courses, plant visits, etc., at regular intervals to better equip and empower the students when they come out of their academic precincts. Academic activities apart, Student Chapters organize cultural events and sports activities for their members. At present, 168 Student Chapters are functioning at various engineering institutes across the country.

Activities

Skill and Knowledge Development

Associate Membership Examination: One of the primary objectives of the Institute is enhancement of skill in Chemical Engineering and its allied fields. Besides regularly organizing workshops, seminars and lectures towards this end, the Institute has been conducting Associate Membership Examination two times a year –March and September – since 1960. The examination is meant for those working in chemical and allied industries as unskilled workers, having a diploma in engineering or a degree in science, but who do not have a degree in Chemical Engineering. This examination offers them an opportunity to qualify as skilled chemical engineers.

Online Summer Internship Program-2020 (OSIP-2020)

IChE has embarked on a novel initiative, namely, 'Online Summer Internship Program-2020 Online Summer Internship Program-2020 (OSIP-2020)' on 23 May 2020. The Internship program continued in batches till 31 July 2020. With 13 Course Coordinators and 65 Subject Experts, It has covered nine subjects, namely, i. Zero Liquid Discharge Management, ii. Six Sigma Training, iii. Chemical Process Technology, iv. Biochemical Process, v. Process Safety Management, vi. Petroleum Refinery Engineering, vii. Petrochemical Engineering, viii. Biochemical and Biomedical Engineering, and, ix. Biochemical Process. The program has evoked tremendous response among the students. Crtificates were issued to the students who had submitted Assignment Report at the completion of the program. The program will be continued with further updates and improvements.

A partner in FICCI Initiative

IIChE has joined a FICCI (Federation of Indian Chambers of Commerce & Industry) initiative, titled Chemical and Petrochemical Sector Skill Council (CPSSC), which has been developed with a view to easing out potential crisis of skilled manpower in the chemical and petrochemical sector. This is a public-private initiative and IIChE is one of the 14 supporting organizations for developing skill and human resources in the country in partnership with FICCI.

IIChE has also been partnering with FICCI to hold highly successful annual programmes, such as, India Chem and Chemtech in Mumbai.

Publications

The Institute publishes a quarterly journal, *Indian Chemical Engineer* (*ICE*), which has been the Institute's main organ since 1959. Even before that, *Transactions of Chemical Engineers* was regularly published between 1948 and 1958.

The Special Issues of ICE are rich sources of information with contributions from noted academics and industry bigwigs. Extensively focusing on a topical issue in vast arena of Chemical Engineering, these are much sought after by professionals and students for future reference. The journal's Editorial Board and the International Advisory Board include eminent professors and scientists in India and abroad as its members.

The Institute has entered into an agreement with Taylor & Francis, a UK-based and internationally renowned publishing house, for publication of *ICE* w.e.f. 1 January 2011 with a view to obtaining better impact factor for the journal. The authors can submit their papers online and Life Members can view/download the journal online, free of cost, subject to submission of valid/correct email ID to the IIChE HQ.

In addition to *ICE*, the Institute also publishes a quarterly News Letter for circulation among Life Members of IIChE. It comes in an attractive package with each issue containing expert write-ups, professional and research guidelines, important updates on the chemical/petrochemical/bioengineering industry fronts, research developments, environmental topics, etc. Side by side, it also publishes detailed news about in-house activities and achievements of the members.

Research and Developments

The Institute is recognized by the Department of Science and Technology, Government of India, as a Scientific and Industrial Research Organization. Some of the major R&D projects concluded by the Institute in recent times include:

- A Technical Report prepared by inspecting the affected site of Dhunseri Petrochem & Tea Ltd. (South Asian Petrochem), Haldia.
- Parametric optimization and control of semi batch reactor for sulfonation process.
- Green route synthesis of Cadmium sulfide quantum dots.
- Treatment of coke oven waste water using hybrid technology.
- Flow of emulsion through porous media.
- Supercritical fluid extraction of natural products from various plant residues.

Research Work on the 'Adsorptive removal of pollutants from synthetic waste water' was carried out by Mr Sandip K Ghosh, Assistant Secretary – Research & Professional Development, IIChE with the permission obtained from his employer. The research work was carried out at the Department of Chemical Engineering, University of Calcutta under the supervision and guidance of Prof. Amitava Bandyopadhyay, a Life Member of IIChE.

Research Projects Taken Up in Recent Years

IIChE undertakes research works by providing research fund to the tune of Rs.5.0 lakhs for each project, totaling Rs.15.0 lakhs for a period of 3 (three) years. Sanctioned projects for FY 2018-19 to FY 2020-2021 are as follows:

i. Development of economically viable peeling and dissolution process for active cathode of the lithium-ion batteries. PI: Dr Ravi Methekar, Visvesvaraya National Institute of Technology, Nagpur.
ii. Development of an Economic Appliance for household Waste Disposal. PI: Dr Madhusree Kundu, National Institute of Technology, Rourkela.
iii. Design and Development of MnO_2 – Nitrogen Doped Biomass-based Graphene-PEDOT as Electrode Materials for Electrochemical Energy Storage Applications. PI: Dr. R. Saravanathamizhan, Anna University, Chennai.

R&D Vision

IIChE has also evolved an R&D Vision 2030 with a view to gradually working towards a low-carbon sustainable economy and society. In order to encourage fundamental research initiatives within this framework, certain core areas have been shortlisted, i.e., Nanotechnology, Micro-reactor, Bio-refinery, CO_2 capture and sequestration, Conversion of CO_2 to useful chemicals, Artificial intelligence in chemical processes, etc.

Professional Meets

CHEMCON

The Annual Session of the Institute, popularly known as the Indian Chemical Engineering Congress (CHEMCON), is the most important event in the calendar of the IIChE. Held every December at one of its centres, the four-day CHEMCON features a host of events, which include memorial lectures, plenary lectures, seminars, symposia, panel discussion, exhibitions, etc. To the Indian chemical engineering fraternity in the country and abroad, CHEMCON offers the most attractive platform, ensuring four days of intensive interface with the best of brains – national and international – in chemical engineering and allied fields.

Three memorial lectures, namely Dr H L Roy Memorial Lecture (the Founder President), Prof N R Kamath Memorial Lecture (a distinguished professor associated with the University Institute of Chemical Technology, Mumbai, and IIT, Mumbai), and C K Murthy Memorial Lecture (an accomplished chemical engineer who passed away prematurely) set the tune of every CHEMCON. These lectures are delivered by the who's who of academia, elite research establishments and the corporate world in the national and international circuit and they are a veritable treasure trove of knowledge. CHEMCONs are often held in collaboration with premier chemical engineering bodies of

the USA, UK, Australia, Canada, etc, who send large delegations, hold joint symposia/seminars and take part in meaningful dialogue.

Lectures by CHEMCON Distinguished Speakers and international symposia are the other prestige events, where one gets access and exposure to the latest happenings in the ever-expanding domain of chemical engineering.

CHEMCON 2019 was organised in New Delhi during 15 – 19 December 2019. It was jointly organised by the Northern Regional Centre of IIChE; the Department of Chemical Engineering, IIT Delhi; Indian Oil Corporation Ltd. (Industry Partner) and European Federation of Chemical Engineering (International Partner). The central theme for the event was 'Seamless Chemical Engineering in Service of Humanity: Innovations, Opportunities and Challenges'.

CHEMCONS apart, the Institute HQ, the Regional Centres and the Student Chapters organize seminars, workshops, refresher courses and so on round the year to update the students and the professionals with the latest developments in the profession.

Dhirubhai Ambani Commemoration Day

Every year 28th December is observed as Dhirubhai Ambani Commemoration Day on the occasion of his Birth Anniversary of the late Shri Dhirubhai Ambani and the Dhirubhai Ambani Oration on varied topics is delivered by eminent personalities of the country to celebrate the occasion.

S CHEMCONS

A national programme for the students of chemical engineering in line with CHEMCON was introduced in 2005. Popularly known as Students' CHEMCON (SCHEMCON), it acts as a source of encouragement and self-confidence to young minds, which is considered as the most fertile ground for generation of original and creative ideas. The first SCHEMCON was organised during 7 to 9 December 2005 at IIT-Guwahati jointly by the Student Chapters at IIT-Guwahati and Assam Engineering College, both newly formed at that period. Over the years, the response received from the students of chemical engineering in general to participate in this programme has been phenomenonal. SCHEMCON 2019 was organized by the Student Chapter at the Department of Chemical Engineering, Shroff S R Rotary Institute of Chemical Technology, Gujarat under the aegis of the Ankleshwar Regional Centre of IIChE on 17 and 18 October 2019.

Awards / Prizes

Each year the Institute confers a large number of awards and prizes to honour eminence as well as to nurture young talents. These awards have been instituted with endowments from leading industry houses, media enterprise and R & D organizations. The awardees indeed cover a wide spectrum – revered scientists, esteemed industrialists, respected academics, meritorious students and research scholars, etc. Ten national awards are given in recognition of overall excellence and original contribution to the domain of chemical engineering. Fourteen awards have been instituted to acknowledge lifelong service to the profession of chemical engineering, striking innovations, original papers published in the Institute journal and other international journals of repute, etc. Eighteen CHEMCON Distinguished Speaker Awards, associated with the names of renowned academics and

scientists, are conferred every year, the awardees being the crème of academia and industry. Thirteen awards have also been instituted to encourage and support under-graduate, post-graduate students and research scholars. The list of awards would indeed impress even the greatest sceptic.

Besides the HQ, Regional Centres of the Institute have also instituted a number of awards to encourage professional excellence. Some of the Regional Centres also offer scholarships and research fellowships to students and research scholars, pursuing studies in their respective geographical region.

Membership

The IIChE welcomes all into its fold – the aspiring chemical engineers of the future as well as veterans with vast experience. The membership of the Institute in itself is an accomplishment that stands one in good stead in one's future career. The horizon of chemical engineering is fast widening with newer disciplines merging with it and new ideas emerging. As a member of the Institute, one gets plenty of opportunities to share the platform with many well-known academics and established professionals in one's field. These interactions help one to constantly update and equip oneself so as to keep pace with the fast-changing professional scenario. Equally important, as one becomes a member of this network of fellow professionals with multifarious connections, one can derive rich dividends to further one's professional goals.

Those engaged in the manufacture/processing in chemical industry or employed in teaching or research in chemical engineering and allied fields can become Fellow, Member or Associate Member of the Institute, fulfilling certain criteria. The undergraduate students begin with Student Membership and transfer to Associate Membership after they complete their degree course. Chemical/allied industries, research bodies and academic institutes in the field of chemical engineering can also become Organisational Members of the Institute.

Collaborations

The Institute maintains close association with a number of professional bodies at home and abroad. Post-globalisation, the IIChE has embarked on a number of initiatives to become part of a wider network of inter-disciplinary forums and to be more visible in the international chemical engineering circuit.

For long, it has been a member of Bureau of Indian Standards, Asia Pacific Confederation of Chemical Engineering, Australia, and a corresponding member of the European Federation of Chemical Engineering, Germany; the Institution of Chemical Engineers, UK; the American Institute of Chemical Engineers (AIChE) and the Canadian Society for Chemical Engineering (CSChE). Every alternate year, a Student Exchange Programme is held in collaboration with IChemE, UK. The Institute has a close tie with the AIChE as well, organizing joint programmes and offering dual membership at a concessional rate. The Institute is also a permanent invitee to DECHEMA, Germany.

IIChE became the first organization from the developing countries to join the Executive Committee of the World Chemical Engineering Council, which was formed in Melbourne in 2001.

During 2003 - 2004, the Institute forged a collaboration with InnoCentive Inc., a US-based organization, which offers a wide platform to the international scientific community, to work on complex scientific problems and find their solutions.

At the national level, IIChE has been on the Boards of Governors of Engineering Council of India (ECI) since its corporation in 2002. The ECI is the apex body of professional and consulting engineers in India, representing various engineering disciplines. The Institute is also represented at various committees/sub-committees of Bureau of Indian Standards.

Academia-Industry-Institute Interaction

In recent period, many of the Institute's Regional Centres have been engaging themselves with the academia and industries to play a comprehensive role in nurturing talents from a nascent stage. One such successful initiative has been undertaken by the Hyderabad Regional Centre. HRC has conducted first of its kind one-year (full day session on all Sundays for a batch of 50) Certificate Course for Chemists of Dr.Reddys Laboratories (DRL).

For the last few years, Chemical Engineering courses have been losing their popularity among students for supposed lack of career prospects. IIChE has been exploring various projects and programmes to change the scenario. Towards this direction, a concrete step has been taken in association with Engineering Council of India. Two internship models are being developed to update students with skills so that industries can voluntarily employ students at the end of the internship programme.

Industrial Clinic

Small- and medium-scale industries are facing a host of operational problems in India threatening their sustenance and survival. In view of these long-standing hindrances that may affect the health of the national economy in the long run, the Baroda Regional Centre has chalked out a plan for an Industrial Clinic. The projected functions of the clinic will include: i) Constituting an expert group to give advice to the ailing units, ii) Developing a dedicated and interactive web site for the purpose, where the affected units will come forward with their problems and the concerned experts from the Institute will refer back with possible remedies, iii) Initiating web based courses on small and medium scale entrepreneurship. The Council has decided to implement the project in phases through other Regional Centres.

The Institute is ever evolving. It is carving out new niches for itself as well as redefining its traditional profile. As a dynamic body, the IIChE wants to keep all its doors open, welcoming new members, new ideas and new visions in its journey forward.

Xxxxxxxxxxxxx

Indian Institute of Chemical Engineers
Hyderabad Regional Centre (IIChE – HRC)

The Indian Institute of Chemical Engineers (lIChE) with its Head office at Kolkata and its 42 Regional Centers as well as 168 Student Chapterisspread throughout the country holds National and International conferences, seminars, workshops and meetings so that its members can learn, understand and interact among themselves. Major goals of the lIChE are to promote the advancement of Chemical Engineering Sciences andmaintain professional standards among its members. Further, it acts as an authoritative body on matters concerning the teaching and theprofession of chemical engineering as well as publishes journal, newsletter, monographs, proceedings of conferences/seminars/workshops etc.

Hyderabad Regional Centre (HRC) with its office at 3-6-237/611, La'BuiIde, Lingapur House, Himayath Nagar has been involved in manyactivities such as organizing conferences, seminars, lectures and conducting industrial tours etc. HRC has successfully conducted three AnnualIndian Chemical Engineering Congress CHEMCON in the years 1970, 1986 and 2002 respectively. CHEMC0N-2002 conducted by the HRCunder the stewardship of Dr. K. Anji Reddy, Dr. K.V. Raghavan and Prof. S. Venkateshwar was a trendsetter in many ways and was agrand success, and once again demonstrated the organizational capabilities of the HRC. HRC has organized several National Seminars onmultiple themes relevant to chemical engineering professionals and students.

Recognizing the accomplishments of IIChE-HRC, Indian Institute of Chemical Engineers (IIChE) has conferred Best Regional Centre Award (Category “A”) 2019 on the IIChE – HRC.

Catch them young is slogan, which is apt for a professional body and therefore, the students - who are going to be the pillars of ourprofession –aremotivated through innovative schemes. Scientific Model Making competition has been initiated this year.

In the past years, HRC has been conducting number of programs forthe student chapters affiliated toit and the prizes have been given away under the endowment schemes of Dr.BV Raju, Mr. Allam Pandu and Prof. V. Gopalakrishna. Mr. Anantha Chary, CMD, Elbit Medical Diagnostic Limited has also instituted endowment fund with HRC for the promotion and awareness of Chemical Engineering and to provide a platform for exchange of ideasin memory of his father Late Mr. M P Chary.

Student Chapters of IIChE-HRC are as follows:

- University College of Technology, Osmania University, Hyderabad
- Dept. of Chemical Engineering, National Institute of Technology, Warangal
- Dept.of ChemicalEngineering, Chaitanya Bharathi Institute of Technology, Hyderabad
- Dept.of Chemical Engineering, Padmasri Dr. B.V. RajuInstitute of Technology, Medak
- Dept. of Chemical Engineering, Anurag University, Ghatkesar, Hyderabad
- Dept. of Chemical Engineering, BITS Pilani, Hyderabad Campus, Hyderabad
- Dept. of Chemical Engineering, JNTU College of Engineering, Hyderabad
- Dept. of Chemical Engineering, JNTU College of Engineering, Anantapur
- Dept. of Chemical Engineering, Rajiv Gandhi University of Knowledge Technologies (Student Chapter Started in 2020)

Indian Institute of Chemical Engineers – Hyderabad Regional Centre (IIChE – HRC)
Executive Committee (2019 -2021)

S.No.	Name	Position
1.	Dr. Sanjay Bhardwaj	Chairman
2.	Sri C.P. Ramulu	Vice Chairman
3.	Prof. P. Shashikala	Vice Chairperson
4.	Sri M. Misra	Secretary
5.	Sri S. Ilaiah	Joint-Secretary
6.	Sri D.N. Singh	Treasurer
7.	Sri MGV Chalapathi Rao	EC member
8.	Sri M. Ranga Rao	EC member and Chair, Student Chapters
9.	Sri E. Venkatesham,	EC member
10.	Dr. M. Mukunda Vani	EC member and Co-chair, Student Chapters
11.	Sri Ch. Appa Rao	EC member
12.	Dr. Vineet Aniya	EC member
13.	Sri. Arun Anand	Co-opted Member
14.	Sri Baidurjya Nath	Co-opted Member

INDIAN INSTITUTE OF CHEMICAL ENGINEERS - HYDERABAD REGIONAL CENTRE (IIChE – HRC)

Chairmen / Chairpersons and Secretaries

PERIOD	CHAIRMAN	HON.SECRETARY
1959-1961	Dr. S. Hussain Zaheer	Dr. Y. Venkatesham
1961-1962	Dr. Y. Venkatesham	Dr. R. Kaparthi
1962-1963	Dr. B.S. Kulkarni	Dr. Asgar Hussain
1963-1966	Sri. K.V. Srinivasan	Sri. K. Seshacharyulu
1966-1971	Sri. P. Veereshwar Rao	Dr. V. Gopala Krishnan
1971-1972	Sri. D.B.K Murti	Sri Prem Raj Shah
1972-1974	Sri. P. Veereshwar Rao	Sri V. Narayana Swamy
1974-1975	Sri. Y.V.S.S. Murti	Sri V. Narayana Swamy
1975-1976	Dr. R. Kaparthi	Sri V. Narayana Swamy
1976-1977	Sri. D.B.K. Murti	Sri V. Narayana Swamy
1977-1978	Sri. P.S. Ramachandran	Sri V. Narayana Swamy
1978-1980	Dr. P.S. Murti	Dr. P. Sadasiva Rao
1980-1981	Dr. P.S. Murti	Sri V. Narayana Swamy
1981-1983	Sri M.R. Krishnaiah	Sri M. Mohan Reddy
1983-1984	Dr. Asgar Hussain	Sri M. Mohan Reddy
1984-1985	Sri T.K.K. Krishnan	Sri M. Mohan Reddy
1985-1987	Sri T.K.K. Krishnan	Sri Prem Kumar Mathur
1987-1988	Sri M.R. Krishnan	Sri Prem Kumar Mathur
1988-1989	Sri V. Kumar	Dr. S. Pullaiah
1989-1990	Sri Y.V.S.S. Murti	Dr. S. Pullaiah
1990-1991	Dr. A.A. Khan	Dr. S. Venkateshwer
1991-1995	Sri G.K. Raju	Dr. S. Venkateshwar
1995-1996	Sri M. Mohan Reddy	Dr. T. Sankarshana
1996-1998	Sri S.M. Rao	Dr. S.S. Sridharan
1998-1999	Dr. S. Venkateshwar	Mr. M.G.V. Chalapathi Rao
1999-2000	Dr. S. Venkateshwar	Dr. V.V. Basava Rao
2000-2001	Sri G.V. Sethuraman	Dr. V.V.BasavaRao
2001-2002	Sri G.V. Sethuraman	Sri B. Balakishan
2002-2003	Sri G.V. Sethuraman	Sri B. Balakishan
2002-2004	Dr. T. Sankarshana	Sri M. Ranga Rao

2004-2005	Sri A. Bhasker Reddy	Sri M. Ranga Rao
2005-2006	Sri A. Bhasker Reddy	Dr. R. Shyam Sunder
2006-2008	Prof. S. S. Sridharan	Dr. R. Shyam Sunder
2008-2010	Sri M.G.V. Chalapathi Rao	Dr. Ch. Sailu
2010-2012	Sri. V. Sridharan	Sri. M. Ranga Rao
2012-2013	Dr. R Shyam Sunder	Dr. R. Sreedhar Rao
2013-2014	Mrs. Sheela	Sri E. Venkatesham
2014-2015	Mrs. Sheela	Sri E. Venkatesham
2015-2016	Dr. Vijay Kale	Sri M. Misra
2016-2017	Dr. Vijay Kale	Sri M. Misra
2017-2018	Mrs. Sheela	Dr. Sanjay Bhardwaj
2018-2019	Mrs. Sheela	Dr. Sanjay Bhardwaj
2019-2020	Dr. Sanjay Bhardwaj	Sri M. Misra
2020-2021	**Dr. Sanjay Bhardwaj**	**Sri M. Misra**

ABOUT CHEMCON - 2020

The Indian Chemical Engineering Congress (CHEMCON), which marks the Annual Session of the Indian Institute of Chemical Engineers, is the most important and popular event in the annals of the IIChE. Organized in the month of December, CHEMCON is a spectacle comprising multiple events including Memorial Lectures, Plenary Lectures, Seminars, Symposia, Panel Discussion, Exhibitions, etc.

This year, in the wake of the unrelenting Covid-19 crisis, IIChE has been compelled to depart from the customary format. Consequently, the IIChE Headquarters and IIChE-HRC will jointly organize CHEMCON 2020 on the digital platform during 27 – 29 December 2020.

CHEMCON 2020 will feature the three signature Memorial Lectures, i.e., DhirubhaiAmbani Commemoration Celebration Lecture, Dr. H.L. Roy Memorial Lecture sponsored by Jacobs, Aker Powergas's Prof. N R Kamath and Mrs. Ruzena Kamath Memorial Lecture, Inventaa C K Murthy Memorial Lecture, on 27th December, 2020.

Continuing with the long tradition, the Memorial Lectures will be delivered by the who's who of academia, elite research establishments and the corporate world in the national and international arena. Dr. H. L. Roy Memorial Lecture will be delivered by Prof. Bala Subramaniam, University of Kansas USA, Aker Powergas's Prof. N. R. Kamath and Mrs. Ruzena Kamath Memorial Lecture by Dr. R.R. Sonde, Executive Vice President, Thermax Limited, and Inventaa C. K. Murthy Memorial Lecture by Prof. Debangsu Bhattacharyya, West Virginia University USA.

Conference Objectives

Lectures by CHEMCON Distinguished Speakers and international symposia are the other prestige events, where one gets access and exposure to the latest happenings in the ever-expanding domain of chemical engineering.

All areas in Chemical Engineering

1 Nanomaterials and Nanotechnology, Polymers & Composites (NMN)
2 Energy and Environment: Solar/Biomass/Fuel Cell/Hydrogen Energy/Li-ion Battery/ Conventional and Non-conventional energy, Wastewater Treatment (EEN)
3 Bio-process Engineering, Biomedical Engineering, Food Technology (BFT)
4 Petroleum Refining & Petrochemicals (PRP)
5 Process Modeling, Stimulation & Optimization (PMS)
6 Green Chemistry and Industrial Chemistry (GCH)
7 Others area of Chemical Engineering like Advanced Separation Processes, Catalysis Process Intensification & Process Automation (OCH)

TECHNICAL SESSIONS

CHEMCON-2020 is the first virtual conference and all the presentations are being organized online.

We have received 220 (two hundred and twenty) abstracts in all areas of Chemical Engineering.

Nano materials & Nanotechnology, Polymers & composites --35

Energy and Environment --67

Bio process Engineering, Bio Medical Engineering & Food Technology-- 24

Petroleum Refining & Petrochemicals-- 9

Process Modelling, Simulation & optimization-- 35

Green Chemistry and industrial Chemistry--8

Other area of Chemical Engineering (Advansed Separation processes, Catalysis, Process Intensification & Process Automation) -- 42

CHEMCON – 2020 – Abstracts of Papers List

S.No.	Session code	No. of papers received
1	NMN	35
2	EEN	67
3	BFT	24
4	PRP	09
5	PMS	35
6	GCH	08
7	OCH	42
	Total	220

All the paper presentations are organized in 22 technical sessions:
12 sessions on the first day and 10 sessions on the second day.

Eminent Experts from all over the Country are identified and placed as Chairpersons for each session to evaluate the presentations and select the best paper in each session. Best paper award is instituted for each session.

Students from various Institutions have volunteered to take active part in the technical sessions. Two students are identified for every session to assist in smooth conduct of the presentations.

S No	Session Name and ID	Faculty Coordinator	Organization
1	NMN -I Abstract ID: OP-01: 01-10	Dr. ShirishSonawane	NITWarangal
2	NMN – II Abstract ID: OP-01:11-20	Dr. ShirishSonawane	NITWarangal
3	EEN- I Abstract ID: OP-02: 01-10	Prof. T. BalaNarsaiah	JNTU, Anantapur
4	EEN- II Abstract ID: OP-02:11-20	Prof. T. BalaNarsaiah	JNTU, Anantapur
5	EEN- III Abstract ID: OP-02: 21-30	Dr. P.V. Naga Prapurna	CBIT, Hyderabad
6	BFT-I Abstract ID: OP-03: 01-10	Prof. KavithaWaghray	OUCT, Hyderabad
7	PRP – I Abstract ID: OP-04: 01-09	Dr. P. Sri Durga	OUCT, Hyderabad
8	PMS-I Abstract ID: OP-05: 01-10	Dr. M MukundaVani, Mrs. P.L.V.N. Sai chandra	Anurag University, Hyderabad
9	PMS-II Abstract ID: OP-05:11-20	Dr. M MukundaVani, Dr. M.B. VenkataRamana Reddy	Anurag University, Hyderabad
10	GCH – I Abstract ID: OP-06: 01-08	Dr. P. Sri Durga	OUCT, Hyderabad
11	OCH– I Abstract ID: OP-07: 01-10	Dr. Prabhakar Reddy	OUCT, Hyderabad
12	OCH– II Abstract ID: OP-07: 11-20	Dr. Prabhakar Reddy	OUCT, Hyderabad

I wish the virtual conference a grand success.

Prof. P Shashikala
Chairperson
Technical Sessions Committee
Chemcon 2020

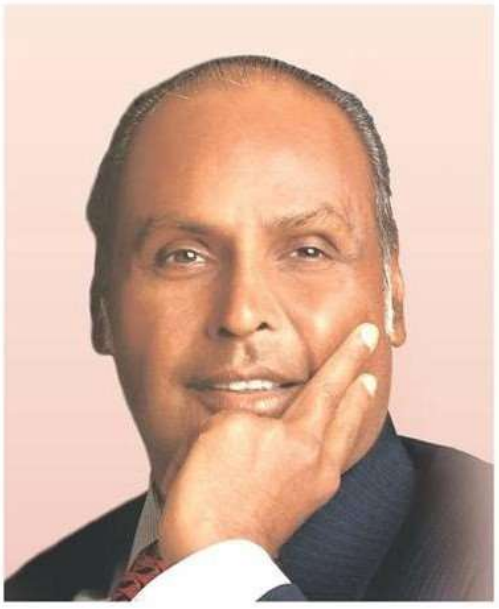
Dhirubhai Ambani Commemoration Day

Shri DhirubhaiAmbani Commemoration Lecture by Dr. RenuSwarup, Secretary, Department of Biotechnology Ministry of Science & Technology, Government of India on Lecture Topic: New Emerging Technologies &Tools: Driving the Bio economy Growth.

IIChE has decided to ensure that the grand tradition of over seven decades remains unbroken and that CHEMCON 2020, the most prestigious event in the realm of Chemical Engineering in India, is organized virtually with the assistance of the Hyderabad Regional Centre for hosting it.

The Dhirubhai Ambani Commemoration Day, to be held on 28 December 2020 to mark the 88th birth anniversary of the late Shri Dhirubhai Ambani, will be a great event of the virtual conference. Padma Vibhushan The Late Shri Dhirubhai Ambani, the Founder Chairman of Reliance Industries Ltd, was an exceptional soul and an outstanding leader, who epitomized the dauntless entrepreneurial spirit. He dared to dream on a scale unimaginable before in Indian industry. His life's achievements prove that backed by confidence, courage, and conviction; one can achieve the impossible. In recognition of his unparalleled contributions to the industry and India at large, the IIChE has been celebrating, since 2004, the 28th December as the Dhirubhai Ambani Commemoration Day and an individual of exceptional qualities and achievement is chosen to deliver the Dhirubhai Ambani Oration. Earlier this lecture was given by Secretaries of DST, DBT, PSA, DG CSIR, Bharat Ratna Prof CNR Rao, Chairmen, DAE, among others.

Reliance
Industries Limited



"Shri. Dhirubhai Ambani Commemoration Lecture"

28th December 2020

Regional Chairpersons & Secretaries of IIChE Regional Centres for the year 2020-21

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40.	**Trivandrum**	**Mr R Muraleekrishnan** Chairman Trivandrum Regional Centre Deputy General Manager PEPF/CSG/PCM Vikram Sarabhai Space Centre Trivandrum –695 022 (Mobile):09446387517 E.Mail: r_muraleekrishnan@vssc.gov.in muralivssc@gmail.com	**Mr S Somanathan** Honorary Regional Secretary Trivandrum Regional Centre Scientist/Engineer QDSM/QRPG/SR Vikram Sarabhai Space Centre Trivandrum – 695 022 (Mobile): 09020954296 EMail: som.pdy@gmail.com s_somanathan@vssc.gov.in
41.	**Vapi**	**Dr Hiten M Bhatt** Chairman Vapi Regional Centre C/o.Precitech Laboratories Pvt Ltd. 1st Floor, Bhanujyot Complex, Plot No. C5/27, B/h Pancharatna Complex, Nr GIDC Char Rasta P.O. VAPI-396 195, Dist.Valsad, Gujarat (Mobile) 09825121185 E.Mail: dr.hmbhatt@precitechlab.com hiten05@yahoo.com	**Mr Shashikant S Pokale** Honorary Regional Secretary Vapi Regional Centre 104, Ekta Tower Asopalav Complex Vapi, Gujarat -396 191 (Mobile): 09737344456 E.Mail: sspokale@yahoo.co.in
42.	**Waltair**	**Prof V S R K Prasad** Chairman Waltair Regional Centre Plot No.28, Prasanti Nagar D.No. 8-4-53, pedawaltair Visakhapatnam – 530 017 (Mobile): 09440120154 E.Mail: prasadvsrkp@gmail.com	**Prof Pulipati King** Honorary Regional Secretary Waltair Regional Centre Head,Department of Chemical Engg A.U.College of Engineering (A) Andhra University Visakhapatnam – 530 003 (Mobile) 09440191017 E.Mail: p_king@rediffmail.com

Annual Sessions and Venues since 1947

YEAR	SESSION	VENUE	YEAR	SESSION	VENUE
1947	Inaugural Session	Patna	1985	38th	Kolkata
1948	1st	Kolkata	1986	39th	Hyderabad
1949	2nd	Mumbai	1987	40th	Sindri
1950	3rd	Bangalore	1988	41st	Baroda
1951	4th	Kolkata	1989	42nd	Trivandrum
1952	5th	Kanpur	1990	43rd	Varanasi
1953	6th	Hyderabad	1991	44th	Chennai
1954	7th	Baroda	1992	45th	Manipal
1955	8th	New Delhi	1993	46th	Mumbai
1956	9th	Kolkata	1994	47th	Kharagpur
1957	10th	Chennai	1995	48th	Kalpakkam
1958	11th	New Delhi	1996	49th	Ankleshwar
1959	12th	Mumbai	1997	50th	New Delhi
1960	13th	Kanpur	1998	51st	Vishakhapatnam
1961	14th	Dalmianagar	1999	52nd	Chandigarh
1962	15th	Varanasi	2000	53rd	Kolkata
1963	16th	Kharagpur	2001	54th	Chennai
1964	17th	Bangalore	2002	55th	Hyderabad
1965	18th	Chandiragh	2003	56th	Bhubaneshwar
1966	19th	Durgapur	2004	57th	Mumbai
1967	20th	Neyveli	2005	58th	New Delhi
1968	21th	Mumbai	2006	59th	Ankleshwar
1969	22th	New Delhi	2007	60th	Kolkata
1970	23th	Hyderabad	2008	61st	Chandigarh
1971	24th	Kanpur	2009	62nd	Vishakhapatnam
1972	25th	New Delhi	2010	63rd	Annamalai Nagar
1973	26th	Coimbatore	2011	64th	Bangalore
1974	27th	Rourkela	2012	65th	Jalandhar
1975	28th	Kolkata	2013	66th	Mumbai
1976	29th	Vishakhapatnam	2014	67th	Chandigarh
1977	30th	Chandigarh	2015	68th	Guwahati
1978	31st	Cochin	2016	69th	Chennai
1979	32nd	Mumbai	2017	70th	Haldia
1980	33rd	New Delhi	2018	71st	Jalandhar
1981	34th	Chennai	2019	72nd	New Delhi
1982	35th	Vishakhapatnam	**2020**	**73rd**	**Hyderabad**
1983	36th	Pune	**2021**	**74th**	**Bhubaneshwar**
1984	37th	New Delhi	**2022**	**75th**	**Kanpur**

Office Bearers of Indian Institute of Chemical Engineers

Year	President	Vice-Presidents	Honorary Secretaries	Honorary Treasurer	Honorary Registrar	Honorary Editor	Controller of Examinations
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1947	Dr H L Roy						
1948	Dr H L Roy	Dr G P Kane Mr S G Shastri	Mr S Ganapathy	Mr A C Dutta			
1949	Dr H L Roy	Dr G P Kane Mr S K Sircar	Mr S Ganapathy Dr H E Eduljee	Mr A C Dutta			
1950	Dr H L Roy	Dr G P Kane Mr S K Sircar	Mr S Ganapathy Mr B K Mukherji	Mr A C Dutta			
1951	Dr R R Hattiangadi	Dr G P Kane Dr M A Govinda Rau	Mr S Ganapathy Mr B K Mukherji	Mr A C Dutta			
1952	Dr R R Hattiangadi	Dr G P Kane Dr A Nagaraja Rao	Mr S Ganapathy Mr B K Mukherji	Mr A C Dutta	Dr G S Kasbekar	Mr B K Mukherjee	Dr G S Kasbekar
1953	Dr G P Kane	Dr A Nagaraja Rao Dr L A Bhatt	Mr S Ganapathy Mr B K Mukherji	Mr A C Dutta	Dr H E Eduljee	Dr H E Eduljee	Dr H E Eduljee
1954	Dr G P Kane	Dr S K Sircar Dr A Nagaraja Rao	Mr S Ganapathy Mr B K Mukherji	Mr A C Dutta	Dr N A Govinda Rau	Dr N A Govinda Rau	Dr N A Govinda Rau
1955	Mr S K Sircar	Dr L A Bhatt Dr H E Eduljee	Dr B Ghosh Mr B K Mukherji	Mr A C Dutta	Dr P S Mene	Mr B K Mukherjee	Dr P S Mene
1956	Mr S K Sircar	Dr L A Bhatt Dr D S Dhingra	Dr B Ghosh Mr B K Mukherji	Mr A C Dutta	Dr P S Mene	Mr B K Mukherjee	Dr P S Mene
1957	Dr L A Bhatt	Dr G S Kasbekar Dr P S Mene	Dr B Ghosh Dr N K Bose	Mr A C Dutta	Dr M Narasinga Rao	Dr B Ghosh	Dr M Narasinga Rao
1958	Dr L A Bhatt	Dr G S Kasbekar Dr P S Mene	Prof D K Dutta Dr N K Bose	Mr A C Dutta	Dr M Narasinga Rao	Dr N K Bose	Dr M Narasinga Rao
1959	Dr G S Kasbekar	Dr P S Mene Dr C R Barat	Prof D K Dutta Dr N K Bose	Mr A C Dutta	Dr M Narasinga Rao	Dr T K Roy	Dr M Narasinga Rao

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1960	Dr G S Kasbekar	Dr P S Mene Dr C R Barat	Dr B Ghosh Dr O P Kharbanda	Mr A C Dutta	Dr G S Laddha	Dr T K Roy	Dr G S Laddha
1961	Dr H L Roy	Dr P S Mene Mr M B Bhagwat	Prof T K Ghose Dr O P Kharbanda	Dr D C Tapadar	Dr G S Laddha	Dr T K Roy	Dr G S Laddha
1962	Dr H L Roy	Dr M Narsingh Rao Mr M B Bhagwat	Dr K K G Sikchi Dr N K Bose	Prof T K Ghose	Dr G S Laddha	Dr O P Kharbanda	Dr S S Nandapurkar
1963	Dr P S Mene	Dr M Narsingh Rao Dr D C Tapadar	Dr N K Bose Mr N Thandavan	Dr S K Sircar	Dr G S Laddha	Dr O P Kharbanda	Dr D Vankateswarlu
1964	Dr P S Mene	Dr M Narsingh Rao Dr D C Tapadar	Dr D N Ghosh Mr N Thandavan	Dr S K Sircar	Dr G S Laddha	Dr N K Bose	Dr D Vankateswarlu
1965	Prof M N Rao	Dr G S Laddha Prof J D Adhia	Dr D N Ghosh Mr N Thandavan	Dr S K Sircar	Prof N R Kuloor	Dr G S Laddha	Prof N R Kuloor
1966	Prof M N Rao	Dr G S Laddha Prof J D Adhia	Mr N Thandavan Dr R N Mukherjea	Dr S K Sircar	Prof N R Kuloor	Dr G S Laddha	Prof N R Kuloor
1967	Prof J D Adhia	Dr G S Laddha Dr T K Roy	Dr R N Mukherjea Prof B C Chanda	Dr S K Sircar	Prof N R Kuloor	Dr G S Laddha	Dr D Vankateswarlu (upto 30.04.1968) Prof D K Dutt (for rest of the year)
1968	Dr G S Laddha	Dr T K Roy Dr O P Kharbanda	Dr R N Mukherjea Prof B C Chanda	Dr C R Bharat	Prof N R Kuloor	Dr G S Laddha	Prof D K Dutt
1969	Dr T K Roy	Dr S K Mukherjee Mr S D Bhasin	Dr R N Mukherjea Prof B N Srimani	Prof B C Chanda	Prof G S R Narasimhamurthy	Dr G S Laddha	Prof D K Dutt
1970	Dr T K Roy	Dr S K Mukherjee Mr S D Bhasin	Dr D N Ghosh Prof B N Srimani	Prof B C Chanda	Dr M Raja Rao	Mr J P Kapur	Prof D K Dutt
1971	Dr K S Chari	Prof D K Dutt Dr D Venkateswarlu	Prof D N Ghosh Mr N Thandavan	Prof KC Roychowdhury	Dr M Raja Rao	Prof T K Ghose	Prof N K Bose
1972	Dr D Venkateswarlu	Mr J P Kapur Dr A N Roy	Prof D N Ghosh Mr P D Agarwal	Prof KC Roychowdhury	Dr M Raja Rao	Prof T K Ghose	Prof N K Bose

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1973	Mr J P Kapur	Prof N R Kamath Dr N K Bose	Prof D N Ghosh Prof A K Mitra	Prof B N Srimani	Dr K J R Sarma	Prof T K Ghose	Prof R Kaparthi
1974	Prof N R Kamath	Prof D K Dutt Dr Sm Lakshmanan	Prof A K Mitra Prof GSR Narasimhamurthy	Mr P D Agarwal	Dr M S Krishna	Prof T K Ghose	Dr V Gopalakrishnan
1975	Prof N R Kamath	Prof D K Dutt Prof GSR Narasimhamurthy	Prof A K Mitra Prof M Satyanarayana	Prof KC Roychowdhury	Dr D K Guha	Prof T K Ghose	Dr V Gopalakrishnan
1976	Prof D K Dutt	Dr S K Mukherjee Mr A K Basu	Prof A K Mitra Prof M Satyanarayana	Mr U Chatterji	Dr D K Guha	Prof T K Ghose	Dr V Gopalakrishnan
1977	Dr S K Mukherjee	Mr A K Basu Prof M Satyanarayana	Prof A K Mitra Prof K J R Sarma	Mr U Chatterji	Dr K Lakshminarayana	Prof N K Bose	Dr K J R Sarma
1978	Mr A K Basu	Dr N K Bose Mr M Raja Rao	Prof B N Srimani Dr M S Krishna	Mr U Chatterji	Dr C Chiranjivi	Prof N K Bose	Dr K J R Sarma
1979	Prof N K Bose	Mr S D Bhasin Prof GSR Narasimhamurthy	Prof D N Ghosh Prof B N Srimani	Mr S B Dutt	Dr C Chiranjivi	Dr L K Doraiswamy	Prof K K Tiwari
1980	Prof N K Bose	Mr S D Bhasin Prof GSR Narasimhamurthy	Prof B N Srimani Prof A K Mitra	Mr S D Bhasin	Dr C Chiranjivi	Dr L K Doraiswamy	Prof K K Tiwari
1981	Mr S D Bhasin	Prof T K Ghose Prof M Satyanarayana	Prof B N Srimani Prof A K Mitra	Mr S B Dutt	Dr P D Grover	Dr L K Doraiswamy	Prof D N Ghosh
1982	Prof M Satyanarayana	Prof G J V J Raju Mr N R Nandi	Prof B N Srimani Prof A K Mitra	Mr U Chatterji	Dr P D Grover	Dr L K Doraiswamy	Prof D N Ghosh
1983	Prof M Satyanarayana	Prof G J V J Raju Mr N R Nandi	Prof A K Mitra Mr TVK Satyanarayana	Mr U Chatterji	Dr R K Gupta	Dr L K Doraiswamy	Prof D N Ghosh
1984	Prof G J V J Raju	Prof M K Sarkar Mr G S Keshavamurthy	Prof A K Mitra Mr TVK Satyanarayana	Mr U Chatterji	Prof T Gopichand	Prof M Satyanarayana	Prof N K Bose
1985	Dr S K Mukherjee	Prof M K Sarkar Prof R Kaparthi	Prof B N Srimani Prof A K Mitra	Mr U Chatterji	Prof N Subrahmanyam	Prof D K Guha	Prof N K Bose
1986	Prof M K Sarkar	Mr T K K Krishnan Dr A N Dravid	Prof B N Srimani Dr B N Mukhopadhyay	Mr U Chatterji	Prof P Dakshina Murty	Prof A K Mitra	Prof N K Bose

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1987	Mr T K K Krishnan	Dr A N Dravid Dr PVS Namboodiripad	Prof B N Srimani Dr B N Mukhopadhyay	Mr U Chatterji	Prof P Dakshina Murty	Prof A K Mitra	Prof C Venkateshwarlu
1988	Dr A N Dravid	Dr PVS Namboodiripad Mr KN Venkatasubramanian	Prof P Sen Gupta Dr B N Mukhopadhyay	Mr U Chatterji	Prof P Dakshina Murty	Prof A K Mitra	Prof P Sen Gupta
1989	Dr PVS Namboodiripad	Mr KN Venkatasubramanian Prof D K Guha	Dr B N Mukhopadhyay Prof C Venkateswarlu	Mr U Chatterji	Prof M Bhagwanth Rao	Prof A K Mitra	Prof P Sen Gupta
1990	Mr KN Venkatasubramanian	Prof D K Guha Dr B Jagannadhaswamy	Dr B N Mukhopadhyay Prof B B Paira	Mr U Chatterji	Prof R Jagannadha Rao	Prof A K Mitra	Prof B R Maiti
1991	Dr B Jagannadhaswamy (upto April'1991) Mr K P Mohandas Rao (for rest of the year)	Prof K J R Sarma Prof D N Ghosh	Dr B N Mukhopadhyay Prof B B Paira	Mr U Chatterji (upto 28.09.1991) Prof D N Ghosh (for rest of the year)	Prof R Jagannadha Rao	Prof A K Mitra	Dr Rm Muthiah
1992	Prof K K Tiwari	Prof K J R Sarma Prof D N Ghosh	Prof A P Sinha Dr G D Yadav	Dr A S Bhaduri	Prof K Ethirajulu	Prof D D Kale	Mr P G Selvaraj
1993	Prof K K Tiwari	Prof D N Ghosh Mr P K N Panicker	Dr G D Yadav Prof D K Guha	Prof A P Sinha	Prof K Ethirajulu	Prof D D Kale	Mr P G Selvaraj
1994	Mr P K N Panicker	Prof P Sen Gupta Mr J S Vasani	Prof D K Guha Mr Ashok Panjwani	Prof A P Sinha	Prof T R Das	Prof B K Dutta	Prof Y Jagannadha Rao
1995	Mr P K N Panicker	Mr Ashok Panjwani Mr H K Sadhukhan	Mr P G Selvaraj Prof B B Paira	Dr P De	Dr Rm Muthiah	Prof B K Dutta (upto 12.02.1995) Prof P Sen Gupta	Prof Y Jagannadha Rao
1996	Mr Ashok Panjwani	Mr H K Sadhukhan Prof A K Mitra	Dr P De Prof K D P Nigam	Prof A P Sinha	Dr Rm Muthiah	Prof P Sen Gupta	Prof C M Lakshmanan
1997	Dr K V Raghavan	Prof A P Mitra Prof K D P Nigam	Prof B N Srimani Dr P G Rao	Prof B N Mukhopadhyay	Dr Rm Muthiah	Prof S Basu	Dr R K Jha
1998	Prof A K Mitra	Prof K D P Nigam Prof N Subrahmanyam	Prof B N Srimani Prof C Ayyanna	Prof B N Mukhopadhyay (upto 23.07.1998) Mr Smrajit Das (for rest of the year)	Prof B K Guha	Prof S Basu	Prof Ch V R Murthy

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1999	Prof N Subrahmanyam	Prof C Ayyanna Prof B K Guha	Prof B N Srimani Mr Sunil Kapadia	Prof A P Sinha	Prof T R Das	Prof S Basu	Prof Ch V R Murthy
2000	Mr Sunil Kapadia	Mr B M Sharma Prof P V R Iyer	Prof P Sen Gupta Prof S Venkateshwar	Mr Manas Das	Prof T R Das	Prof R K Saha	Prof D V S Murthy
2001	Prof G D Yadav	Prof S K Sharma Prof S Venkateshwar	Prof P De Mr A K Saxena	Prof P Sen Gupta	Dr Rm Muthiah	Prof R K Saha	Mr V K Srivastava
2002	Prof S K Sharma	Mr A K Saxena Dr Rm Muthiah	Prof P De Mr A B Reddy	Prof P Sen Gupta	Prof V K Srivastava	Prof R K Saha	Prof Ch V R Murthy
2003	Dr P G Rao	Mr D M Butala Mr D P Misra	Prof B K Dutta Dr K Sarveswara Rao	Mr Dipak Dutta	Prof V K Srivastava	Prof S Basu	Prof S S Sridharan
2004	Mr D P Misra	Prof S Venkateshwar Prof K Ethirajulu	Prof B K Dutta Mr K Sahasranaman (Jt. Secy)	Mr Dipak Dutta	Dr V S Gangadhar Rao	Prof S Basu	Prof S S Sridharan
2005	Prof B K Dutta	Prof S Venkateshwar Dr V S G Rao	Mr Dipak Dutta Mr Kalyan K Basu (Jt. Secy)	Dr Sudip K Das	Prof P V R Iyer	Prof S Basu	Mr K Sahasranaman
2006	Prof S Venkateshwar	Mr G V Sethuraman Mr K Sahasranaman	Dr Sudip K Das Mr T K Chakraborty (Jt. Secy)	Prof B R Maity	Prof P V R Iyer	Dr Suddhasatwa Basu	Prof V K Rattan
2007	Mr K Venkataramanan	Mr G V Sethuraman Mr Kalyan K Basu	Dr Sudip K Das Mr N M Surana (Jt. Secy)	Mr Smarajit Das	Prof P V R Iyer	Dr Suddhasatwa Basu	Prof V K Rattan
2008	Dr S Ganeshan	Prof V K Rattan Mr Sushil Kumar	Prof Basab Chaudhuri Mr T L Prasad (Jt. Secy)	Mr Smarajit Das	Dr T Kannadasan	Dr S S Bandyopadhyay	Prof V V Basava Rao
2009	Mr Sushil Kumar	Prof V K Srivastava Prof Ch V R Murthy	Prof Basab Chaudhuri Mr N M Surana (Jt. Secy)	Mr B R Saha	Dr M K Jha	Dr A K Saroha	Dr T Viruthagiri
2010	Prof V K Srivastava	Mr A Bhasker Reddy Dr T Viruthagiri	Prof Basab Chaudhuri Mr S I Thakar (Jt. Secy)	Mr B R Saha	Prof Y Jagannadha Rao	Dr A K Saroha	Dr M K Jha
2011	Mr A Bhasker Reddy	Mr K S Rajanandam Mr S I Thakar	Mr B R Saha Mr Praveen Saxena (Jt. Secy)	Dr Ashim K De	Prof Y Jagannadha Rao	Dr A K Saroha	Dr Ajay Bansal
2012	Mr P Vijayraghavan	Prof V K Rattan Mr C P Ramulu	Dr Ashim K De Mr Praveen Saxena (Jt. Secy)	Dr Sudip K Das	Prof G M J Raju	Dr A K Saroha	Prof R Dhanasekar

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2013	Prof V K Rattan	Dr Ajay Bansal Mr Praveen Saxena	Dr Ashim K De Mr M P Jain (Jt. Secy)	Dr Sudip K Das	Prof V V Basava Rao	Dr A K Saroha	Prof G M J Raju
2014	Prof Ch V R Murthy	Dr M K Jha Mr M P Jain	Dr Sudip K Das Prof V V Basava Rao (Jt. Secy)	Mr Smarajit Das (upto 23.02.2014) Dr Swami Vedajnananda	Dr (Mrs) Alpana Mahapatra	Dr A K Saroha	Dr T Kannadasan
2015	Mr G V Sethuraman	Mr D M Butala Prof V V Basava Rao	Prof P De Prof Alpana Mahapatra (Jt. Secy)	Mr Dipak Dutta	Prof S V Satyanarayana	Dr A K Saroha	Prof C Karthikeyan
2016	Mr Shyam Bang	Prof S V Satyanarayana Prof G A Shareef	Prof P De Dr D Mandal (Jt. Secy)	Mr Dipak Dutta	Prof Radha Das	Prof V K Rattan	Prof M V Rao
2017	Prof P De	Prof C Karthikeyan Prof Vinay K Srivastava	Mr Dipak Dutta Prof M V Rao (Jt. Secy)	Mr S I Thakar	Mr Dhawal Saxena	Prof V K Rattan	Dr M Rajasimman
2018	Prof Vinay K Srivastava	Prof S P Chaurasia Dr Ajay Bansal	Prof Sudip K Das Mr M Ranga Rao (Jt. Secy)	Prof M Srinivasa Rao	Mr Dhawal Saxena	Prof Suddhasatwa Basu	Dr M Rajasimman
2019	Prof S V Satyanarayana	Mr D M Butala Prof V V Basava Rao	Prof A Bandyopadhyay Mr M Ranga Rao (Jt. Secy)	Dr G S V Ratnam	Mr Praveen Saxena	Prof Suddhasatwa Basu	Dr M Rajasimman
2020	**Prof V V Basava Rao**	**Mr Praveen Saxena** **Prof M V Rao**	**Dr Avijit Ghosh** **Dr Madhu Agarwal (Jt. Secy)**	**Dr M K Jha**	**Dr Gaurav Rattan**	**Prof Suddhasatwa Basu**	**Dr N Balasubramanian**

Name of the Speakers of three Memorial Lectures of the Institute in the field of Chemical Engineering

Year	Dr H L Roy Memorial Lecture	Prof N R Kamath Memorial Lecture	C K Murthy Memorial Lecture
1977	Dr. H. N. Sethna		
1978	Prof. C. Venkat Rao		
1979	Dr. Atma Rao		
1980	Sri A. L. Mudaliar		
1981	Dr. Raja Ramanna		
1982	Dr. G. S. Sidhu		
1983	Sri S. S. Rangnekar		
1984	Dr. S. Varadarajan		
1985	Dr. Anders Nielsen	Dr. S. Ganguly	Dr. P. Benjamin
1986	Dr. Max Appl	Dr. B. D. Tilak	Dr. N. Bhanuprasad
1987	Prof. M. M. Sharma	Dr. P. K. Iyenger	Dr. A. V. Rama Rao
1988	Dr. L. K. Doraiswamy	Mr. Lovraj Kumar	Prof. R. Kumar
1989	Dr. V. Gowariker	Mr. M. R. Kurup	Prof. N. K. Bose
1990	Dr. R. A. Mashelkar	Dr. P. K. Mukhopadhyay	Prof. T. K. Ghose
1991	Dr. G. S. Laddha	Dr. S. Ramachandran	Dr. T. S. R. Prasada Rao
1992	Dr. T. K. Roy	Prof. S. B. Chandalia	Prof. G. J. V. J. Raju
1993	Prof. R. Kumar	Dr. N. N. Dhuldhoya	Prof. D. T. Wasan
1994	Prof. M. M. Chakraborty	Prof. A. P. Kudchadker	Mr. G. R. Balasubramanian
1995	Dr. R. Chidambaram	Dr. O. P. Kharbanda	Dr. K. V. Raghavan
1996	Dr. P. K. Mukhopadhyay	Dr. K. Anji Reddy	Prof. J. B. Joshi
1997	Sri S. M. Datta	Mr. K. V. Mariwala	Dr. K. S. Gandhi
1998	Prof. T. K. Ghose	Dr. A. N. Dravid	Prof.G.S.R.Narasimhamurthy
1999	Prof. B. Ghosh	Dr. A. Panjwani	Mr. A. Venugopal
2000	Dr. Anil Kakodkar	Dr. M. Sriram	Prof. K. D. P. Nigam
		Aker Powergas's Prof N R Kamath Memorial Lecture	
2001	Dr. K. Kasturirangan	Prof. D. Ramakrishna	Prof. Ashok Misra
2002	Sri Subir Raha	Dr. P. N. Devarajan	Dr. D. S. Viswanath
2003	Dr. B. D. Kulkarni	Mr. B. Bhattacharjee	Mr. B. Muthuraman
2004	Mr. Mukesh D. Ambani	Mr. Proshanto Banerjee	Mr. Nadir B. Godrej
2005	Prof. Ashok Misra	Dr. Prodipto Ghosh	Mr. R. Kalidas
	Dr H L Roy Memorial Lecture sponsored by Jacobs		**Inventaa C K Murthy Memorial Lecture**
2006	Mr. Desh Bandhu Gupta	Dr. S. Banerjee	Prof. K. Nandakumar
2007	Dr. S. K. Jain	Prof. M. S. Ananth	Dr. Y. V. S. S. Murthy
		Aker Powergas's Prof N R Kamath and Mrs Ruzena Kamath Memorial Lecture	
2008	Prof. G. D. Yadav	Prof. Ashutosh Sharma	Prof. Rakesh Agrawal
2009	Prof. K. S. Gandhi	Prof. S. J. Chopra	Mr. M. Ganapati

2010	Mr. B. M. Bansal	Mr. K. Venkataramanan	Prof. A. K. Mitra
2011	Prof. S. K. Sharma	Prof. M. S. Murthy	Mr. Sushil Kumar
2012	Shri Sudhir Vasudeva	Shri Rajkumar Ghosh	Dr. M. O. Garg
2013	Prof. R. Krishna	Prof. Devang Khakkar	Dr. Sukumar Devptta
2014	Prof J B Joshi	Prof Arun K Grover	Dr S N Chakravarty
2015	Dr K V Raghavan	Dr Sanjeev Katti	Prof A B Pandit
2016	Padma Bhusan Dr A V Rama Rao	Mr D P Misra	Sri K V Vishnu Raju
2017	Dr Asoke Deysarkar	Prof S C Jana	Smt Sheela
2018	Prof V A Juvekar	Mr P D Samudra	Dr U Kamachi Mudali
2019	Prof K VijayRaghavan	Dr S S V Ramakumar	Prof Ashutosh Sharma
2020	**Prof. Bala Subramaniam**	**Dr R R Sonde V P Thermax**	**Prof. Debangsha Bhattacharya**

Names and Addresses of The Council Members of 2020

1.	**Prof V V Basava Rao** **(President, IIChE)** Plot No. 184, Tirumala Nagar Colony Meerpet (V), Moula-Ali Housing Board Hyderabad 500 040 Telangana State	Tel	[Mobile]: 9989156705
		E-mail	profbasavarao_1964@yahoo.com
2.	**Prof S V Satyanarayana** **(Immediate President, IIChE)** Dept of Chemical Engineering JNTUA College of Engineering Anantapuramu Dist Andhra Pradesh 515 002	Tel	[Mobile]: 9849509167
		E-mail	svsatya7@gmail.com
3.	**Mr Praveen Saxena** **(Vice President, IIChE)** Director Blast Carboblocks Pvt Ltd 505, Persipolis, Sector-17 Vashi Navi Mumbai 400 705	Tel	[Mobile]: 9869606386/ 2227821417
		E-mail	praveensaxena1951@gmail.com; info@blastcarbo.com
4.	**Dr M Venkateswara Rao** **(Vice President, IIChE)** Professor, Dept of Chemical Engineering RVR & JC College of Engineering (A) Chowdavaram Guntur 522 019 A.P.	Tel	[Mobile]: 9440010190
		E-mail	mvrao79@rvrjc.ac.in; mvrao79@gmail.com
5.	**Dr Avijit Ghosh** **(Honorary Secretary, IIChE)** Assistant Professor Department of Chemical Engineering (Room No. CB 209) Heritage Institute of Technology Anandapur, Madurdaha Kolkata 700 107	Tel	[Mobile]: 9433139742/ 9830752111
		E-mail	avijitghosh.che@gmail.com
6.	**Dr Madhu Agarwal** **(Honorary Jt Secretary, IIChE)**	Tel	[Mobile]: 9413349429

	Associate Professor Department of Chemical Engineering Malaviya National Institute of Technology (MNIT) Jaipur 302 017	E-mail	madhunaresh@gmail.com
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Sl. No.	Name of the Awards/Prizes	Awardees of the Year
1.	Dr.B.P.Godrej Life Time Achivement Award	**Mr P K N Panicker**, Past -resident, IIChE
2.	Dr H L Roy Memorial Lecture sponsored by Jacobs	**Professor Bala Subramaniam**, Dan F, Servey Distinguished Professor of Chemical and Petrochemical Engineering, Director, Center for Environmentally Beneficial Catalysis (CEBC), University of Kansas, Lawrence, KS
3.	Aker Powergas's Prof N R Kamath and Mrs Ruzena Kamath Memorial Lecture	**Dr R R Sonde**, Formerlly Executive Vice President & now Advisor (Research, Technology & Innovation Centre) & Member on Board of Executive Council, Thermax
4.	Inventaa C K Murthy Memorial Lecture	**Professor Debangsu Bhattacharyya**, GE Plastic Material Engineering Professor, West Virginia University, Morgantown, USA
5.	Lala Shriram National Award for Leadership in Chemical Industry	**Mr. D. M. Butala**, Corporate Management Executive and Consulting Engineer
6.	ICI India Ltd Award for Excellence in Process or Product Development	**Dr Sundergopal Sridhar,** Senior Principal Scientist , Membrane Separations Group, Indian Institute of Chemical Technology, Hyderabad
7.	Herdillia Award for Excellence in Basic Research in Chemical Engineering	**Professor Bishnupada Mandal,** Indian Institute of Technology, Guwahati
8.	NOCIL Award for Excellence in Design or Development of Process Plant and Equipment	**Mr. Dhawal Saxena,** Executive Associate Director Blast Carbo Blocks Pvt Ltd, Navi Mumbai
9.	ONGC Award for Excellence in Design and Development of Oil/Gas Related Process Plant and/or Chemicals	**Dr. Tarun Kumar Naiya,** Associate Professor IIT (ISM), Dhanbad
10.	Hindustan Dorr-Oliver Award for Excellence in Use of Science & Technology in Rural Development	**Professor Shirish Hari Sonawane,** National Institute of Technology , Warangal (TS)
11.	Hindustan Lever Biennial Award for the most Outstanding Chemical Engineer of the Year (Under the Age of	**Professor Vimal Chandra Srivastava,** Indian Institute of Technology, Rorkee

	45 Years)	
12.	Amar Dye-Chem Award for Excellence in Research and Development (Under the Age of 35 Years)	**Dr. Vineet Aniya**, CSIR – Indian Institute of Chemical Technology, Ministry of Science & Technology, Govt of India Hyderabad
13.	Prof Shyamal Kanti Sanyal Memorial Award for the best PhD Thesis in the Area of Membranes Research with Significant Commercial Potential	**Dr. Akshay Modi,** Research Associate Indian Institute of Technology of Bombay,Powai Mumbai
14.	Dr A V Rama Rao Fndn Best Ph D Thesis and Research in Chemical Engineering/Technology	**Dr. Babul Prasad,** Post Dotoral Researcher The Ohio State University, Columbus, USA And his research guide **Professor Bishnupada Mandal,** Indian Institute of Technology, Guwahati
15.	The Chemical Weekly Prize for Best Research Paper published in a High Impact Factor International Journal by an Undergraduate Chemical Engineering Student (First and Second Prizes)	1st Prize **Mr. Ashin Antony Sunny** Institute of Chemical Technology, Mumbai 2nd Prize **Mr P Ravi Teja,** UPES, Bidholi, Deradun, Uttarakhand
16.	Chemical Weekly Award for the Best Paper Published in the Institute's Journal (ICE-2018)	**Dr Ashwini Sood**, **Dr Tulika Gaur** Harcourt Butler Technical University, Kanpur
17.	IIChE NRC Award Best Paper in "Indian Chemical Engineer" 2018	**Dr Ashwini Sood**, **Dr Tulika Gaur** Harcourt Butler Technical University, Kanpur
18.	The Kuloor Memorial Award to the best technical paper published in the journal of the Institute in the issues of the preceding year	**Dr Ashwini Sood**, **Dr Tulika Gaur** Harcourt Butler Technical University, Kanpur
19.	Sisir Kumar Mitra Memorial Award to the second best technical paper published in the journal of the Institute in the issues of the preceding year	**Dr Shaik Shadulla, Dr K Satish Raj, Dr S V NAidu** AU College of Engineering, Andhra University, Visakhapatnam
20.	IIChE NRC Award 2nd Best Paper in "Indian Chemical Engineer" 2018	**Dr Shaik Shadulla, Dr K Satish Raj, Dr S V NAidu** AU College of Engineering, Andhra University, Visakhapatnam

21.	IIChE NRC Award 3rd Best Paper in "Indian Chemical Engineer" 2018	**Dr Vivek Nigam, Dr S Narasimha Reddy, Dr P S T Sai** Institute of Chemical Technology Madras, Chennai
22.	M P Chary Memorial Award	**Ms Harsha Nagar**, Chaitanya Bhrathi Institute of Technology, (CBIT), Hyderabad
23.	Late Lakshmi Nandakumar Awasrd of the Institute for best presentation in Schemcon 2017 by a Lady Student	**Ms Jasneet Kaur Pala** Bits Pillani, Goa Campus, Goa
24.	Gouri Dutta Award for the Best Paper presentation in Schemcon 2017 of the Indian Institute of Chemical Engineers	**Mr. Yash Patel** G H Patel College of Engineering & Technology, Gujarat
25.	Ambuja's Young Researcher's Awards for doing Post-Graduate Studies in India after GATE Examination (Ten Prizes)	**Mr Akash Gupta** ICT, Mumbai **Ms Avni Singh** ICT, Mumbai **Mr Naman Kukreja** ICT, Mumbai **Ms Mamta Gwala** NIT, Durgapur
26.	Ambuja's Best Student Chapter Award (2 Prizes)	1st Prize **IIChE Student Chapter** **Sri Venkateswara College of Engineering** Pennalur, Sriperumbudur 2nd Prize **IIChE Student Chapter** **SSN College of Engineering** Kalavakkam
27.	Pidilite's Best Student Chapter Award	**IIChE Student Chapter** **Shroff S R Rotary Institute of Chemical Technology** Bharuch
28.	Best Regional Centre Award (3 Prizes)	Category "A" Best **Calcutta Regional Centre, IIChE** Category "B" Best **Amaravati Regional Centre, IIChE**

		Category "B" Second Best **Trivandrum Regional Centre, IIChE**
29.	Prof.P.Sen Gupta Award for Best Employee of the Year	**Mr Anirban Ghosh** IIChE, Kolkata
30.	Fellow	**1. Dr K Yamuna Rani** **2. Prof S V Satyanarayana** **3. Dr Bishnupada Mandal** **4. Dr Siddhartha Mukherjee** **5. Dr Prabir Kumar Saha** **6. Dr Bidhan Chandra Bag** **7. Dr Mihir Kumar Purkait** **8. Dr Subrata Kumar Majumder**
31.	Padmashri Professor G D Yadav and Dr (Mrs) Vasanti G Yadav Awards for the Most Versatile Chemical Engineering/Technology Students in India	**Pingali Sai Praneeth** Indian Institute of Technology, Hyderabad **Ms. Aindrila Indra** Heritage Institute of Technology, Kolkata
32.	Lupin Industries Best Chemical EngineeringTeacher Award for the Faculties in Private Colleges below the age of 50 years	**Dr. Mukunda Vani Medala** Anurag University

ABSTRACTS -
ORAL PRESENTATIONS

Nanomaterials and Nanotechnology, Polymers & Composites (NMN)

Numerical investigation of microchannel cooling using Graphene Nanocomposites

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OP-01-001

Abstract
In power electronics system thermal management is a pressing challenge in thecurrent scenario, as the power ratings of intensive computational resources have increaseddrastically. This can be accomplished by introducing heat sink incorporated with microchannelinto power electronics, using composite nanocoolant as the fluid. In the current work,simulations are carried out with computational fluid dynamics to study theperformanceofgraphene/ iron oxide hybrid coolant in a three diverse volume fraction of about 0.05%, 0.075%,and 0.1% (by solid volume) in water(base fluid). ANSYS Fluent 16.2 is used for the numericalsimulations with the laminar flow and fully developed conditions. The experimentally recordedlowest base temperature is 310.01K for 0.1 volume fraction of graphene/ iron oxide coolant at0.75 LPM, while in simulation the lowest temperature of 310.81 K was recorded for thegraphene/ iron oxide for a constant heat load of 325W. The comparison of simulated andexperimental base temperatures reveals simulations can be very well used in determiningthe base temperatures which represents the CPU processor.

Keywords: Thermal conductance, Graphene/ Iron oxide composite nanocoolant, microchannel.

A facile method of ZIF-67 nanoparticles synthesis on membranes for gas separation applications

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OP-01-002

Abstract
Zeolitic-imidazolate frameworks (ZIFs) have very attractive properties for gasseparation applications due to their tunable pore size, high surface area and porevolume, chemical and mechanical stability. Here, a facile synthesis method for ZIF-67nanoparticles is demonstrated, by sequential flow of ZIF-67 reagents through the lumenof polymeric hollow fiber membranes (HFMs). The formation of ZIF-67 nanoparticleson the membrane surface was confirmed by examining the surface morphology, andsurface functional groups of the membranes. The ZIF-67 coated HFMs were applied forCO 2 /CH 4 separation, which are typically found in biogas. The gas separation studieswere conducted for pure gases and binary gas mixture at 1–5 bar pressure and 25 ± 2°C. ZIF-67 coated HFMs showed better gas separation performance than pristine HFMs,with 3.5 times higher ideal CO 2 /CH 4 selectivity for pure gas experiments. For binary gasexperiments, the CO 2 /CH 4 selectivity of ZIF-67 coated HFMs was 44.94 whereas thepristine HFMs showed only 13.48, at 1 bar pressure. These results show that the newmethod developed for the synthesis of ZIF-67 nanoparticles on the membrane surface is promising for gas separation applications.

Keywords: ZIF-67 nanoparticles; Facile synthesis; Hollow fiber membranes; Biogas separation; Mixed gas experiments

Reinforcement of kevlarfiber/carbon fiber in ethylene propylene diene monomer composites

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OP-01-003

Abstract:

The supersonic vehicles are subjected to catastrophic breakdown during their flight. The elastomeric composite material has been used as a thermal protective element towards high temperatures. These materials exhibit a low erosion rate and high thermal stability during the launching of the rocket.
The present study shows an elastomeric composite in which insulator ethylene propylene diene monomer (EPDM) as matrix phase having excellent mechanical properties along with additives liketetramethylthiouramdisulphide, stearic acid, benzoyl peroxide, ethoxyquin, dicumyl peroxide have been used as an accelerator, activator, initiator, antioxidant and curing agent to prepared the composites. In this study strong synthetic Kevlar fiber (KF) has been taken, which has outstanding strength-to-weight properties ratio, high tenacity, and char residue property. Carbon fiber (CF) having lightweight, high mechanical, thermal, and chemical resistance properties. The preparation of the CF, KF & EPDM composite with different parts per hundred of CF and KF(phr) ratio (5/0, 0/5, 5/5, 10/5,5/10) and its effect on mechanical and thermal properties have been studied. The 5 phr of KF and 5 phr of CF have been investigated in the composite. The functional groups of composites has been determined by the Fourier Transmission Infrared spectroscopy (FTIR). The established composite improved mechanical property such as tensile strength (8.75MPa), elongation at break (1295%), tensile modulus(12.51MPa) by the universal testing machine (UTM). The physical properties of the composites have been examined by density test (0.91g/cc) and hardness (89 Shore-A). Thermal properties of the composite have been studied by thermal conductivity(0.20W/mK),differential scanning calorimetry (DSC),and thermal gravimetric analysis (TGA).The morphology and crystallinity of composites have been observed by scanning electron microscopy (SEM) and X-ray diffraction (XRD), respectively. In this experiment, the main concern has to improve mechanical and thermal properties as well as low density and ablatives rate with high char residue of the composites.

Keywords: ethylene propylene diene monomer, filler, fibre, composites

Isolation And Characterization Of Humic Acids From Arctic Fjord Sediments And Subsequent Application In The Rremoval Of Chromium From Aqueous Solutions

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OP-01-004

Abstract

Humic acids (HA) isolated from Arctic Fjord sediments were characterized using NMR, FT-IR, and UV-Visible, followed by elemental analysis. The lower ratio of E4/E6 (UV spectral analyses) suggests the presence of HAs with high degree of aromaticity and condensation.
FTIR study of HAs indicates the presence of hydroxyl, methyl, methylene, carbonyl,carboxyl, phenol, and alcohol and amide groups. NMR spectral characteristics showedresonance in the range 1.10 – 1.75 ppm that arise from protons on terminal methyl groups ofmethylene chains and methyl groups of highly branched alkyl groups as well as alicycliccompounds. The NMR signal at 2-3ppm indicates that the aliphatic protons are attached to Catoms adjacent to highly electronegative (O or N), unsaturated groups or aromaticgroups. Metal adsorption studies of Cr (III) on humic acid followed Freundlich adsorptionisotherm. The Cr(III) cation binds very strongly to humic acid by phyisorptionwhichprevents it from (re)oxidation to Cr(VI) and reduces its bio-availability. Adsorption studiesstrongly support its ability to use as an adsorbent for various environmental applications.

Keywords: Kongsfjorden, humic acids, characterization, aromaticity, adsor

Resveratrol-Induced Augmentation of Telomerase Activity

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OP-01-005

Abstract

Cells age and lose their capacity to divide as their telomere length gets shortened each timethey divide, eventually leading to the stoppage of cell division. This is primarily the reasonfor aging of an organism. Telomeres are thousands of repeated sequences that protects thechromosome ends from DNA damage. Each time a cell divide, some part of the telomere islost due to the inability of DNA polymerase to replicate the end of the chromosome (the end replication problem) during lagging strand synthesis. As a result, most cells (includinghuman cells) can divide only up to a certain amount of division (50-70) before goingsenescent phase, a phenomenon known as Hayflick limit. Telomerase is an enzyme that canextend the telomere length and 'repair' the ends of chromosomes. It consists of twomolecules each of human telomerase reverse transcriptase (TERT), telomerase RNA (TR orTERC), and dyskerin (DKC1). TERT is a reverse transcriptase, which is a class of enzymethat creates single-stranded DNA using single-stranded RNA as a template. The enzymeworks by binding to a telomerase RNA molecule that contains a sequence complementary tothe telomeric repeat. It then extends the overhanging strand of the telomere DNA using thisRNA as a template. After that, DNA polymerase adds complementary strands to theoverhang producing double-stranded DNA. Various factors are known to affect the activityof telomerase enzyme. Thus, strategies for improving the activity of telomerase can increasethe telomere length and thereby increase the overall lifespan of the individual. The currentstudy intended to compare the different bioactive compounds that affect telomerase enzymevia docking and to optimise its usage. It has been found that the compound "resveratrol"showed the highest binding affinity towards telomerase.

Keywords: Telomeres; Hayflick limit; resveratrol

Compressibility Factor of Nanoconfined Alkane along Vapor-liquidCoexistence

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OP-01-006

Abstract

The fluid PVT properties have direct influence on the fluid compressibility factor (Z-factor). Thecommon sources of Z-factor values are experimental measurements, equation of states andempirical correlations. Moreover, these equations of states and correlations are applicable to thebulk fluid and not suitable for the fluids confined at nanoscale. In the current work,compressibility factor of saturated liquid (Z l) and saturated vapor (Z g) of nanoconfined alkanesare estimated using the simulation data obtained from the Monte Carlo simulations. Thisinvestigation indicates that with increase in temperature compressibility factor of saturated liquidincreases and the compressibility factor of saturated vapor decreases for all studied nanoporewidths. Critical compressibility factors (Z c) of nanoconfined alkanes are also estimated using thecritical point data obtained from simulations. The Z c of nanoconfined alkanes reveals non-monotonic trend with inverse pore width (1/H) and approaches to the bulk value at highernanopore width. Moreover, with decrease in nanopore width, Z c decreases and finally remainsindifferent in quasi-2D region of nanopore width. A typical variation of Z c with inverse ofnanopore width (1/H) for nanoconfined methane and n-butane are shown in the following figure.

Keywords: compressibility factor; nanoscale; nanoconfined alkanes, Monte Carlo simulation.

Food Quality Assessment using Graphene-based Nanosensors

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OP-01-007

Abstract

With the sudden outbreak of foodborne related illnesses in recent times, researchers from across the globe have driven their attention towards proposing novel materials which would be effective for detecting food deteriorating elements. The application of engineered nanostructures in the Food Industry has gained much popularity due to their remarkable properties and intrinsic or chemically incorporated efficiency. Among them, graphene which is a 2-D planar sheet of carbon atoms along with its various derivatives such as graphene oxide [GO] and reduced GO [rGO] have shown promising results invarious aspects of food safety. These NMs show great affinity towards cross-linkingability, allowing them to make nanocomposites which in turn helps to strengthen theirexisting properties. Nanosensors have recently emerged in the field of food safety andare versatile devices for detecting various chemical and biological contaminants presentin the foodstuff. This article focuses on the application of graphene-based nanocompositeas a potent material for developing nanosensors. The impact of the conjugation ofgraphene with various biocompatible polymers and other commonly used metals andmetal oxides has been discussed. Besides, a future outlook of using graphene and itscomposites in active packaging of food products is also added.

Keywords: Graphene Oxide (GO); Nanosensors; Food Assessment

Dual stimuli responsive nanohybrid carrier targeting biotin receptors for the controlled delivery of eugenol

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OP-01-008

Abstract

Stimuli-responsive nanocarriers specifically targeting tumor cells are extensivelyresearched for the benefit of their selective and rational release of cytotoxic agents. Inthis work, a protein-inorganic nanohybrid carrier was synthesized with pH and magneticfield responsive properties. The multifunctional system was used as drug carrier toinvestigate the encapsulation and controlled release of natural drug eugenol. Thenanocarrier was further functionalized with biotin to exploit the cancer cell specificligand-receptor interactions and intracellular release of the drug. The carrier exhibited asuperior drug encapsulation efficiency of 84.67 % with good stability (Zeta potential -31.45 mV). The carrier demonstrated higher drug release under acidic pH (mimickingcancer microenvironment ~5.4) and magnetic field influence, with minimal releaseunder physiological pH conditions. Kinetic modeling of drug release data projected thediffusion-controlled release mechanism. The non-toxic nature of the formulation wasconfirmed form the biocompatibility assay on L929 cells. The anticancer potential ofthe developed nano-formulation assessed A549 lung cancer cells suggested the biotin-functionalized protein-inorganic nanohybrid carrier has great potential towards targetedanti-cancer drug delivery.

Keywords: Nanohybrid carrier; Stimuli-responsiveness; Natural cytotoxic drug;Targeted drug delivery.

A Review on Electrical Properties of Polymer/Zinc Oxide Nanocomposites and its Applications

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OP-01-009

Abstract

Polymeric nanocomposites have gained the attention of researchers because oftheir unique structural, optical, mechanical and electrical characteristics. In recent years,polymer nanocomposites, especially metal oxide nanofillers are found to have electricalapplications due to their dielectric properties. Zinc oxide (ZnO) is a material of highimportance due to its combined piezoelectric, pyroelectric and semiconductingproperties. The ZnO nanoparticles (NPs) have excellent optical, mechanical, electrical,and chemical properties compared with bulk ZnO. The applications of ZnO NPs aremainly in the field of effect transistors, nano-generators, solar cells and photocatalysis.ZnO NPs as a functional inorganic filler can also be used in functional devices,catalysts, pigments, optical materials, cosmetics, and ultraviolet (UV) absorbers,coatings, rubbers, plastics, sealants, fibers and other applications. This paper gives anoverview of the properties of ZnO NPs, the main methods to synthesize ZnO NPs, andfinally, the electrical properties of the nanocomposites. The dielectric constant,dielectric loss and dissipation factor of nanocomposites with ZnO NPs is found toincrease with an increase in nanoparticle concentration.

Keywords: ZnO nanoparticles; polymer nanocomposites; dielectric constant; electricalproperties

Effect Of Nanoparticles In Wood Composites

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OP-01-010

Abstract

Wood is a natural, biodegradable, and renewable material that can be used in manyapplications, including structural members, ornamental objects, aerospace technology,etc. Its low thermal and electrical conductivity coefficients have made it unique forspecific purposes for the creation of humanity. However, some of its other features arequite bothering such as its deterioration by a variety of fungi and insects, itssusceptibility to fire, as well as the dimensional instability to water absorption. Woodpanel industries relied on polycondensed thermosetting resins that one of the mostimportant is urea formaldehyde. Particle board and plywood panels are renewable bioresources that are made from wood particles and veneer. Nano science andnanotechnology provide a numerous opportunities for enhancing the properties of woodcomposites due to their nanoscale size. The ability to see materials down to nanoscaledimensions and to control how materials are constructed at the nanoscale is providingthe opportunity to develop new materials and products in previously unimagined ways.Nanoparticles can be used as filler or additive in various polymers so that differentenhancement in material properties can be achieved. They can also be used to reinforcethermosetting polymer to improve final performance properties. Therefore,nanomaterials are receiving increased interest for research and development activities.The influences of Nano particles modified thermosetting adhesive on the mechanicalperformance properties of wood composite panels have been evaluated by severalauthors. The use of nanotechnology in the manufacture of particle board and plywoodpanel is of great importance to overcome the formaldehyde emission. This review papercovers the different aspects of preparation, characterization, material properties andprocessing of wood nanocomposites.

Keywords: wood composites, nanoparticle, emission etc.

Impact Modification of Polycarbonate by Siloxanes for Low Temperature Application with Simultaneously Maintaining Its Melt Processing Properties

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OP-01-011

Abstract:

Polycarbonate (PC) is a thermoplastic material with excellent impact strength at roomtemperature and very good optical transmittance. Material however has reduced impactstrength below -20 o C as it leads towards ductile to brittle transition temperature (DTBT), which restricts its application in extreme cold weather and other low temperature ambience [1].

In the work presented in this paper, PC is chemically modified by siloxanes toimprove its low temperature impact strength [2]. Hydroxyl terminated Polydimethylsiloxane(PDMSOH) is incorporated in the polymer chain of PC by transesterification reaction inpresence of alkali catalyst [3]. Different viscosity and concentrations of PDMSOH are used tomodify PC and very useful observations are found with respect to low temperature impactstrength, optical transmittance and melt flow properties of the modified PC. Higherconcentration of siloxane though increases low temperature ductility but it adversely affectsoptical transmittance and also increases melt flow beyond the desired value. Selection ofPDMSOH of appropriate viscosity however circumvents this problem and compositions ofsiloxane modified PC could be developed having good impact strength at -30 o C whilemaintaining its optical transmittance and desired melt flow properties meeting the processingrequirement for injection and blow moulding. Izod Impact tester, Melt Flow Index Meter,Viscometer, UV-Vis spectrometer and SEM are used to characterise the material.This work will pave the way for developing desired grades of PC for low temperatureapplication.

Key Words: Polycarbonate, Impact Modification, Melt Flow

A Review on Integration of Antenna Systems and Nanotechnology

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OP-01-012

Abstract:

Nanoscience is the study of things of size around 100 nanometres, and nanotechnology is its application in the development of all the science fields – physics, chemistry, biology, to name afew. Graphene and Carbon Nanotube (CNT) are very commonly used to develop sensors. Forcommunication, radiations of range 380nm to 700 nm and 780 nm to 1 mm have great potential tointensify light interaction with matter in nanometer scale when nanotechnology is used in sensors,as they can efficiently transmit in electrical fields. This capability of nanosensors offers a widevariety of applications in nano circuits, optical spectroscopy and solar energy. CNTs are preferredin sensor and antenna systems due to their responsiveness, fast feedback time, and null powerconsumption.This paper provides an outline of nanotechnology, basic concepts, and its application in antennasystems.

Keywords: Carbon Nanotube; Nanosensors; Optical Spectroscopy

Ruthenium-bound Silica Nanoparticles coated onto Contact Lenses for Oxygen Sensing in the Tear Film

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OP-01-013

Abstract

Oxygen is critical for healthy functioning of eye. Contact lens wear divides the tear filmintopre and post-lens tear film (PLTF). This adversely affects oxygen dynamics andhence, measuring pO 2 dynamics underneath PLTF is critical to evaluate corneal health.Measurement of pO 2 dynamics in nano timescale in PLTF is however, a major clinicalunmet need. Hence, we propose coating contact lenses with oxygen-sensitiveRuthenium (Ru)-phenanthroline-bound silica nanoparticles (NPs) for measuring pO 2dynamics and measuring fluorescence quenching life-time using a custom-built ocularspot fluorometer.

NPs were synthesised by microemulsion method and water etched to improve porosity. The average NP size was 150 ± 20 nm. XRD results showed amorphous nature of NPs.FTIR results confirmed Ru was bound to Si. Fluorescence emission at 590 nmconfirmed the presence of Ru. Binders were added to enhance binding of NPs ontocontact lens. TEM micrographs of the NPs confirmed hollow core and thin shellfacilitating better oxygen permeability. Fluorescence quenching life-time was 4-6 µswhen measured using spot-fluorometer. Fluorescence decay was seen in presence of O 2 ,confirming oxygen selectivity of NPs. In vivo measurement of pO 2 dynamics in rabbitmodels is warranted.

Keywords: Post-lens tear film, oxygen dynamics, fluorescence quenching, ruthenium.

A review on Nanomaterials in Waste water Treatment

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OP-01-014

Abstract

Nanotechnology has various applications in the fields of biological andchemical.Nanoparticles were widely used for the treatment of waste water.Treatment of waste water using the nanoparticles mainly involves the metalhaving zero valency. Basically, the treatment of the waste water is accompaniedby the metal oxide nanoparticles, carbon nanotubes, and nanocomposites.Different types of pollutants in the water can be removed by the nano adsorbent.It also prevents the harmful effect on the water due to the dyes, pesticides andheavy metals. This can be effectively treated by the metal oxides nanoparticlessuch as Ferric oxide as an active treating material for the nanotech waterpurification. The current review briefly describes the various nano materialsused in Waste Water treatment.

Keywords-Nanomaterials; Nanocomposites; Nano adsorbent; Ferric oxide; Waste water treatment

Engineering of Structural and Surface Functional Characteristics of Graphite Oxide Nanosheets by Controlling Oxidation Temperature

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OP-01-015

Abstract

The specific application potential of graphite-based materials is mostly depend on theirstructural and surface properties and hence their synthetic conditions. Among the graphitefamily, graphite oxide (GO) nanosheets have demonstrated applications in fields such asionic conductor, sensor and nano-electronic structural support. We have developed thegeneral strategy to control the surface functional groups namely carboxyl, carbonyl, epoxyand hydroxyl group present on the GO by varying the oxidation temperature from 30 to 110ºC using the modified Hummer's method. Analytical investigations suggested that the bestcondition for synthesizing GO was found to be about 50 ºC based on the crystallinity andits single sheet nature. Interestingly, the concentration of the functional groups on thesurface of GO nanosheets increases with the oxidation temperature until 50 ºC anddecreases thereafter possibly due to the condensation reaction between the epoxy and thehydroxyl groups. The temperature dependent change in the properties is well explained interms of the change in the functional groups present on the surface of the GO. This studyhas a high impact not only for changing properties of GO but also towards the designing ofelectronic devices and sensors.

Keywords: Graphite oxide; Oxidation Temperature; Surface Functional Groups.

Antibacterial Leather doped with Silver Nanoparticles and ZnO for application in Footwear Industry

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OP-01-016

Abstract

Footwear is one of the garments that is not usually washed and taken care. However, it issubjected to extreme conditions of use and since footwear encompasses a closed and poorlyventilated space it creates the basis for microorganism growth which are mainly responsiblefor shoe bad odour and the presence of certain microorganisms can lead to some footconditions such as athlete's foot, blisters etc.

Apart from the preventive measures recommended, such as foot care and hygiene, otherways must be adopted to reduce these problems. Therefore, the development of newcompounds with prolonged antifungal effect with no toxic effects is of great importance. Asan antimicrobial agent Silver nanoparticles (Ag–NPs) have gained significant popularity asit shows excellent antimicrobial properties against bacteria and fungi. So in this workAgNPs have been protected with a porous coating, such as Zinc Oxide, capable ofpreventing the aggregation of the nanoparticles and also enhancing the antimicrobialmechanism. Therefore, the combination of Ag–NPs and ZnO-NPs is intended to extend theapplicability of both as a single system with enhanced properties. The main objective ofthis work is to evaluate the antimicrobial activity of leathers covered with Ag–ZnO NPs.

Keywords: Ag-Nps; ZnO; Leather; Footwear

Analysis for Permeation of Binary Aqueous Mixture of Ethanol/Water through Synthesized PVDF-PTFE Composite Membrane Using Vacuum Membrane Distillation

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OP-01-017

Abstract

Present study emphasises on vacuum membrane distillation(VMD) as a possible technique forethanol–water separation using synthesized composite flat sheet PVDF-PTFE membrane.VMDis an emerging process in which thermally driven selective mass transfer occur across themembrane by creating vacuum in the permeate side and condensation takes place outside themembranemodule.VMD performance were examined by measuring ethanol flux and separationfactor. Increased PTFE content in PVDF base polymer shows enhanced hydrophobicity ofsynthesized membrane which is highly desired for VMD separation. Effect of operatingparameters such as feed concentration (5-20 wt %), feed temperature (35-60ºC), feed flow rate(2-5 LPM) and vacuum pressure(600-720 mmHg) were studied on ethanol-water VMDseparation. Membrane morphology of synthesized membrane was analyzed by scanningelectron microscopy. Membranes were found to be asymmetric in nature with 0.19µm pore sizeand 91µm thickness. The flux and selectivity obtained from the experimental work were in therange of 0.75-8.5 kgm -2 h -1 and 0.25-4.5 respectively.

Keywords: Vacuum Membrane Distillation, Condensation, Flat sheet composite membrane, PVDF-PTFE blend.

A Review On Plastic Waste Into Tiles

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OP-01-018

Abstract

Look around us. We can find a lot of plastic sources getting ready to pollute our environment. Out of 300 million metric tons ofplastic wastes produced 7% is recycled, 8% is incinerated, and remaining is landfilled or dumped into water bodies as landfilling demandshigh energy & cost. This affects the marine eco system, humans feeding on that. The net plastic wastes generation is not reduced despite allthe necessary measures taken. This review is done on various studies that use plastic wastes (polypropylene, LDPE, HDPE) as rawmaterial, grinded and mix it with chemicals to increase the tensile strength, compressive strength, flexural strength, and then melt into longwires whose granules are moulded into tiles of various compositions and is compared with commercial tiles. Therefore, the proposedobjective is the need of the hour, to create a balance over the plastic wastes. The main plus of this sustainable act is that the urbanization, adrawback of plastic wastes management is now turned into our raw material producers and consumer. Infrastructure demand is our key. Advantages includes anti-bacterial, lightweight, cost efficient, highly reusable, rejects the use of rubber dampers (another solid waste) in
industries.

Key Words: plastic wastes, compressive strength, flexural strength, tensile strength, highly reusable.

A Review on Carbon Nanotubes and its Applications

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OP-01-019

Abstract

In the field of nanotechnology, carbon nanotubes are the one of the most uniqueinvention and carbon nanotubes are significant material for future. It has beendiscovered in 1991, because of its huge production they have attracted manyindustries and companies towards itself. Carbon nanotubes are used innanotechnology, membranes, capacitors, polymers, metallic surfaces, ceramics, nanomedicine etc. Carbon containing sp2 hybridisation having different structures. graphite is well known example of it but now beside graphite, carbon can formclosed and open cages with honeycomb arrangement. Carbon nanotubes are madeup of carbon and it is a tube shaped material. its diameter is too small and ismeasured by nanoscale. The main motive of this paper is to highlight synthesis, properties and toxic effects of carbon nanotube.

Keywords: Nanotechnology, carbon nanotubes, nanomedicine, Hybridization, MWCNTs etc.

In vivo Study on Inflammatory Response of Graphene Oxide Functionalized Chitosan Injectable Nanoparticles on Mice Models

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OP-01-020

Abstract

In the last two decades, development and advances in the field of nanotechnology have drawn interest of many researchers specifically in the field of drug delivery. In spite of having many advantage in drug delivery like pH responsive, efficacy to deliver the drug and many, thematerial that makes these nano particle and its inflammatory response are always a majorconcern when taken into in vivo applications. Hence, in our present study we focus on these issues in continuity to our previous study where we studied the effect of graphene oxidebased chitosan nano particle for delivering siRNA targeting Bcl-2 expression in vitro and onbone marrow, cells derived from mice models. The in vitro studies revealed no inflammatoryresponse and before, we induce tumor in mice models it would be necessary to evaluate the inflammatory response in vivo. Hence, we focused on evaluating the inflammatory response of these graphene oxide based material on mice models at five different time points (0 dayrespectively). The materials were injected onto the intraperitoneal cavity of mice in twodifferent concentrations containing 50 mg in 1ml saline and 100 mg in 1ml saline. The results of inflammatory responses were analysed using qPCR particularly for inflammatorycytokines IL-1, IL-6, TGF-β & TNF-α and FACS analysis showed a meagre amount ofinflammatory cytokines compared to the untreated cells. FACS analysis from theintraperitoneal fluid collected after sacrificing mice showed less than 5% of neutrophils inmost of the cases and lower amount of inflammatory macrophages observed which was inagreement with our qPCR results. In order to be affirmative, we further confirmed using themultiplex immunoassays for cytokines IL-1β, IL-6, MIP-1α, TNF-α and the results showedthere were negligible or no response in most of the samples treated. The results of our studyshowed that the material prepared is suitable to carry drugs for targeted delivery withoutcausing any inflammation at the site of implant or any part of body.

Keywords: Inflammatory Response, Graphene Oxide, Chitosan, Cytokines, Immunoassays

Green Synthesis of Silver Nano-Particles From Azadirachta Indica And Artocarpus Heterophyllus

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OP-01-021

Abstract

In this study, rapid, simple approach was adopted for synthesis of silver nanoparticlesusingAzadirachtaindicia (neem) and Artocarpusheterophyllus aqueous leaf extracts. The plantextracts are used as a reducing agents as well as capping agents. X-Ray diffraction technique isemployed to ascertain the formation of as synthesized silver nanoparticles. UV-Visiblespectrophotometer studies reveals that the formation of Ag nanoparticles in this study. UV-Visible absorbance results shown the absorbance maxima are in the range of 430-450 nm.Results confirmed this protocol as simple, rapid, one step, eco-friendly, non-toxic and analternative conventional physical/chemical method. Moreover, few hours were required for theconversion of silver ions into silver nanoparticles at room temperature, without the involvementof any hazardous chemicals.

Keywords: Azadirachtaindicia, and Artocarpusheterophyllus, nanoparticles, reducing agents.

Removal of Fluoride from Aqueous Solution using Calcium Peroxide as a Low-Cost Adsorbent

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OP-01-022

Abstract

Removal of fluorides from water is essential for humans and animals because it causesdental and bone deficiency. The maximum permissible limit of fluoride is 1.5 mg/L,according to the World Health Organization. The advantage of using adsorption is thatit is a technique which is easy to implement and relatively cheap. To characterise thestructure, size and morphology of adsorbent nanoparticles, Fourier-transform infraredspectroscopy, X-ray powder diffraction, scanning electron microscopy with energydispersion X-ray spectroscopy, and Raman spectroscopy were applied. In batchadsorption experiments, the process parameters varied were: pH (2–12); contact time(5–60 min); adsorbent dosage (0.05–1 g); concentration (10–100 mg/L), andtemperature (5–60°C). The kinetic study has shown that the experimental data areconsistent with pseudo second order model with the regression coefficient of 0.99. Theadsorption equilibrium is best describable by Langmuir isotherm model with adsorptioncapacity of 89.6 mg/g. The isothermal multistage adsorption was investigated tounderstand the mechanism of calcium peroxide nanoparticle adsorption for fluorideremoval. The maximum fluoride adsorption capacity calculated for CaO 2 was 89 mg/g,with 90% defluorination efficiency. The results suggested that calcium peroxidenanoparticles can be considered as a promising adsorbent for fluoride removal.

Keywords: adsorption; fluoride; calcium peroxide nanoparticles

Synthesis and Characterization of Functionalized Nanocellulose and Its Probable Application

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OP-01-023

Abstract

Lignocelluloses biomass is abundantly available in nature, and it is considered tobe the largest renewable resource on earth. Cellulose is one of them which is a majorcomponent of tough cell wall that surrounds plant cells and it makes plant, leaves &branches so strong. Cellulose can be extracted from different agriculture waste likecotton linter, bagasse, rice husk, wheat straw. There is new emerging field related tocellulose which is known as nanocellulose (NC). There are different methods availablefor synthesis of NC. Synthesis ofNC is two stage process. 1st stage: isolation ofcellulose from agricultural source. In which lignin and hemicellulose will be removedusingNaOCl and NaOH treatment respectively. In 2nd stage: acid hydrolysis of isolatedcellulose will be performed using H2SO4 where nanocellulose will be obtained. Resultsshows that obtained cellulose is successfully isolated in 1st stage and successfullyconverted into nanosize in 2nd stage. Nanocellulose has gained a significant attention inthe material community because of its unique properties like lightweight, high tensilestrength, electrically conductive, etc. based on the application various functionalizationof NC also helps to enhance efficiency of NC and some of them are also discussed.

Keywords: Nanocellulose, Agricultural waste, Acid hydrolysis.

Synthesis and Application of Iron oxide Nanoparticles for Oil Spill Removal – Review

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OP-01-024

Abstract

An oil spill is the release of liquid petroleum hydrocarbon into the environment,especially the marine ecosystem, due to human activity, and is a form of pollution. Oilspills have huge and immediate economic, social, and environmental impacts. Thelimitations of existing clean-up techniques have stimulated researchers to work on theapplication of nanotechnology for oil remediation. The application of iron oxidenanomaterials has received much thoughtfulness due to their unique properties, such asextremely small size, high surface-area-to-volume ratio, excellent magnetic propertiesand great biocompatibility. It is crucial to remove the oil droplets from water in order tomeet the discharge regulations set by the environmental authorities. The mechanism ofoil spill removal may be explained through the fact that the small nano size, low
density, hydrophobic character and high surface area of iron oxide enable thepenetration process of nanoparticles inside the oil. The contents of oil spill weresimultaneously aggregated and easily removed by an external magnetic field. Thereview is to obtain a better understanding of the materials used to obtain efficient oiladsorbents with iron oxide nanoparticles and latest applications of iron oxidenanomaterials in oil remediation, and gaps which limited their large-scale fieldapplications.

Keywords: iron oxide nanoparticles; oil spill; oil adsorbents; oil removal; magnetic field

Pervaporation of Hydrazine / Water with Ethylcellulose/4A Zeolite Mixed Matrix Membranes

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OP-01-025

Abstract

Hydrazine a hygroscopic liquid needs to be dehydrated for its utilization as rocket propellant. The conventional processes of separation are cumbersome as hydrazine forms azeotrope with water apart from being explosive and highly alkaline in nature. Pervaporation is one of thewell-established safe, energy intensive process for separation of azeotrope mixtures. Theselection of polymer for pervaporation dehydration of hydrazine hydrate is of majorimportance. In this context Ethylcellulose (EC) polymer was chosen for pervaporativeseparation of hydrazine/water system. To increase the permselectivity zeolite 4Ananoparticles were encroached into the polymer matrix. The major focus of the present study is preparation of zeolite 4A nanoparticles and synthesis of the ethylcellulose-zeolite 4A(ECA) mixed matrix membrane. The characteristics of the membranes were observed bymeasuring contact angle. Sorption of hydrazine water in both EC and ECA were observed. Pervaporation studies showed high flux values and low selectivity with feed water concentration.

Keywords: Hydrazine hydrate, Pervaporation, Ethylcellulose, Zeolite 4A nanoparticles

Biodegradation kinetics of Chlorpyrifos degradation by enriched bacterial culture

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OP-01-026

Abstract

Industrial development and urbanization led to the intensive usage of pesticides in agriculture and food industries. These effluents with extremely toxic organic contaminants discharged fromindustries into aquatic environments cause serious issues to human beings and other creatures. Among the pesticide, organophosphorus (OPs) chlorpyrifos (CP) is extensively used as anacaricide, insecticide and termiticide. The application of CP has caused environmentalcontamination and also leads to the disturbance in the biogeochemical cycles. Microbial methodsof CP degradation proves as a better alternative to the conventional methods of degradation. Thisstudy focuses on the biodegradation kinetics of CP. Different kinetic and substrate inhibitionmodels were fitted to the kinetic data and found the best fitting model. The model predictedkinetic parameters were in agreement with experimental findings.

Keywords: chlorpyrifos, pesticide, degradation, kinetics, inhibition models.

Synthesis of SnO 2 decorated NiO/Ni hybrid-based p-n type nanostructures for photocatalytic degradation of Crystal Violet Dye

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OP-01-027

Abstract

Water pollution is a grave problem due to untreated discharge of wastewater fromindustries to the water bodies, especially by organic dyes which also poses serious healthproblems. Nanostructured materials have shown great potential due to their high surfacearea to degrade organic dye by photocatalytic oxidation. But the major challenge is therecombination of photogenerated electron-hole pairs which decreases photocatalyticactivity. One of the viable solution to this problem is by doping nanoparticles that results inmovement of electron and hole pairs in opposite directions thereby reducing the chances ofrecombination. Here, we have demonstrated one-step synthesis of SnO 2 doped Ni/NiOnanostructures forming a p-n type heterojunction via a polymer assisted route for crystalviolet dye removal. These nanostructures were characterized through microscopic (FESEMand TEM), spectroscopic (XRD), and BET surface area analysis. These nanostructureswere tested for the photocatalytic degradation of crystal violet dye through a series ofexperiments and observed 95% removal efficiency in 40 min.

Keywords: Crystal Violet Dye, Photocatalytic Nanostructures, P-N type Semiconductors

Analysis on different types of polymeric mask material

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OP-01-028

Abstract:

Since, the start of the COVID-19 pandemic, health associations have insistedon usage of face mask to limit the spread of coronavirus. Since then, acollection of mask and respirators varying from handmade mask to N95respirators have been available in the market. Although, recent mask have beencustomized with features such as shape of the mask, fans, exhalation valves, strap designs, and many others the most important feature of the mask still stands to be the material of the mask.

Apart from the N95 mask which provides high level of protection, there arevarious polypropylene and polyester fabric-based mask and respirators whichhave similar protection value. The purpose of this analysis is to present varioustypes of mask materials and their performances and limitations. The focus ofthe review is mainly to describe properties such as breathability, filtration, lifeand fluid- resistance. With the use of mask and respirators being commonplace,it is also very important to consider its recyclability and reusability.

The purpose of this study could help us choose the type of mask that must bepromoted by the industry for the future.

Keywords: Respirator; mask; coronavirus; polypropylene; polyester

Hydraulic and Mechanical Properties of Pervious Concrete Made with Recycled Coarse Aggregates and Volcanic Ash (Mineral Admixture)

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OP-01-029

Abstract

Many problems related to water bodies which in turn is related to Environmental problems Likewater logging, storm water runoff is because of impervious concrete surfaces or pavementsPervious concrete is the answer to the serious problem of storm water and rainfall as it captures& percolates the rainfall, storm water to ground and hence recharges the ground water. Perviousconcrete is basically a special type of porous concrete comprising of coarse aggregate, Portlandcement, and water. It is different from the standard concrete in this respect that it contains nofines in the initial mixture, this concrete is the high porosity concrete having 18 to 35% voidcontent& infiltration rate of 2 to 18 gallons per minute per square foot (80 to 720 litersperminute per square meter). Pervious concrete is traditionally used as filtering media in watertreatment plants, low-volume pavements, residential roads, passageway, driveways, parkingareas and pavement edge drains etc. In addition to these benefits, pervious concrete also reducethe HIE. This study includes to enhance the permeability, mechanical, durability properties andto observe the infiltration capacity of pervious concrete by adequate amount of replacement ofCement by volcanic ash (chemical admixture) and coarse aggregates by recycled coarseaggregates.

Key Words: HIE (heat island effect), VA (volcanic ash), PC (porous concrete) and ME (mineraladmixture).

Recent Developments in the production and implementation of the Banana Fiber reinforced Polymer composites

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OP-01-030

Abstract

The detrimental impacts of synthetic material have rooted the heavy search for eco-friendly materials. Agriculture has always been the backbone of economy, in general. With the passageof time we have closely seen the technology fostering the agro-based industries, but the twofaced technology increased the quantity of waste as well. Recent past has evolved this wasteinto a meaningful composite which nowadays are used as the building blocks for a variety ofindustries. This review caps all the recent developments that have been made in the BananaFiber reinforced polymer composites. Natural fibers and Polymer matrix in varying amountwhen clubbed constitutes a composite. The composites so produced arebiodegradableinnature due to which these are termed as Green composites. Their flamboyant properties likeTensile Modulus, Tensile Strength, etc. are in hand to hand with the conventionally usedmaterial. The wide application of composite encompasses industries like Automobile, Aerospace, Electrical, etc. In upcoming era composites are seen to have a very vivid future.Our review work includes different combinations of Polymer matrix with Banana Fiber to getthe best suited properties of the composites so formed by varying percentages of fiber.

Keywords: Biocomposites; Natural Fibers; Sustainability; Eco-friendly.

Locally available uncommon natural fibers as a reinforcement in polymer composites

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OP-01-031

Abstract

Natural fibers have shown their potential as a reinforcement material in differentpolymer composites. Being environment friendly, cost effective and sustainable innature they become the choice of researchers and academicians to be exploited indifferent polymer matrix for developing green composite materials. Significantamount of work has been reported on traditional natural fibers like coir, banana,wheat straw, hemp, sisal, pineapple etc.. Mechanical properties, morphologicalcharacterization, compositional analysis, thermal degradation and kinetics have beenextensively studied for these traditional natural fibers and their reinforced polymercomposites. India, being an agricultural country there are several other locallyavailableagro-waste and natural fibers are there having immense potential to be usedin polymer to develop composites. This article gives a review on different locallyavailable natural fibers, their properties and their utilization potential fordevelopment of these novel materials.

Plastic Waste Management and Recycling –Plastic Bricks

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OP-01-032

Abstract

Plastic is a non-bio-degradable substance which takes thousands of years to decompose thatpollutes the land as well as water. The quantity of plastic waste in municipal solid waste isexpanding rapidly. The packaging revolt has not been backed by proper plastic wastemanagement policy, which has left cities littered with plastic wastes. This project reviews one ofthe sustainable and effective way of managing plastic waste by recycling it into plastic brickswhich are light in weight and possess high strength when compared to standard bricks. But, themanufacture of pure plastic brick is tedious in nature, requiring large amounts of bottles andwaste plastic for even a single brick. Therefore, a composite material consisting of a cementbrick and plastic is the better approach as it provides the fundamental properties of a standardbrick incorporating the recycled plastic in it, as well. “Poly Brick”, provides the consumer withvarious extended benefits, in extension to being eco-friendly. These will be studied at variousdifferent compositions of plastic material and further they will be tested for their porosity, compressive strength, tensile strength, chemical reactivity and durability in comparison with astandard brick. After preparing various compositions of the Polybrick and testing them in variousaspects as said above, the brick performed exceptionally well at 25% plastic composition.

Keywords: Plastic Recycling; Plastic bricks; Polybricks.

Experimental Investigation of Polyurea Synthesis by Interfacial Polycondensation: Effect of Limiting Monomer and Organic Solvent

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OP-01-033

Abstract

Interfacial Polycondensation (IP) of hexamethylene-1, 6-diamine (HMDA) andhexamethylene-1, 6-diisocyanate (HMDI) reaction for synthesis of polyurea is very fast.Therefore the overall process of Polyurea synthesis via Interfacial Polymerization byenlarges mass transfer control reaction. Interfacial area is an important parameter in its ownright during this reaction. Also, the effect of solvent in case of interfacial reactions is amplydiscussed in literature in case of organic synthesis reactions. IP reactions are also noexception to this. Therefore, the objective of this experimental work was to study the effectof moles of limiting monomer per unit volume of dispersed phase on kinetics of interfacialpolymerization reaction using two different organic solvents. Reaction rate is inverselyrelated with increase in mole moles of limiting monomer per unit volume of dispersed phase.Polyurea synthesis was directly related with relative polarity of solvent. Characterization ofPolyurea was carried out by FTIR, XRD and DSC which demonstrated that semi crystallinepolyurea with good thermal stability was synthesized.

Keywords: Polymerization; Interfacial Polycondensation; Polyurea;

Bio-Sorptive Studies On Removal of Rhodamine Blue Using Synthesized Zn NP'S

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OP-01-034

Abstract

In the present study, Zinc Nano particles (Zn NP'S) were synthesized using leaf extract of TabernaemontanaDivaricata as stabilizing agent and used for biosorption of Rhodamine Blue dye from aqueous solution. Synthesized Zn NP'S were characterized by SEM, XRD and FTIRanalysis. The process variables such as Agitation time, Initial Concentration of RhB dye, pH, Dosage of Zn NP'S and temperature were performed and compared by using response surfacemethodology (RSM). At the optimized parameter conditions, the dye biosorption was studiedfrom Isotherms, Kinetics and Thermodynamics respectively. At the optimized conditions, Maximum Removal (more than 90 %) of RhB dye occurred. It was found that experimental datawas fitted well into Freundlich Isotherm, pseudo first order kinetics models. ThermodyanmicParameters were evaluated.

Keywords: Rhodamine Blue; TabernaemontanaDivaricata; isotherms; kinetics; thermodynamics; Response Surface Methodology (RSM).

Studies On Green Synthesis Of Silver Nanoparticles For The Removal of Brilliant Green Dye From Aqueoussolution

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OP-01-035

Abstract

The present study aims to exploit the experimental determination of biosorptivecharacteristics of synthesized nanoparticles with tecoma Stans leaf extract. The synthesizednanoparticles were characterized by XRD, FTIR, SEM and FESEM analysis. Batch runs wereconducted to study the effects of time, pH, concentration of brilliant green (BG) dye, biosorbent dosage, and temperature on % removal of BG dye. The optimum conditions wereobtained experimentally are compared with those of response surface methodology (RSM)results. The experimental data was fitted into Temkin isotherm. From the kinetic studies thedata follows pseudo first order kinetics. The results of thermodynamic studies givesendothermic nature, thermodynamically feasible and spontaneous nature of biosorption. The results indicated that the Ag-TS-Np's can be used as good low cost biosorbent fortreatment of effluents from aqueous solution.

Keywords: Brilliant green; Tecoma stans; Isotherms, Kinetics; Thermodynamics; Response surface methodology; and Ag-TS-Np's.

Energy and Environment: Solar/Biomass/Fuel Cell/ Hydrogen Energy/ Li-ion Battery/ conventional and non-conventional energy, Wastewater Treatment (EEN)

Pyrolysis of Banana Agro-waste: Recent Advances, Challenges, and Recommendations

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OP-02-001

Abstract

Lignocellulosic biomass (LCB) is making deep inroads as a sustainable renewableenergy source in tandem with solar and wind energy. India is one of the largest agrarian-based economies in the world and livelihood of around 75% of its inhabitants dependson agriculture. Consequently, abundant agricultural waste to the tune of 350 milliontons per annum (MMTPA) is generated in India which is envisioned to be a majorconstituent of India's future energy supply. It is worth mentioning that India stands atnumber one position in banana production (30 MMTPA) in the world. In bananacultivation, significant amount of agro-wastes comprising pseudostem, leaves, stalk etc.are generated. After an exhaustive literature survey regarding pyrolysis of agro-residues, it was figured out that although researches associated with rice and wheat agro-residueshave been reviewed, researches dealing with banana agro-residue have not beenanalyzed and presented in the form a review paper. The goal of the presentcommunication is to put together different aspects associated with pyrolysis of bananaagro-waste in a single thematic framework. Analysis revealed that banana agro-waste has an enormous potential to be a part of bioenergy mix in India leading to theproduction of bio-oil and bio-chemicals through pyrolysis.

Keywords: Banana agro-waste; Pyrolysis; Kinetics; Model-free isoconversionalmethods; Thermodynamics

Ultrasonically enhanced electroxidation for mineralization of real personal care wastewater

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OP-02-002

Abstract

In this paper, the mineralization of real personal care product wastewater using asonoelectrochemical reactor was studied. The concept of combined sonication andelectrochemical treatment for mineralization was demonstrated using 40 kHz ultrasonicpower and titanium coated ruthenium oxide (Ti/RuO2) electrode. Various parametersaffecting mineralization efficiency, such as ultrasonic power (P), current density (j), initialpH, and electrolyte concentration (m) of the sonoelectrochemical reactor, were evaluated.Sonolysis was virtually less useful for mineralization, while electrochemical andsonoelectrochemical were found to be more effective for them in terms of chemical oxygendemand (COD) and total organic carbon (TOC) removal. Almost 87% removal of CODand 65% removal of TOC at the optimum condition of 6.5 pH, 60 W ultrasonic power, anapplied current density of 105 A/m 2 , 1 g/L electrolyte concentration were investigated. Asynergistic effect of 1.2 was found. Mineralization was followed to be pseudo first orderkinetics in both the process, but the rate of mineralization was faster in thesonoelectrochemical process compare to the electrochemical process, which confirm thesynergistic effect between the cavitation process and the electrochemical process. Inaddition, specific energy consumption was also calculated. The mechanism ofsonoelectrochemical oxidation was also postulated.

Keywords: Sonolysis, Electrolysis, Sono-electrolysis.

Rational Reliability Analysis in Nuclear Power Plant

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OP-02-003

Abstract

The growing interest in nuclear power from the past few years has led intoanincreasednumber of concerns of the power plant utilities and the generalpublic about the safety of the power plant and their operational reliability. Reliability analysis is completely essential in modern-day science wherecomplex devices are used for scientific purposes. Reliability monitoringwill help in nuclear safety in many ways as it will not only tell the cause ofthe failure but also tell how the particular cause can be eliminated. Also, Nuclear power brings numerous hazards which may create a huge impactand as nuclear power plant usesradioactive material the exposure toradiation increases the chances of various diseases and all the wastegenerated by the reactors remains radioactive for thousands of year which badly affects the environment. Nuclear power plants were even stigmatizedby two very severe accidents the Chernobyl and the Fukushima accidentsand studies confirmed that humans are the major contributors for suchincidents to take place. To avoid such disasters Human reliability analysis(HRA) can be applied to identify and judge human error. It mainly helps toimprove the human-machine interface and reliability. The main purpose of HRA is the identification of human error, human error modeling, and theerror probability quantification. The present study critically reviewsdifferent HRA used in the nuclear plant and reports the efficacy of eachanalysis.

Keywords: Human reliability analysis; Human error; Nuclear power plant

Comparison of different coagulant's efficiency on COD reduction from Pharmaceutical wastewater

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OP-02-004

Abstract

In this study, various coagulants such as ferric chloride, aluminium sulphate, chitosanandaloevera all in form of solutions were used to show the efficiency of coagulation-flocculation for the COD reduction from Pharmaceutical wastewater. Effect of variousparameters such as coagulant dose, pH and settling time of solution on COD reductionwere investigated using jar test experiment. It was observed that when ferric chlorideandAloevera were used as coagulant, COD reduction of 79% and 54% at optimumconditions of 4g/L, pH 7 and settling time 60 minutes were obtained respectively. Dualcoagulant was also studied with different ratio of coagulants in COD reduction. 4:1 ratioof ferric chloride: aloevera resulted in maximum COD reduction of 60% and remainingratios showed less reduction than that, 50% COD reduction was shown when organiccoagulants Aloevera: chitosan was used. This study shows aloevera is promisingalternative as coagulant for the wastewater treatment.

Keywords: Chemical oxygen demand (COD), Coagulation, Pharmaceutical wastewater, Aloe vera

Preparation of Three Layer Particle Board Using Banana Pseudostem Coir Pith

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OP-02-005

Abstract:

The world demand for wood products increases constantly. Trees, both from plantations and forests, are currently the primary source of the fiber which is facing importantsustainability. Due to the over harvesting of low-valued wood for the production of particleboards the forestresources are decreasing day by day and hence finding new substitutes for producingparticleboard is a major concern nowadays. This study attempts to fabricate and examine thephysical and mechanical properties of banana pseudo-stem-coir pith based particle boards thatare capable to serve as a cost-effective and technologically viable substitute to the conventionalwood chip particle boards.

The three-layer particle board is prepared by using a mixture of banana pseudo stem coir pith, sawdust and sugarcane bagasse in different ratios. 35% banana pseudo stem coir pith used as face layer and 65% core layer is made using mixture of Banana pseudo stem coir pith, Sawdust and Bagasse in the ratio of 100:0:0, 70:15:15 and 40:30:30.The formaldehyde resin used as a binder. The particle boards are prepared using mixture of banana pseudo stem coir pith.

Keywords: particle board, banana pseudo stem coir pith, sawdust, sugarcane bagasse

Solar Energy for Water Desalination

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OP-02-006

Abstract

There is an increasing demand for advancing conventional desalination technologies and developingnovel solar powered desalination processes. Solar energy utilization systems such as flat plat solarcollectors, evacuated tubes, and solar ponds absorb the solar energy and convert it to thermal energy thatdrives thermal desalination processes. Solar desalination is a technique to produce water with a low saltconcentration from sea-water or brine using solar energy. There are two common methods of solardesalination. Either using the direct heat from the sun or using electricity generated by solar cells topower a membrane process. This paper presents the different solutions to the most commonly useddesalination process (RO, MSF, MED), and solar energy production technology compatible withdesalination. The goal is to assess the feasibility and profitability of the substitution of fuel energy usedfor desalination plants with renewable energy. A review of various technologies will definebroadlyfeatures associated to each technology and range of cost that are expected. Finally, a review of variousprojects will detail the practical aspects of floor space and actual production costs of fresh water.

Keywords: Desalination, RO, MSF, MED, Solar energy.

A Review on Pyrolysis of Various Grades Waste Plastics into Fuels and it's Characterization Studies as per ASTM Standards

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OP-02-007

Abstract:

In recent scenario due the presence in contamination of the physical, chemicaland biological components of the atmosphere system to such an extent that normalenvironmental processes are skeptically affected. Contaminants can be naturallyavailable substances or may be from energies such as generation of wastes during theinvention of new compounds/components through various derived resources. But theyare considered as contaminants, when it becomes excess of natural levels. Any use ofnatural resources at a rate higher than nature's capacity to restore itself can result incontaminations of Air, Water, and Land.The present study is an initial attempt to explore the plastic wastes from dump inurban and municipal areas, also to segregate such plastic wastes according to the SPI(Society of the Plastics Industry) stranded Codes, it creates an awareness to developingcountries like INDIA on plastic wastes and its possible reuse for conversion of valueadded products as fuels, this could be generated and marketed at cheaper rates ascompared to that of commercially available fuels in the market. This study also gives anidea on comparing various properties and other parameters of plastic waste fuel intocommercial fuels according to the ASTM (American Society for Testing and Materials)standards. This study will cover various possible Plastic Waste Processing Methods likePyrolysis for the production of plastic waste fuel oil and its recovery. In that approximately 65 % of oil can be recover from 25940 tons/day of plastic wastegenerated in INDIA. This will helps to reduce the environmental issues, also to reducethe dependency on gulf countries for fossil fuels, thereby contributing to the Economicgrowth of the country.

Keywords: ASTM; Fuel oil; Fossil fuels; Plastic Wastes; Pyrolysis & Thermo -Catalytic.

Water Desalination usingCarbon Based Nanomembranes

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OP-02-008

Abstract

Water pollutants highly impact the ecosystem of flora, fauna, aquatic, and terrestrialframeworks. In addition to this, newly emitted nano/micro-pollutants are posing threatsto freshwater availability. A regular increase in global warming is increasing land andseawater salinity levels. There is a huge need to develop a membrane that not onlyremoves nano/micro-contaminants but also effectively desalinates the water. Over thetraditionally used materials, Carbon Nanotubes (CNTs) have showcased betterproperties in terms of attracting polar molecules and blocking pollutant salts. Lessenergy utilization, self-cleansing, and anti-fouling characteristics of CNT have overshined over other conventional ones. Also, graphene and graphene oxidenanomembranes have shown remarkable performance in the desalination process due totheir high stability and large specific surface area.
Graphene provides excellent
properties to fabricate the size-selective membranes with strong mechanical properties. Hence, this paper demonstrates an intensive review of the current developments ofcarbon-based nanomembranes for water desalination. Special attention has been givento the present challenges as well as the future scopes of these nanomembranes in water
treatment

Keywords: Water desalination; Water purification; Carbon nanotubes; Graphene; Nanomembranes

Adsorptive Removal Of Heavy Metals From Aqueous Solution Using Activated Carbon Prepared From Natural Sources

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OP-02-009

Abstract

This work concern about the removal of heavy metals from aqueous solution usingActivated carbon prepared from mixture of various seeds of vegetables. Now-a-dayscolour removal from dye effluent is a major issue, various adsorption studies areproposed to remove those components from aqueous solution using adsorbing materials. Natural absorbers are always preferred because of their easy availability and low cost. In this paper we have reported the removal of Cr by using activated carbon preparedfrom seed mixture collected from various vegetables. Activated carbon is activated byusing chemical activation with hydrochloric acid and sulphuric acid is the activatingagent. All are having good adsorption properties of Chromium and the SEM analysis, EDX analysis shows the same. Adsorption isotherm studies also conducted and it givesgood results.

Keywords: Activated Carbon; Isotherms; Adsorption; Chromium

Enhanced Arsenate Removal using Iron Oxide impregnated Cocos Nucifera (coconut husk) Nanoparticles from Aqueous Solution

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OP-02-010

Abstract

Arsenic pollution causes a potential threat to ecosystem and human health. Owing to costeffectiveness, easy handling and enhanced efficiency, the adsorption technique has beenextensively used for the remediation of arsenic from the contaminated aquatic system. Due to high surface area, size and magnetic characteristics of Fe oxide nanoparticle has proven to be very prominent for heavy metal removal. Therefore, in present paper, surface modification of coconut husk with Fe oxide (Fe oxide +CNH) was confirmed by SEM, XRD and FTIR, and batch adsorption experiments were also conducted for the mitigation of arsenate ions from the spiked solution. Arsenate removal was reported as 98.7 % with 1.5 g/L adsorbent dose, 10 mg/L initial arsenate concentration and 25 °C temperature of Fe oxide +CNH. Theequilibrium adsorption data best fitted in Freundlich adsorption isotherm (uptake capacity of91.1 mg/g). The kinetic study reveals that the adsorption process is controlled by the pseudo-second-order kinetic model with regression coefficient equal to 0.989. The results of presentstudy demonstrated prominent insights on propitious adsorbent for arsenate removal.

Clean Fuels for Greener Future

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OP-02-011

Abstract

Today worldwide transportation sector & energy sector mostly uses fossil fuels (around30% of the total annual global energy demand), which generate greenhouse gases and emitspollutants with particulate matters leading to environmental /climate changes causingglobal warming. This has led to scientists, environmentalists, industrialists and intellectualsto think about use of clean fuels & green technology. As an outcome of 'Paris Agreement,2016' and enforcement of government legislations, worldwide investments are going onand projects are planned to enhance the production capacity of clean fuels. &developcleaner technology.

In this presentation we'll explore how the objectives of the Paris agreement will be fulfilled in a time bound manner, its advantages and disadvantages along with the key technology players and touch upon industry investments.

Microbial Fuel Cells in Wastewater Treatment

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OP-02-012

Abstract

Environmental issues associated with water sanitation are not confined to developingcountries alone but are the most basic human and environmental necessities all over theworld. Wastewater sources are major causes for environmental pollution in surface andground water bodies. Current wastewater treatment technologies are not sustainable tomeet the ever growing water sanitation needs due to rapid industrialization andpopulation growth, simply because they are energy- and cost-intensive leaving latitudefor development of technologies that are energy-conservative or energy-yielding. Forthe present and future context, microbial fuel cells technology may present a sustainableand an environmentally friendly route to meet the water sanitation needs. Microbial fuelcell based wastewater systems employ bio electrochemical catalyticactivity of microbes to produce electricity from the oxidation of organic, and in somecases inorganic, substrates present in urban sewage, agricultural, dairy, foodand industrial wastewaters. This paper presents the potential for energy generation and comprehensive wastewater treatment in microbial fuel cells. This paper provides anoverview of current energy needs for wastewater treatment and potential energyrecovery. From the economic and life cycle assessment point of view, although recentdevelopments in power production are encouraging, important discoveries in electrodematerials, innovative and integrated process configurations along with experience inpilot scale studies are urgently required to determine the real potential of the microbialfuel cell technology to provide sustainable and energy-positive wastewater treatment.

Keywords: Microbial fuel cell, Bio electrochemical systems, Wastewater.

Process Optimization at an Industrial Scale in the removal of Cd2+ions using Dolochar via Response Surface Methodology

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OP-02-013

Abstract

While potential of many biosorbents have been explored in laboratory setup, very fewstudies have tried to scale up the biosorption process and predict the performance of thesebiosorbents in a large scale industrial setup. In this work, performance of laboratorysynthesizeddolochar has been investigated for adsorption of Cd 2+ ions in a large scaleprocess with the application of Aspen Adsorption. Moreover, the optimum values of theoperating parameters (namely, flow rate, bed height and inlet metal ion concentration) thatwould result into maximum amount of cadmium ion adsorption in minimum time for afixed mass of dolochar (1200 kg) have been calculated via the application of ResponseSurface Methodology. It was found out that, at optimum values of bed height (3.48 m),flow rate (76.31 m 3 /day) and inlet concentration (10 ppm), the optimized value ofexhaustion capacity and exhaustion time for cadmium ion adsorption in dolochar packed-bed is equal to 1.85 mg/g and 11.39 hours, respectively. The validity of these simulationexperiments can be proven by the fact that the obtained exhaustion capacity of dolocharpacked beds always remained in close proximity of the experimentally obtained value ofadsorption capacity of the dolochar (equal to 2.1 mg/g).

Keywords: Large-scale biosorption; heavy metal removal; Process Simulation; Process Optimization; Dolochar

Cavitation based Advanced Oxidation Process for effective treatment of emerging pollutants: Focus on real-life greywater streams

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OP-02-014

Abstract

Tremendous stress on water sources has led to a situation where there will be a 55%upsurge of water demand, globally, by 2050. Sustenance of limited water availability canbeaddressed by focusing on recycling and reuse of wastewater. In this regard, this is theneed of the hour for a sustainable, cost-effective and safe solution for water management.Thus, the current work explores hydrodynamic cavitation (HC) as a promising treatmenttechnology coupled with other advanced oxidation processes for effective degradation ofemerging water pollutants. The authors have focused on treatment of surfactants, dyes,antibiotics and real-life greywater streams discharged from kitchen sinks. A systematicapproach has been adopted for all the treatment schemes whereby the following modusoperandi were taken: (i) selection of a cavitating device for HC treatment (ii) optimizationof operating parameters (iii) influence of oxidizing agents on treatment efficiency (iv)energetics and economics of the treatment scheme. The results indicate that HC inducedadvanced oxidation process is efficient in reduction of more than 75 % organic content,around 60% dye degradation, more than 90% antibiotic degradation and almost 100 %surfactant degradation. Encouraging results at laboratory scales can help in providingscaled up solutions both for domestic and industrial applications.

Keywords: Hydrodynamic cavitation; Advanced oxidation process; Surfactants; Antibiotics; Dyes; Greywater

Synthesis of N-Doped Graphene from Biomass Sources

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OP-02-015

Abstract

Graphene has been one of the most noteworthy materials for reasons owing to itssuperlative properties. This work majorly focuses on graphene composite derived frombiomass as an electrode material for supercapacitors given the significance of light weightand compact energy power sources that are increasing due to increase in demand of energywith increased population. Graphene composites are synthesized from bioprecursorslikecoconut shell and rice husk through simultaneous activation graphitization where theprecursors are heated in inert atmosphere to 900 o C in a tubular furnace and then doped withNitrogen. This work highlights the various aspects of the ensuing product such as itsformation mechanism, morphology, merits and de-merits of the process. Results such asXRD and Raman analysis are also included about the product where the presence ofgraphitic peak, Nitrogen and particle size is determined. Comparison is made between theprocesses that are conducted with the two precursors respectively. In rice husk particularly, the process is conducted in three trials with varying ratio of the precursor, strength of thecatalytic precursor and number of times of washing and the results of the trial products arestudied in detail for their product formation efficiency.

Key words: Biomass; graphene; super capacitor; energy storage application

Morphological and Mineralogical Characterization of Lignite for Gasification

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OP-02-016

Abstract

In the present paper main emphasis was given in lignite coal by mineralogicalcharacterizationofcoal was done by different analytical methods such as Proximate and Ultimate analysis, TGA/DTA, FTIR, FE-SEM and EDX.The results of mineralogical analysis of coal reveal the occurrence of several metals in variousminerals form like sulphate, kaolinite, albite, mullite, Illite, hematite, hercynite, and pyrite.Alkali/alkaline earth metal oxides were also found in ash shows its suitability for clean coaltechnology such as pyrolysis and CO 2 gasification. “A” factor (aliphatic/aromatic bands) and “C”factor (carbonyl/carboxyl bands) value indicate that sample has lowest aromaticity and thehighest hydrocarbon-generating potential; which also validate by the cross plot between atomicH/C and O/C. TGA curve confirm that at 25 to 240°C temperature, approximately 50% (AR) and20% (AD) wt. loss appeared due to loss of water; which is also endorsed by DTA curve.In case of CO 2 gasification VM model showed higher activation energy value 139.15 kJ/molcompared to RPM model value 131.37 kJ/mol for the temperature range of 900 °C to 1000 °C.

Keywords: Lignite coal; Hydrocarbon-generating potential, FE-SEM and EDX analysis, TGA/DTA, FTIR and Reactivity index.

Analysis of Biogas Production from Organic Waste

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OP-02-017

Abstract

Consumption of fossil fuel as primary energy source in India increases to 2.3% in 2019.Carbon-dioxide and methane are the two major greenhouse gas emitted on combustionof fossil fuel and anaerobic degradation of organic waste respectively causing globalwarming. Biogas an alternative energy source enriched by methane is equivalent tonatural gas and reduces CO 2 emission on combustion. Buswell and Muller developed amodel to estimate the theoretical yield of methane from a stoichiometry equation basedon the elemental composition of the organic biomass. The energy value of the biomassis calculated from the modified Dulong formula. This model has a small-scaleapplication and serve as a tool in selection of biomass suitable for the desired biogasproduction.

Key words: Biogas, Theoretical analysis, Energy value.

Microbial Electrolysis Cell (MEC) Design and Configuration for Biohydrogen Production from wastewater: A Review

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OP-02-018

Abstract

Hydrogen is among the low carbon alternatives in the real-time energy revolution. Bioelectrochemical system, referred as Microbial Electrolysis Cell (MEC), is a novelgreen alternative technology which produces biohydrogen and other value-addedproducts along with simultaneous removal of pollutants from wastewater. MicrobialElectrolysis cell consists of an anode and a cathode chamber separated by a protonexchange membrane in which hydrogen is produced with the addition of small electricalinput (<1.2 V) due to thermodynamic limitations. Biohydrogen production dependsmainly on the various factors including substrate, anode and cathode catalyst, appliedpotential, reactor configuration etc in the MEC. However, the reactor configurationplays a significant role in minimizing the cost and compactness among other factors. Hence, the main aim in this review article is to discuss the basic mechanism of MEC,electron transfer mechanism and various reactor designs including single, dual andmulti-chamber, up flow, packed and fluidized bed configuration etc. This review also provides the advances and recent developments in research on MEC reactor design andconfiguration for real time applications.

Keywords: Microbial Electrolysis Cell, Biohydrogen, reactor design, Wastewater

Electrode Regeneration and Energy recovery studies of flow electrodes in Flow electrode capacitive deionization process

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OP-02-019

Abstract

The two most alarming concerns of current era are water scarcity and depleting energyresources. There are many ways to reduce water scarcity, including rain enhancement, desalination, watertreatment and reuse potential, water harvesting etc. When it comes to desalination and water treatment,current methods are energy expensive. Capacitive deionization is an electrically driven desalinationtechnique to produce fresh water from saline water at the expense of minimal energy. Not only this, it isan emerging and promising technology for removal of ionic as well as polarizable species from water.With low operational cost, enhanced energy efficiency and less water rejection it is even projected as analternative to conventional pressure-driven systems (such as RO) or thermal technologies in desalination.Flow electrode capacitive deionization (FCDI) cell is a modified capacitive deionization device to bringoff more efficiency and a continuous process even at elevated salinity levels by virtue of regeneration ofthe flow electrodes. The possibility of energy recovery is an added benefit of regeneration of electrodes.In this work regeneration behaviour and energy recovery of different flow electrodes are analysed withthe help of electrochemical studies.

Keywords: Flow electrodes, Energy recovery, capacitive deionization, RO Reject, Electroderegeneration

Studies on Reactive extraction of Succinic acid

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OP-02-020

Abstract

Succinic acid has received increasing attention in various fields and hence reactive extraction has been employed to recover by using tri pentyl-amine and tri butyl amine in different diluents (1-octanol, chloroform and dimethyelene chloride). Physical and chemical equilibrium isotherms were measured through (1:1) and (2:1) type of acid- amine complex at room temperature and pressure. Equilibrium complexion constant (K_{E1}) is evaluated using loading ratio (Z), at 40% amine in 1-octanol for TPA K_{E1}=14.06 and for TBA K_{E1}=7.5. A (1:1) type of complex is observed. Effect of acid (0.1 to 0.4N) and amine concentration (10% to 40%) is noticed in terms of distribution coefficient, K_D = 5.41 to 32 for TPA and K_D =2.64 to 8.09 for TBA, at 0.1N. In a batch type reactive system, order with respect to acid and amine, mass transfer coefficient, rate constant was determined at different succinic acid concentration (0.1 N to 0.4 N) by conducting kinetic studies at different succinic acid concentrations. Based upon the value of hatta number and other criterion conditions, enhancement factor and type of reaction regime for TPA and TBA with 1-octanol have been evaluated.

Keywords: Reactive extraction, equilibria, kinetics, Succinic acid, tripentyl amine, tributyl amine, 1-octanol, chloroform and dimethylene chloride.

Production of Biodiesel from Rice Bran Oil using Ultrasonication

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OP-02-021

Abstract

Biodiesel defined as the mono alkyl ester of vegetables oils or animal fats is an “alternative” diesel fuel that is becoming popular and is gaining acceptance in growing numbers in countriesaround the world. As biodiesel comes from domestically produced renewable resources, itcontributes to the domestic energy security. Biodiesel is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatics.

The present work focuses on the production of the methyl ester fuels based on the rice bran oilutilizing the Ulttrasonicator. The effect of various parameters such as temperature, residencetime, catalyst concentration is investigated for the conversion of the biodiesel. The physicalproperties like Viscosity are also studied.

Keywords: Ultrasonicator; Biodiesel; Rice bran oil; Methyl Ester; Ultrasonication.

Effect of pre-treatment conditions on preparation of bioethanol from dried fallen neem leaves

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OP-02-022

Abstract:
During the recent years ethanol derived from biomass, popularly known as bioethanol isgrabbing attention due to incessant spike in petroleum prices. Ethanol derived from corn and sugar are the most popular substitute for ethanol. However the feedstock is not sufficient and poses the menace food versus fuel. Hence cheaper and inedible sources need to be investigatedfor the production of bioethanol. In the current study lignocellulosic biomass derived from waste, dried neem leaves was used as a source for bioethanol production. The powdered leaves werehydrolyzed with conc. H 2 SO 4 followed by fermentation with yeast S. cereviciae. On completionof the fermentation process the broths obtained were distilled to obtain bioethanol. The effect ofpre-treatment on the bioethanol yield was studied by varying the concentrations of H 2 SO 4 as0.5 N, 1 N, 2 N, 3 N and 5 N, temperature as 100°C,120°Cand 140°C and pre-treatment time as15, 30 and 60 minutes. H 2 SO 4 conc. of 1N, temperature 120° C and pretreatment time of 60minwas found to be the most optimum condition for bioethanol production.

Key words: Bioethanol, pre-treatment, lignocellulosic biomass, fermentation

Solar Aided Drying of Various Natural Products

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OP-02-023

Abstract
Solar Drying Technique is a novel trend of using solar energy in food industry. After the success of harnessing solar energy for electricity, next idea on the brightestminds of globe is to reduce use of coal and carbon emission in industry for heatingapplications, where solar drying could be the outset. Direct exposure to high temperature imparts adverse effects on nutritional valuesof edible products, such as fruits, spices and medicines. Solar drying could emerge as abreakthrough in not only making the product cheaper, but also better. The dryer consistsof a parabolic roof structure covered with polycarbonate plates on concrete floor. Thedryer base being a concrete floor with an area of 9×12.4m 2. Nine DC fans powered by three 50-W PV module were used to ventilate the dryer.

Our research compiles the data and advancements from various researches inthis field, which includes the comparison of various driers with solar driers, integrationof multiple metallic solar concentrators, dryer performance based on drying airproperties, drying rates, energy utilization and energy efficiency. The study reveals thatthe solar radiation gives the most effective drying in terms of cost and retention ofnutrients which are lost with other driers.

Keywords: Solar radiation; Solar drier; Renewable energy; Drying efficiency

Extraction and Characterization of Chitosan from Crab Shells For Industrial Effluent Treatment

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OP-02-024

Abstract

Textile effluent in to the nearby water bodies becomes a significant threat to environmentmostly to the aquatic life. It has so many offensive properties like strong odour, strong colour, turbidity, alkalinity, toxicity etc. The increase in the content of these objectionable properties results in to adverse effects which influences the life of marine organisms. Membraneseparation is a simple technique and rapidly used in the waste water treatment. This studywas based on crab chitosan membrane for waste water treatment. PES/crab chitosan preparedby phase inversion methods and chitosan was prepared by deacetylation of crab scales, whereas PES was prepared by phase inversion method. The prepared 15% polyether sulphonewas dissolved in dimethylformamide (DMF) in which 2gm of polyvinylpyrrolidone (PVP)was added as a pore performing agent. The (1gm/1gm) crab chitosan solution was preparedwith dilute acetic acid and cast on the top of PES membrane and then cross-linked with 2%glutaraldehyde. The resulting crab chitosan composite membrane was extensivelycharacterized using several methods such as X-ray powder diffraction (XRD), scanningelectron microscope (SEM), thermogravimetric analysis (TGA) and Fourier transforminfrared spectroscopy (FTIR). The 15% crab chitosan membrane and 15% commercialmembrane molecular weight cut-off was found to be 9180 and 9022 Da respectively. Thepure water flux for fish shrimp membrane with thickness of 0.22 mm was 50 L/m 2 h.

Key word: Chitosan, Waste water treatment and Turbidity.

Aromatic compounds production from the waste plastics by using the derived catalyst

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OP-02-025

Abstract

The global production of plastics is increasing rapidly because of their vital role in today's dailyactivities. The sharp rise and mass consumption of plastics produce a great number of wastes, whichposes a formidable challenge for waste management. Domestic waste generally contains many kindsof waste plastics, including polyethylene, polypropylene, and polyvinyl chloride, which is 70% oftotal waste as per Ll et al. 2001. Approximately 10-20 million tons of plastics end up in the oceanseach year as per Tranksali et al. Thus, it is becoming increasingly challenging to manage and controlthe use of plastics due to their adverse environmental effects. In this paper, we focus on theproduction of clean fuel from waste plastics by catalytic pyrolysis. Catalytic pyrolysis is a novel highefficient technology for the recycling of waste plastic and it is environment friendly also. It can alsostabilize the global need for fossil fuel which tends to be a crisis. Pyrolysis of different waste plasticssuch as polyethylene, polypropylene, polystyrene, and polyvinyl chloride was achieved at a benchscale to produce clean fuel of required calorific values or chemical feedstock. Combination ofpyrolysis with catalytic up-gradation process can prove significant economic and economical optionin the conversion of e-waste plastic. Herein, we conducted the pyrolysis by utilizing the porous wastecarbonaceous material as a catalyst. Study the effect of catalytic temperature, residence time, andplastic waste component on the production of Aromatic compound. It found that the selectivity ofsludge char to monocyclic aromatic was up to 75.3% when the catalytic temperature was 600 0c witha residence time of 1 s.

Keywords: Waste plastics; Aromatic production; Catalytic thermochemical conversion

Influences of different subsurface stratigraphic folds on the residual-trapping and structural integrity during CO 2 geological sequestration

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OP-02-026

Abstract:

In CO 2 sequestration, the residual-trapping is one of the prominent trapping mechanismsthat get influenced by the geological parameters such as petro physical properties,cracks, stratigraphic folds etc. The multiphase flow model aims at the impacts of thestratigraphic folds of subsurface region on the residual-trapping. Four stratigraphicstructures are modelled to which petrophysical properties, perturbations and cracks ofvariable permeability are introduced to attribute a realistic nature to the multiphase flowmodel. Supercritical CO 2 is injected for 30 years and its migration path is analysed for720 years to understand storage capacity, pressure build-up and sweeping efficiency.Optimal injection rate, location and nature of structural fold have played a crucial rolein enhancing the trapping efficiency. It was noted that the presence of cracks provided aground for storing residual CO 2 in the migration pathway and high permeable cracksdepicted higher storage potential than that of the lower ones. The pressure distributionon the structure does not exhibit significant change that indicates the structural integrityof the domain. It was observed that anticline structure exhibited the maximum trappingefficiency compared to the rest of the structures and can be observed as a promisingstructure for CCS.

Keywords: CO 2 sequestration; Structural integrity; Residual Trapping mechanism; subsurface stratigraphic folds

Lattice Boltzmann modelling to study the Anodic Porous Transport Layer structure of PEM electrolysers

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OP-02-027

Abstract

Many experimental and numerical approaches have been implemented to study the complex multiphase flows in anodic porous transport layer (PTL) in electrolysers and fuel cells. LatticeBoltzmann Model (LBM) is a mesoscopic method which acts as a Navier-stokes solver atmacroscale and imitates micro-level interaction at microscale. It is implemented to studyvarious multiphase phenomena such as drying [1] and drainage. In this study, themulticomponent model (Shan Chen LBM) is implemented to study the O2 drainage in a watersaturated anodic PTL of the polymer electrolyte membrane (PEM) water electrolyser. Theanodic PTL serves channels for the water to reach the active sites of the catalyst layer as wellas it provides escape pathways for the oxygen. The microstructure of the anodic PTL plays amajor role in the performance of the PEM water electrolysers. In this study, drainage patternof O2 in anodic PTL obtained with the LBM simulation is validated with experiment results[2] and compared with PNM simulations [3]. Porosity gradient is implemented from catalystlayer to the water flow channel: (+) and (-) porosity gradient. The results inspire to consider arandom micro porous layer near the catalyst layer to minimize the accumulation of O2.

Keywords: Lattice Boltzmann method, PEM water electrolyser, O2 drainage, Porositydistribution, MPL, Anode PTL, Hydrogen storage

Graphene Oxide based Proton Exchange Membrane for Direct Methanol Fuel Cell

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Abstract

OP-02-028

Fuel cells are one of the useful alternatives for generating electricity. Fuel celltechnology is beneficial as it can eliminate pollution because it has less greenhouseemissions thus making it environment friendly. Direct Methanol Fuel Cells (DMFC)uses methanol as a fuel producing power by direct conversion of chemical energy intoelectrical energy. Proton-exchange membranes (PEM) are used to generate electricity bythe transfer of H + ions. This study deals with fabrication of a proton exchangemembrane. A sulfonated poly ether ether ketone (SPEEK) and graphene Oxide (GO)membrane was prepared using solution casting method. The molecular structure, thesurface morphology and the crystallinity were thoroughly studied using Field EmissionScanning Electron Microscopy (FESEM) analysis, Fourier Transform Infrared (FTIR)Spectroscopy and X-Ray Diffraction. The resistance offered by the membrane againstmethanol crossover was tested. On incorporating Graphene oxide, the protonconductivity was seen to increase significantly. The permeability was however loweredby addition of Graphene Oxide. The selectivity of the SPEEK/GO membrane was seento be higher than the SPEEK membrane. This indicated the potential of the SPEEK/GOmembranes to be used for Direct Methanol Fuel Cell applications
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Keywords: Graphene Oxide; Proton exchange membrane; Direct methanol fuel cell

Effect of Effective Micro-organisms (EM) Treatment on Chemical Oxygen Demand Reduction of Brewery Industrial Effluent

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OP-02-029

Abstract

The aim of this work is to create a suitable Effective Microorganisms (EM)mixture that can be used to treat Brewery Effluent, with the emphasis being on thereduction of Chemical Oxygen Demand (COD). For this work the Raw UntreatedBrewery Effluent samples were collected from a Brewery Industry in Chennai, TamilNadu. The initial COD of the collected raw samples were S1: 1450ppm and S2:3450ppm respectively. Pure culture of the microorganisms was cultured in the specificgrowth media and EM was formulated. The formulated EM was activated using aCarbohydrate rich Jaggery medium. The activated EM was used for treating the effluent(Volume of EM vs Volume of Treatment solution) and the optimum percentagereduction in COD was estimated for Anaerobic stirred; Aerobic stirred; Anaerobicunstirred and Two stage Aerobic – Anaerobic treatment as 87.1% (S1); 54.49% (S2);67.83% (S2); and 95.16% (S2) respectively for the optimized v/v ratio of 1:200. Thetreatment showed notable reduction in COD with different optimised time periods fordifferent treatments, it was determined as 6 hours for Aerobic and 6 days for anaerobictreatment respectively. The two stage Aerobic-Anaerobic Treatment showed the highest
COD reduction percentage for a optimised time period of 6.25 days.

Keywords: Effective Microorganisms (EM), Microbial Consortia, Chemical Oxygen Demand (COD), Pharmaceutical wastewater, Brewery wastewater.

Investigation of Waste Pomegranate Peel for Their Biofuel Potential

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OP-02-030

Abstract

This work aims to produce biodiesel from waste pomegranate peel collected from localjuice shops. Initially the waste pomegranate peel is drilled in sunlight and make it intopowder The oily content from pomegranate peel was converted to biodiesel by acidcatalyzed and base catalyzedtransesterification using methanol and ethanol. Thebiodiesel so obtained was subjected to analysis in accordance with the AmericanStandard for Testing Materials (ASTM).. The highest % yield of fatty acid methyl esterand fatty acid ethyl ester was found. Also Flash point and fire point was found. The yield of bioethanol from waste pomegranate peels is found to be 1.28%.

Keywords: Biodiesel; Transesterification; Methanol; Oil

Sorption of As (III) on raw (RCH) and surface modified coconut husk in continuous column

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OP-02-031

Abstract

Column studies with raw coconut husk (RCH) and iron impregnated coconut husk (IICH) were carried out to demonstrate the potential of adsorbents at industrial scale for practical suitability. The breakthrough curves obtained for As (III) on RCH and IICH at different concentration(10-100mg/l), different bed depth(10-30 cm) and different flow rate(1-4 ml/l) with the constant initial pH of influent solution 7.5 maintained was evaluated. Breakthrough time was found to decrease with increase in initial As (III) ion concentration and flow rate but increased with an increase in bed height. The higher value of bed height is not recommended. The shape and gradient of the breakthrough curve differed slightly from one another for varying the bed height. As bed height increased the curves shape changes from steep concave to flatter concave (i.e. steepness changed). The breakthrough curves for higher bed height tends to be more gradual, meaning that the column was difficult to complete exhaust. An ideal S-shape was found to occur at a bed height of 20 cm. The experimental data obtained during this work were fitted with Adams- Bohart, Thomas, and Yoon-Nelson models at different experimental conditions of inlet concentration, bed height and flow rate. Significant features of the different models such as rate constant (Adams-Bohart model), adsorption capacity (Thomas model), and time for 50% breakthrough (Yoon Nelson model) were determined by linear regression analysis. The experimental breakthrough curves were not close to those predicted by the Adam-Bohart model. Over all conclusions, Yoon Nelson and Thomas models best described the experimental data.

Keywords: As (III), fixed bed column, RCH and IICH and breakthrough curve.

Statistical Analysis of Biomedical Waste under Corona Virus outbreak

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OP-02-032

Abstract

Most commonly known as Coronavirus, was emerged first in the Wuhan city of China in the late 2019 and proved to be an unprecedented threat to the whole world since then. The sources of infection as a result of COVID 19 disease treatment of the medical waste generated from the COVID 19. The main objective of the present study is to carry out statistical analysis and assess the generation rates and the composition of the medical waste generated during the treatment of COVID 19 patients in a Hospital of Ranchi, Jharkhand. Data is daily collected of the medical waste, number of the admitted patients and on the amounts of consumables like various personal protective equipment, testing kits, and disinfectant used during the treatment of corona virus disease was obtained. Being the second-most populous country in the world and one of the top contenders in the hierarchy in terms of corona virus infection, India is facing far extreme consequences of this unrestrained outbreak than many other countries in the same league. Apart from all the other challenges put forward by the existence of SARS-CoV-2, there is a need of proper management to handle the different types of solid waste especially As data was subjected to descriptive statistical analysis to find the average generation rates. During the month of August, 754 infected patients have admitted to the Hospital. The recovery ratio of the hospital is 38.8%and case fatality is 5.7%. The amount of the average rate of the medical waste generated as a result of coronavirus treatment was found to 9.09 kg/bed/day. In this paper, we have discussed briefly the susceptibility of the virus due to Biomedical waste produced daily as a result of curing infected patients.

Keywords: Biomedical Waste, Novel Corona Virus, Statistical Analysis.

Pyrolysis of Personal Protective Equipment (PPE): Estimation of Kinetic Parameters

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OP-02-033

Abstract
Samples derived from four variety of PPE (face shield, hand glove, lower and upper parts ofapron) were pyrolyzed separately in a thermo gravimetric analyzer (TGA) and kinetic study of the pyrolysis process was undertaken to understand the factors governing the process. Thecorresponding weight loss at three different heating rates of 5, 10 and 15 K/min weredetermined in TGA. As each sample is made-up of different materials (chemical composition),the possible reaction mechanism and kinetic behaviour differ. The data on thermal degradationof the samples was collected to calculate the kinetic parameters of the thermal degradation namely activation energy, pre-exponential factor, and order of the reaction. By considering tworeaction models (single reaction, reactions in series) and with the interpretation of the massfraction changes in differential thermogram (DTG) and TGA curves of the samples, thecalculated values of the kinetic parameters were compared with Flynn-Wall-Ozawa (FWO) andKissinger-Akahira-Sunose (KAS) which are denoted as model free methods.

Keywords: PPE (personal protective equipment), Pyrolysis, TGA, Modeling, Kinetics.

Effect of non-solvent additives on the morphology and vacuum membrane distillation performance of synthesized flat sheet hydrophobic PVDF membrane

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OP-02-034

Abstract

Vacuum Membrane distillation (VMD) is an emerging technology that has potential to purify water at lowoperating temperature, low energy consumption and with zero water discharge (Baghel et al. 2017). Hydrophobic membrane is used in VMD, which can provide better flux and has capability to withstand at high liquid entering (LEP) pressure. A lot of research has been done to synthesize hydrophilic membrane for pressure driven membrane-based separation process such as reverse osmosis, nanofiltration, ultrafiltration and microfiltration. However, very limited research is conducted in fabrication and modification of hydrophobic membrane in order to increase the trans-membrane flux through VMD (Zhao and He, 2015). Moreover, lackof systematic work is encountered in literature describing the effect of different additives on the morphological structure of the membrane which infact, may play vital role in desired separation using VMD. Therefore, in this work, hydrophobic flat sheet polyvinylidene fluoride (PVDF) was prepared by using five different additives through phase inversion technique for desalination by VMD. The five different additives taken in this study were Ethan diol, acetone, propanol, TiO2 and LiCl whereas di-methyl-acetamide (DMAc) was taken as solvent for dope solution. Individual additive was mixed with 16 weight percent of PVDF in the dope solution. The effects of various additives on morphological structure, contact angle and porosity of the prepared hydrophobic membrane were determined using scanning electron microscope, sessile drop method and gravimetric method respectively. For desalination, all the prepared membrane using different additives were tested on VMD in order to determine the trans-membrane flux and liquid entry pressure (LEP). It was observed from cross sectional view of synthesized membrane by SEM analysis that membrane comprising Ethan diol as an additive showed better morphology and possess finger like structure at the top and sponge like structure at the bottom. Pores of membrane prepared using TiO2 was found to be bigger in size as compared to other membranes. Propanol and acetone were proved to be effective additive for PVDF membrane due to their pore controlling effect and capacity to improve the properties and performance of the resultant membrane. Membrane with LiCl as an additive had showed the desired morphology, contact angle of 98 ˚ and trans-membrane flux of 15 kg/(m2.hr) with 99.98% salt rejection.
Keywords: Polyvinylidene fluoride, Hydrophobic, Phase Inversion, VMD, Liquid Entry Pressure.

Assessment of Renewable Alternatives to Coal Based on their High Heating Value and Global Warming Potential

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OP-02-035

Abstract

About 40% of the Global Electricity produced is fuelled by coal. Although Coal has various advantages like good High Heating Value (23-26 MJ/Kg), easy availability etc., it also has various disadvantages. Green House Gas Released from Coal Thermal Power Plants is the single major contributor to Global warming. Coal is also nonrenewable. Hence it is important to analyze the viability of potential alternatives and reduce the usage of coal. In this assessment, various potential replacements of coalhave been analyzed based on their High heating value (HHV) and their Global Warming Potential. The Global warming Potential (GWP) of the assessed fuels have been calculated by the Respiratory Quotient (RQ) Factor method. Hence a direct comparison between Coal and other replacements based on their HHV and GWP has been performed.

Key Words: High Heating Value; Global Warming Potential ; Respiratory Quotient Factor.

A hybrid material Synthesis and Development of CuO Nanoparticles on Graphene Oxide material by electrodeposition method for DSSC

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OP-02-036

Abstract

In this work, we have reported the electrochemical synthesis and deposition of copper oxide nanoparticles on graphene oxide for development of counter electrode in dye- sensitized solar cell. The deposition of CuO nanoparticles on GO were carried out by Pulse electro deposition method. The physico-chemical characterization of CuO-GO were studied using Transmission electron microscopy (TEM), Raman spectroscopy, X-ray diffraction (XRD) and X-ray photoelectron spectroscopy (XPS). Variouselectrochemical analysis, including those with cyclic voltammetry, rotating disk electrode, Tafel polarization curves and EIS were performed intending to quantify the electro catalytic ability of the DSSC; these techniques were able to distinguish the functions of CuO and GO in the composite. Incident photon-to-current conversion efficiency (IPCE) was used to substantiate the photovoltaic parameters. The DSSCs fabricated using CuO-GO composite as DSSC were tested at 100 mW/cm 2 AM 1.5 illumination. The electrical and electrochemical performances of the resultant DSSC where thoroughly characterized by impedance and Tafel polarization techniques. The enhanced conversion efficiency of solar cells are attributed to the expanded electrolyte/electrode interface to both interface and counter electrode.

Keywords: Copper Oxide nanoparticles; Graphene; Dye sensitized solar cell

Recycling, modification and utilization of Coal Fly Ash as a cost effective adsorbent (Zeolite) for the treatment of dye waste effluent – A shortreview

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OP-02-037

Abstract

In today's industrial revolution, there are lots of processes available which makeundesirable changes in the ecosystem. In order to balance the ecosystem, one must dealwith a balanced approach of Reduce, Reuse and Recycle strategy. In this aspect, one of themost influential mediums is water, which is being polluted and many changes in itsphysical as well as chemical properties have been observed. In this article, we are interestedto highlight the techno-economic feasible solutions for the treatment of dye waste effluentby recycling and utilizing Coal Fly Ash with cost effective techniques. The Coal Fly Ash(CFA) has mineralogical composition of Silica and Alumina which shows tremendouspotential to be used as an adsorbent with high adsorption capacity for the removal ofpollutants. The structure of this paper is designed representing disparate major issuesrelated to environmental problems due to CFA disposal, solution for recycling, variousapplications of CFA, synthesis of CFA based adsorbent (Zeolite), characterization ofzeolite, study of the adsorption performance with the help of various adsorption isothermmodel and study of respective reaction kinetics using kinetic model. This paper focuses onthe generation of coal fly ash from the thermal power plants in India and its utilization forzeolite synthesis for the dye waste effluent treatment.

Keywords: Coal Fly Ash; Dye Effluent; Zeolite;

Removal of heavy metal ions from synthetic galvanic waste water with and without perforations on Iron and Aluminum Electrodes

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OP-02-038

Abstract

In the present study, an attempt is made to investigate the performance ofelectrocoagulation process using aluminum and iron electrodes to treat metal ions insynthetic galvanic wastewater. The electrodes used are with and without perforations.The efficiency of electrodes with perforation (80%) is higher comparable to withoutperforations (50%). The removal efficiency of heavy metal ions increased with retentiontime and direct current. The optimized parameters for residence time, voltage, pH,current, electrode spacing are 160 min, 6V, 5, 0.2A and 3cm, respectively. 90.7% and86% are the maximum percentage removal of nickel and copper ions using perforatediron electrodes. 93.10% is for chromium using combination of perforated iron andaluminum electrodes. The removal of metals ions followed pseudo second order kineticmodel with current dependent parameters.

Keywords: Synthetic galvanic wastewater, electrocoagulation process, heavy metals, electrodes

Photocatalytic degradation of methyl red dye in aqueous solutions by Magnesium oxide nanoparticles: Optimization using RSM

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OP-02-039

Abstract

In this present research, magnesium oxide nanoparticles (n-MgO) were prepared using co-precipitation 28 method and assessed for photo-chemical degradation of methyl red (MR) in presence of UV light. The X- 29 Ray Diffraction (XRD) and scanning electron microscopy (SEM) for n-MgO show spherical crystalline par- 30 ticles with average crystallite size of 13.89nm. The Tauc plot through UV spectra shows the band gap of 31 n-MgO is estimated as 4.6 eV.Response surface methodology (RSM) using the central composite design 32 (CCD) was used todesign the experiments and optimize the process and the effectiveness of methyl red 33destruction was obtained as 97.08% at the optimal conditions obtained by CCD. The methyl reddegrada- 34 tion kinetics fitted with first order kinetic model. The recovery process of the MgOphoto catalyst is easier 35 and reusability studies shows that the catalyst can be reused fordecolourization of dye with slight reduc- 36 tion in efficiency.

Keywords: MgO photo catalyst; Process optimization; Response surface methodology; Kinetics; Methyl red

Reutilization of waste tires as adsorbents for synthetic dye removal from wastewater

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OP-02-040

Abstract

The growing demand for vehicles has shown a significant impact on the amount of waste tires generated. With proper guidelines on disposal techniques, still being an unresolved issue the waste tire generated ishuge threat to the environment. Open burning of tires can cause serious harm to the living system andenvironment. On the other end, a large number of industries such as the tannery, textile, polymer, pharmaceuticals, food, etc. use dyes extensively. The effluents from these industries have to be treatedefficiently for their reuse or to comply with the standards before disposal. Considering the two majorenvironmental problems sourced from waste tires and industrial effluent with toxic dyes, one approach ofreutilization of the waste tire as adsorbents towards the dye elimination from aqueous system focused inthe present investigation. Suitable activation procedure of the waste tires will be developed to enhanceadsorption performance towards dye removal under optimal process conditions. The present approach ofusing adsorbents derived from waste tires is a doubly effective solution, as it will cut down the hazardsassociated with accumulation of both the waste tires and dye disposal into the environment.

Keywords: heat dissipation; computational fluid dynamics; thermal resistance

The Future Energy- Hydrogen

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OP-02-041

Abstract

Energy enthusiasts in developed countries explore sustainable and efficientpathways for accomplishing zero carbon footprint through the H2. Fossil fuel burning causesseveral harmful effects on our Environment. So, there is a need for an alternative fuel.The vast majority of water on the earth's surface, over 96 percent, is salinewater in ocean. So, my objective is to produce hydrogen from the saline water and thepossible ways for implanting industry near coastal area. Producing hydrogen from water is aknown and employed technique, but water is a fresh and expensive source. There is no endfor ocean and producing hydrogen from the saline water can be done annually and in costeffective ways. Hydrogen is an ideal fuel for future because it is clean and has high energyefficiency. Method- by electrolysis, by passing electricity, splitting the molecules andcollecting the major product hydrogen gas(cathode) and the by-products chlorine gas(anode)and sodium hydroxide(precipitate). Hydrogen gas can be collected and stored. Electrodesused can be coated with a thin layer of titanium dioxide with iridium for corrosion resistant assaline water is involved. Direct electricity can be used or solar panel can be harnessed nearthe ocean area. Hydrogen gas is difficult to store, as like LPG we can store hydrogen in liquidform when hydrogen gas is condensed at -252℃ and can be used as alternative for fossilfuels. But when it is liquified some amount energy can be reduced, but not that much, we canattain the energy of fossil fuels. Industry can be implant near the coastal regions and theprocess of producing hydrogen can be done as like drinking water industry (desalinationindustry) with all possible requirements. Hydrogen has more advantages than the fossil fuels.The mileage given by a full tank of petrol can be given by half a tank of hydrogen.

When this technique is employed in large scale more hydrogen can beproduced and our society will be away from energy crisis and effect on our Environment canbe minimized and our country economy will be increase, we can reduce the export ofpetroleum from other countries and we can increase job opportunities for the graduates.

Key words: alternative fuel- hydrogen- saline water- electrolysis.

Comparative study of Photocatalytic process and Electrochemical process for the removal of Rohdamine B dye effluent

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OP-02-042

Abstract

Textile effluent dyes are the most challenging environmental concern nowadays. Due totheir complex structures, dyes are most troublesome part of textile effluents. BothPhotocatalytic process and electrochemical process are effective for treating dyes. Presentwork deals with studying the degradation of Rohdamine B dye with photocatalytic processusingZnO as catalyst and electrochemical process using Ti/RuO 2 electrodes. Forphotocatalytic process influence of operating parameters such as initial concentration ofdye, pH of solution and reaction time were studied. Optimum operating condition wasfound at 7 pH. Degradation rate increases with decreasing the initial concentration of dyeand with increasing reaction time percentage degradation also increases. Forelectrochemical process, effect of operating parameters such as current density, dyeconcentration, electrolyte concentration, COD, TOC were studied. It has been found thatnearly 75 % TOC was removed by using Ti/RuO 2 electrode with current density of 5mA/dm 2 and electrolyte concentration of 2 g/L. Results found indicates that electrochemicalprocess is more effective than photocatalytic process.

Keywords: Rohdamine B dye; Photocatalytic process; ZnO; Electrochemical process; Ti/RuO

Utilization of Waste Derived Material for Renewable Energy Production: A mini review

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OP-02-043

Abstract

Human activities only, results as the waste the inevitable use of resources by exploiting both therenewable and non renewable resources. Among all this, the biggest challenge is regarding wastemanagement. To reach the goal of waste management recycling and prevention measures needs to betaken i.e also denoted as 3R's reuse reduce and recycle. Air pollution controls also ensures thesustainability of environment. For complete demolition of organic hazardous material incinerators areimportant. Waste To Energy plants have taken different measured for waste management and to maintainthe sustainability of environment so that energy gets generated without having worse impact onenvironment.

Keywords: waste, sustainability, energy,material,nonrenewble,5r

A Review on The Integration of Microalgae and Photobioreactor For Wastewater Treatment

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OP-02-044

Abstract

On average, high-income countries treat about 70% of the industrial wastewater they Generate. The wastewater is the real major threat to the environment that leads tocontamination and destruction of natural habitats. In current we have witnessed agrowing interest in microalgae owing to their production of lipids for biodiesel. Theblooming of photobioreactors is recent pioneering technology in the modern world asmicroalgae are considered to bioremediate countless pollutants of non-identicalproperties and characteristics that unleash from various industries, domestic and agriculture sectors. To identify a solution this review gives a comprehensive summaryof mitigation of N, P, and COD from wastewater, discussion of suitable parameters, design for photobioreactor, and the growth effect of different microalgae over variouswastewater. The paper also includes the depth analysis of different properties ofwastewater and the selection of microalgae species.

Keywords: photobioreactor; wastewater; chlorella vulgaris

A Review on Recent Advancements in approaches for Electrocatalyst Design

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OP-02-045

Abstract

Sustainability, a word which the world has been sensitizing over the past few decades.To meet the increasing future energy demands in a sustainable way, Hydrogen energy due to its abundant availability and zero emissions has taken a great interest. There is a lot of research going on in designing an efficient electrocatalyst for hydrogen and oxygen evolution reactions which take place in hydrogen production by Water splitting. This paper reviews the recent advancements in electrocatalyst design and the low over potential and cost efficient electro catalyst designed using DFT calculations and Machine learning models.

Keywords: hydrogen energy, electrocatalyst, Machine learning, DFT calculations.

Utilization of Domestic Sewage Wastewater Treatment for irrigation by using Activated Sludge Process

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OP-02-046

Abstract

The release of untreated wastewater generates multiple microorganisms due to human excreta which increase the biochemical oxygen demand of water. Water supply and sanitation demands are foreseen to face enormous challenges over the coming decades to meet the fast growingneeds in a global perspective. The raw effluent is introduced from different sources will allowedto pass through the screen chamber, oil and grease tank, equalization tank, primary settling tank,aeration tank, settling tank, filter feed tank. The optimum hour for operating the process is 12~14hours. The result shows the 95% of waste removal. Application and implementation ofwastewater treatment is expected both in production of potable water as well as in useful purposelike irrigation.

Removal of Pharmaceutical Contaminants Using Photocatalysis

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OP-02-047

Abstract

Rising rate of microbial infections today are due to the alarming rise of drug resistanceagainst current antibiotics. It has been found that ciprofloxacin discharge is 10 times greaterthan the permissible limits from effluents into ponds, lakes, rivers and other watersheds. Thiscauses more resistance of antibiotics in microorganisms which ultimately lead to eviction ofseveral antibiotics. Hence this prevents the primary role of antibiotics to inhibit the growth ofmicroorganisms and destroys the growth. Bismuth oxyhalides BiOX (X=Cl, Br, I) are beingconsidered as visible light-active photocatalysts. BiOCl, BiOBr, and BiOI have beensynthesized by a wet chemical route. Degradation of ciprofloxacin are studied under visiblelight and have very narrow band gap energy is achieved by adding with Bi_2S3_3. Overallperformance of the three photocatalyst samples gives faster degradation rates along withheterojunction composites BiOCl/Bi_2S3_3, BiOI/ Bi_2S3_3.

Keywords: photocatalysis, ciprofloxacin, drug resistance, Bismuth oxyhalides, band gap energy, bismuth sulphide

Efficient Solid Polymer Electrolyte Membranes for the Fuel Cell Application: A Review

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OP-02-048

Abstract:

Increasing global energy demand, growing carbon emissions and thedepletion of fossil fuel sources are some of the most driving forces for the developmentof sustainable energy solutions. Proton exchange membrane fuel cells (PEMFCs) areconsidered to be a promising technology for clean and efficient power generation in thetwenty-first century. The PEMFC use hydrogen and oxygen as fuel and oxidants. Thehydrogen can be produced using Regenerative Fuel Cell (RFC). The RFC can be usedfor the production of hydrogen by splitting of water, as well as for generating electricityusing hydrogen in different cycles, also requires in the proton exchange membrane.RFC could be used as a replacement of rechargeable battery without spillage ofelectricity. It may also be noted that RFC systems produce power and electrolyticallyregenerate the required reactants using stacks of electrochemical cells. In this regard,there is a constrain regarding high cost of polymer membranes. This review is aimed atcarrying out investigation on the synthesis and characterisation of low cost solidpolymer electrolyte membranes in order to enhance the efficiency of the PEM fuel cell
as well as RFC.

Keywords: PEMFC; Electrolyte; RFC.

Application of Artifical Intillegence In E-Waste Management

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OP-02-049

Abstract

E-waste is huge problem over worldwide and there is need to resolve this issue byrecycling it. In this aspect the application of artificial intelligence (AI) appears to be apotential one due to its capability of sorting the waste in automatic mode. AI works on the e-waste management by sorting the material in two ways either dropping the waste intoseparate trash bins or letting the trash bins sort themselves through an automatic system.These applications of AI reduce this tiresome sorting work otherwise traditionally by usingthe different colour-coded dustbins is used for dumping different e-waste materials manually.This traditional method of sorting is less accurate due to confusion and physical operation.Therefore applying the AI in e-waste sorting and disposal processes is a better method forsmart recycling and waste management. AI works on the various sensors including RFIDtags. Inclusion of this sensor and Internet of Things (IoT) in dustbins sort tons of garbage ona daily basis in accurate manner. Therefore there is a need to initiate the use of smarttechnique included dustbin for the e-waste management which will results the recyclability ofprecious items which otherwise being thrown into dustbins and ended up in landfills.
Therefore it is right time to work on reduce, reuse and recycle e-waste by using AI technique
that helps in near future.

Keywords: E-waste; Artificial Intelligence; Multitasking sorting

Controlled release fertilizer using biochar as coating material

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OP-02-050

Abstract:

Urea supplied to the soil gets easily lost about 70% of the total due losses forexample ammonium volatilization, leaching, de nitrification etc in the environment.There is an immense need to control these losses to improve environment conditionsand fertility of the soil. Controlled release fertilizer is an optimum control alternative forthe same. As coating over the fertilizer aids to control the release which indirectlyreduce the losses and improve the fertilizer use efficiency (FEU). Biochar (BC) is usedfor the coating on urea with the help of a suitable binder. The basic reason for selectingBC as a coating material as it is biodegradable, low cost, easily available, regenerativerate is low, aids to the fertility of the soil, low processing cost. BC's have good waterretention ability, cation exchange capacity (CEC). The effect of the coating material,thickness, drying time, pryolysis temperature, pH, crushing strength can be evaluated.Several characterization tools can be used to justify the successful synthesis of BC's andBC as coating material for urea. Nitrogen releases can be calculated from the same.

Keywords: Biochar (BC), Cation exchange capacity (CEC), fertilizer use efficiency (FEU).

Controlled nutrient release from neem oil coated urea

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OP-02-051

Abstract

As the population is growing exponentially, the need of the hour is to meet the food demands
but with great demand the agricultural soil fertility observes a linear depression which eventually leads to the high production cost. Urea is the most used fertilizer as it supplies about 79% of nitrogen to the soil but due to the losses observed nutrient use efficiency (NUE) is very low. Most of the applied urea may get lost due to losses like volatilization, leaching etc which causes serious environmental issues. There is eager demand for alternative to solve environmental issues and to upgrade crop yield to meet the global food demand. Controlled release fertilizers (CRF) are a ray a hope as they can resolves these issues to a desirable level.
The coating of Urea with Neem oil (derived from seeds and leaves) inhibits the process of nitrification and reduces the formation of nitrates which in-turn will reduce N 2 O emissions. It prevents the loss of urea in the soil. It also controls a large number of pests such as caterpillars, beetles, leafhoppers, borer, mites etc. Also, Neem coating is biodegradable and
so it is environmentally friendly as compared to many non-biodegradable polymers used as coating materials in CRF.

Keywords: Controlled release fertilizers (CRF); Nutrient use efficiency (NUE); Neem oil coated urea

Performance of Graphene supported electro-catalysts for PEM Fuel Cells: A Survey

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OP-02-052

Abstract:

PEMFC is one of the challenging energy conversion devices for transportation and distributed power generation systems due to its attractive features such as high power density, low operating temperature, minimal emissions, negligible noise, and high efficiency. Catalysts have important role for the performance of PEMFC. Various catalysts (Pt–Ru, Pt–Sn, Pt–Mo, cobalt, platinum, and cobalt-platinum, alloys, and transition metal) are established and studied their performance and cost effectiveness on PEMFC since few decades. Although great progresses have been achieved in this area, there are still some challenges in both their ORR activity and stability. Graphene support also studied and improved to NT, graphemefoams, Graphene nano composites, GO, GNM to get highest electrical conductivity, mechanical strength, flexibility, aspect ratio, and high theoretical surface area. Great attentions have been also paid from last decade to microbial fuel cells due to their mild operating conditions and using variety of biodegradable substrates as fuel. Though there was huge development still graphene and graphene supported electro catalysts are not explored in great extent. Therefore, this review may help to understand the developments related to Synthesis andCharacterization of Graphene, Synthesis and evaluation of Graphene Supported Electrocatalyst.

Keywords: PEMFC; Electrocatalyst; Graphene.

Prospective evaluation of biomass for clean energy production

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OP-02-053

Abstract

India is the second largest food producer country in the world and forth position in theagricultural production. By processing of agricultural products, we get wanted and unwanted products: the unwanted products of agriculture is known as agricultural waste. This waste has several limitations like high moisture and volatile matter, low energy density and grindingrelated issues, low composition of chemical element like potassium, nitrogen, sodium. Thermo-chemical conversion technology like pyrolysis with using catalytic conversion can convert thisagricultural waste/residue into the usable biochar, bio-oil, and combustible gas. The keyobjective of the current study is to give an idea about biomass, the effect of catalyst, techno-economic status and future prospects.

Keywords: Agricultural waste; Pyrolysis; catalyst;Biomass;conversion technology.

Gasification study of biomass char

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OP-02-054

Abstract

Gasification is one of the most fortunate ways of utilizing waste like biomass and sustains solidfuel resources. Gasification is also recognized as clean technology and widely used for theconversion of organic material into valuable gaseous fuel. It is a two-stage process; the first stageinvolves removal of volatile substance like volatile matter, water and finally conversion oforganic matter into high carbon material. Co-gasification can significantly stimulate theperformance of the boiler and augment power generation with less cost. The present paper givesa review of the gasification process, mechanism, the kinetics of char formation and product yieldin various environments.

Keywords: Gasification; Mechanism; Co-gasification;Biomass;Kinetics.

Effect of Cellulose-Nanoparticle Composite in Textile Effluent Treatment

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OP-02-055

Abstract:

Textile industry contributes more to the environmental pollution due to the presence of harmful dyes mixed with various contaminants in the effluent. Dyes are toxic, mutagenic, and carcinogenic even at low concentrations ,which causes health problemsto human beings and aquatic living organisms. Hence these effluents have to be treatedbefore discharging. Nanoparticles have very good surface properties and chemicalreactivity which can be utilized for dye removal. Cellulose is a biodegradable, non-toxic, cost effective and abundant polysaccharide material available in different naturalresources and agricultural wastes. The cellulose matrix can be tailored to any formbased on our need. It can serve as a supporting matrix for nanopartilces which provideslarge exposed surface area and thereby increasing it's dye removal efficiency. Hencethis nanocomposite formation circumvents the problems associated with the use ofnanoparticles alone in effluent treatment and also provides mutualbenefits to eachcomponent. The main aim of this study is to do a review on the effect of nanoparticlesincorporated cellulose composite in textile effluent treatment. Further to analyse themethodologies and the major parameters influencing the efficiency of the nanocomposite. Since the methodologies influences the effectiveness of the composite material.

Keywords: Cellulose-nanoparticle composite; dyeremoval; nanocomposite efficiency.

Hydrogen production from seawater by electrolysis and harnessing the plant near coastal area

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OP-02-056

Abstract

Energy enthusiasts in developed countries explore sustainable and efficient pathways for accomplishing zero carbon footprint through the H2. Fossil fuel burning causes several harmful effects on our Environment. So, there is a need for an alternative fuel.. The vast majority of water on the earth's surface, over 96%, is salinewater in ocean. So, my objective is to produce hydrogen from the saline water and thepossible ways for implanting industry near coastal area. Producing hydrogen from wateris a known and employed technique, but water is a fresh and expensive source. There isno end for ocean and producing hydrogen from the saline water can be done annuallyand in cost effective ways. Hydrogen is an ideal fuel for future because it is clean andhas high energy efficiency.Method- by electrolysis, by passing electricity, splitting the moleculesand collecting the major product hydrogen gas(cathode) and the by-products chlorinegas(anode) and sodium hydroxide(precipitate). Hydrogen gas can be collected andstored. Electrodes used can be coated with a thin layer of titanium dioxide with iridiumfor corrosion resistant as saline water is involved. Direct electricity can be used or solarpanel can be harnessed near the ocean area. Hydrogen gas is difficult to store, as likeLPG we can store hydrogen in liquid form when hydrogen gas is condensed at 252℃and can be used as alternative for fossil fuels. But when it is liquified some amountenergy can be reduced, but not that much, we can attain the energy of fossil fuels. Industry can be implant near the coastal regions and the process of producing hydrogen can be done as like desalination industry with all possible requirements. Hydrogen has more advantages than the fossil fuels. The mileage given by a full tank of petrol can be given by half a tank of hydrogen. When this technique is employed in large scale more hydrogen can be produced and our society will be away from energy crisis and effect on our Environment can be minimized and our country economy will be increase, we can reduce the export of petroleum from other countries and we can increase job opportunities for the graduates.

Key words: Alternative Fuel, Hydrogen, Saline Water, Electrolysis.

Optimization of SPL

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OP-02-058

Abstract

Spent Pot Lining (SPL) is a solid waste generated by the Aluminum industries during the manufacture ofaluminum metal in electrolytic cells.The increasing demand of Aluminum leads to production of more SpentPot Lining as well as more environmental problems. The total SPL generation in the world was estimatedto be around 800,000 tons in the year 2003, which was calculated from expected total primary aluminium production of 28 million tons. After 3-7 years of operation, the cathode liner materials deteriorate and affect the cell's performance and need to be replaced. Due to high fluoride (20 wt. %) and cyanide (1 wt. %) content SPL was listed as hazardous waste by the US Environmental Protection Agency in the year1988.We carried out various approaches for the treatment of SPL to recover the valuable carbon, causticand to maintain CN & Fluoride level within permissible limits. In this case, the temperature was found to bethe most significant factor among all the parameters. The carbon percentage of SPL has been increasedfrom 42.19 to 87.03% as confirmed from the ultimate analysis.

Environmental Impacts of Landfill Leachate and Leachate Recirculation in Landfill of Municipal Solid Waste

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OP-02-059

Abstract

The large number of municipal solid waste (MSW) landfills and the many hazardousmaterials which they contain pose a serious threat to both surrounding environmentand human populations. Once waste is deposited at the landfill, pollution can arisefrom the percolation of leachate to the porous ground surface. A number of ions,such as Cl, Mg 2+ , and Ca 2+ , may also contaminate groundwater. Leachaterecirculation is suggested as a cost-effective option. However, its long-term impactsto environment remain disputed. Several determining factors in the evolution ofgroundwater contamination have been highlighted, such as (1) depth of the watertable, (2) permeability of soil and unsaturated zone, (3) effective infiltration, (4)humidity and (5) absence of a system for leachate drainage. So, to reduce thepollution risks of the groundwater, it is necessary to set a system of collection,
drainage and treatment of landfill leachates and to emplace an impermeable surfaceat the site of landfill, in order to limit the infiltration of leachate. Therefore, leachaterecirculation is considered a cost-effective and environmentally viable solution forthe current situation, and landfill gas treatment is urgently required. Thus, thispresent study has focused on the environmental impacts based on the case studies,literature surveys and recommends a strategic sustainable framework for bettermenttowards green environment.

Keywords: Environmental impacts, Ground water contamination, Heavy metals Leachate Solid waste disposal.

Coir Pith- An Alternate Oil Dispersing Agent

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OP-02-060

Abstract

Oil spills are a major threat to the marine environment. Since the density of oil is lessthan water, it floats on the surface which is a threaten to the seabirds and fishes. To removeoil from water surface, oil dispersants are used which are almost chemical in nature. As aresult, the effect of chemicals on marine ecosystem is very much greater when compared tothe oil spills. Chemical dispersants are not eco friendly to the environment and are hazardousin nature. An alternate bio- based dispersants can be used because of its non toxicity to the environment and low cost when compared to the chemical dispersants. This paper presents about using coir pith as a bio dispersant in treating oil spills because, of its availability, cost efficient and adsorption capacity it can act as a good alternate oil dispersing agent.

Keywords: coir pith, adsorbents, oil spills.

Biochar Valorization for Kitchen Wastewater Treatment through Microbial Fuel Cell

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OP-02-061

Abstract

Wastewater treatment along with electricity generation in an eco-friendly manner is a potential solution for energy and waste sector. In this prospect Microbial fuel cell (MFC) play an important role as it simultaneously treat wastewater through anaerobic digestion bymicrobes with electricity generation. It composed with two electrodes and in betweenmembrane is sandwiched. The role of membrane is important for the separation and selective transportation of proton. Considering on this aspect the novel biochar doped proton exchange membrane is synthesized through solution casting and solvent evaporation method. Biochar is derived from chicken feather waste through pyrolysis method and doped in sulphonatedpolyethersulfone (SPES) polymer. The prepared membrane modification is confirmedthrough their structural illustration by FTIR, XRD, TGA and SEM analysis. Membraneproperties such as proton conductivity, IEC, water sorption were characterized and found to be 0.082 S/cm, 1.15 meq/g, 28% respectively. Kitchen waste water with mixed culture areused in anode chamber. The MFC setup was run for 20 days and maximum open circuitvoltage was obtained as 820 mV with a power density of 0.11 W/cm 2 . The synthesizedmembrane is exhibit significant performance with COD reduction of 79% for kitchenwastewater. It could be an inexpensive alternative to existing commercial membranes for MFC applications.

Keywards: Biocomposite; Kitchen wastewater; Proton exchange membrane; Membrane Performance

Regeneration strategy of Liquid Sodium cold trap in Fast Breeder Reactor for uninterrupted energy supplies

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OP-02-062

Abstract

To meet India's energy supply and demand, Fast breeder reactor is used as main component of2 nd generation of nuclear power plant program of government of India for creating sustainableself reliance nuclear fuel cycle. This type of reactor uses liquid sodium as a medium for heattransfer from reactor core to the heat exchangers and back to reactor core. The loop of liquidsodium is provided with secondary cold trap for removing impurities (Sodium hydride andsodium oxide). The current cold trap used in Indira Gandhi Centre of Atomic Research(IGCAR), Kalpakkam, Chennai is designed for the operation of 5 yrs and after that it is replacedwith new cold trap and old one is dumped into the landfills causing a great environmentalconcerns. To do so, main nuclear plant needs to be shutdown during the whole regenerationoperation. The objective of the current study is to develop the regeneration strategies of cold trapwhich increases its life span and eliminates the environment concern. A suitable surrogatesystem (CuSO4 - N-dodecane) is identified to carry out experiments in ICT, Mumbai. Theprototype cold trap batch reactor is developed and thermal decomposition is carried out under200 mmHg vacuum. Also, a geometrical modification has been done in prototype reactor ascompared to cold trap in IGCAR, kalpakkam which facilitate the impurity removal. The processallows removing around 80% of the impurities trapped on cold trap.

Keywords: Fast breeder reactor, Liquid sodium cold trap, surrogate system, thermal decomposition

Isolation, Characterization and Application as Bio-Pesticidal Activity of Bio-Oil Produced from Cashew Nutshell

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OP-02-063

Abstract

Energy demand is growing everyday with swift outgrowth of the population and theeconomy. With the conventional energy sources drying up, there has been an increased quest of renewable energy sources to meet the demands. Biomass presents potential as eco-friendly alternative source of renewable energy which is accessible through diverse biological, physical and thermal processes. Biomass in the form of cashew nutshell represents arenewable and abundant source of energy in India. In the present work, cashew nutshell biomass was examined for the production of bio-oil, which can be used to replace chemical pesticide and petroleum fuels or for the extraction of value-added chemicals. Cashew nut shells (CNS) are analyzed for its compositional analysis of hemicellulose, cellulose and lignin. Cashew nutshell liquid (CNSL) is extracted from biomass before thermochemical conversion is performed. Fast pyrolysis of CNS is performed in the temperature range of 600-800 o C to produce bio-oil. Chemical composition of the bio-oil obtained is analyzed using gaschromatography-mass spectroscopy. Bio-oil is also analyzed for its physical properties suchas acid number, viscosity, density, ash content, solid content and pH. The results showed thatcashew nutshell is an effective lignocellulosic biomass for production of bio-oil which is richin various chemical compounds. Insecticidal activity of two different aqueous phase fractionof bio-oil was tested against aphids. Our bioassay result indicate that chloroform fraction wasmost active causing 80% mortality after 48hrs.

Key words: cashew nutshell; Pyrolysis; Bio-oil; Insecticidal activity; Aphids.

Oil Hydrothermal Liquefaction of Sugarcane Bagasse to Fuel Using Green Solvents as Catalysts and Co-Solvent

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OP-02-064

Abstract

Bioenergy can offer renewable, low-carbon energy systems and therefore supportingglobal climate change targets and future sustainable energy. Hydrothermal liquefaction(HTL) is a relatively low-temperature, high-pressure process that produces biooil from arelatively wet biomass in the presence of a catalyst and hydrogen. In the present study,hydrothermal liquefaction of sugarcane bagasse was catalysed by conventional and greensolvents i.e., deep eutectic solvent (DES) as catalyst to produce enriched and high yield ofbio-oil. Biomass was characterized for cellulose, hemicellulose and lignin content and bio-oilwas analysed for its elemental, physical and chemical properties; basic fuel properties. Themaximum bio-oil yield (42.8%) was obtained at 250 ° C using DES (ChCl:Urea). Proximateand ultimate analyses including ash, moisture and carbon contents of bio-oil produced variedslightly. Using DES as catalyst over conventional catalysts improves the bio-oil quality interms of lower oxygen content (19.1%) and nitrogen content (1.02%) and higher HHV (38.1MJ/Kg) and calorific value (44.1 KJ/g) along with high H/C ratio (0.2). It is suggested thatthe selectivity of bio-crude could be improved by using DESs as catalyst and co-solvent inHTL of sugarcane bagasse biomass.

Keywords: Sugarcane Bagasse; HTL; Bio-oil; DES.

Treatment of highly Conductive Waste Stream from RO using Capacitive Deionization Approach

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OP-02-065

Abstract:

Capacitive deionization has been recent technology in the field of desalination and anefficient emergingtechnology to cope up with the problem of huge reverse osmosis reject,which has been disposed into the groundwithout treatment. In the present study, with the green motive to develop a desalinationsystem with asustainable approach, walnut shell activated carbon (WSAC) used as a precursor for the development of porousactivated carbon electrode (ACE). WSAC was developed through calcination at temperature 450 °C in a mufflefurnace with potentially excellent surface characteristics (surface area ~ 215 m 2 /g) and porous morphology. Thecyclic voltammetry of ACE performed at the scan rate of 10 mV/s from -0.2 to +0.2 V in 1 M NaCl solutionrevealed a good rectangular curve indicating that the sorption of electrolyte ions was primarily due to theelectrical double layer capacitance. Batch experiments were carried out to evaluate the electro-sorption capacityof the synthesized electrode by varying the process parameters including initial concentration from domestic ROreject, sorption time (10-60 min), and binder composition (10-20wt. %). Moreover, the developed materialexhibited the salt sorption efficiency of 61.5 % and an effective optimum electrosorption capacity of 22 mg/gfor 10 wt% binder composition and at the sorption period of 30 min. The investigation reveals that walnut shellscan be a promising material for the preparation of carbon which results in the development of an excellentdesalination CDI electrode.

Investigation of beeswax composite as possible heat storage material

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OP-02-066

Abstract

Present scenario has very high energy demand and therefore new explorations were attempted by the investigators out from which thermal energy storage has gained potential attention. In thermal energy storage, the latent heat storage is found to be superior than sensible heat storageas larger amount of energy can be stored in smaller volume or mass. Phase change materials(PCMs) are an effective way of storing latent heat as it gives high storage density with smallertemperature difference and the isothermal nature of the charging and discharging process. Theusage of various PCMs and its composite for thermal energy storage has been probed in lastfew years. The large variety of PCMs that can be operated at wide temperature ranges has madeit very desirable to explore it further. This paper explores the possibility of using beeswaxcomposite as a PCM. The composite consists of 1:1 ratio of beeswax with coconut oil with 1weight percent of iron oxide nanoparticles. The composite was loaded in a setup and its thermalperformance is studied revealing at 1 LPM fluid flow rate temperature profile was noted atvarious point (60oC, 70oC, and 80oC).

Naked eye detection of fluoride concentration in drinking water using novel receptor

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OP-02-067

Abstract

In this communication, a novel receptor (E)-N-methyl-2-(1-(2-oxo-2H-chromen3yl)ethylidene) hydrazinecarbothioamide), R was synthesized using microwave irradiation thatacts as a highly selective and sensitive receptor towards fluoride detection in aqueous media.Receptor (R) shows naked eye color change from pale yellow to pink towards fluoride ions.Anion binding studies were performed by UV-visible, Mass (ESI-MS) and 1 H NMRspectroscopy. Using the Benesi–Hildebrand equation the binding constant of the receptor for fluoride was found to be 1.565×10 4 M -1 and lowest detection limit was 0.18 mg/L(9.024×10 -6 M)lower than WHO guidelines. To check the applicability of receptor for the detection of fluoridein groundwater samples, preliminary investigations were carried out with synthetic water andgroundwater collected from high fluoride content regions in Rajasthan (India). Studies were alsocarried out using Ion-selective electrode and the results were found to be in good agreement withthe results from UV-visible spectroscopy using synthesized receptor.

Key words: Receptor, groundwater, Aqueous media, Coumarin, Sodium fluoride.

Treatment of Waste Water Effluents By Using Immobilized Photo Catalyst

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OP-02-068

Abstract:

Waste Water Effluents are treated using AOP Photo catalytic degradation. Experimentsare carried out by preparing TiO 2 catalyst by sol-gel technique which is coated on glass beads ofdifferent diameters (3mm, 2mm, and 1.5mm). The process is carried out in the continuousreactor. The coated glass beads are undergone for SEM Examination where surface area can bedetermined. The rate of degradation was estimated spectrophotometrically from residualconcentration.

Bio-process Engineering, Biomedical Engineering, Food Technology (BFT)

Combinational trial and error and statistical design based optimalityof tray dried Musa balbisianaColla. pseudo-stem

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OP-03-001

Abstract

With abundant horticultural produces in North-East India, this investigation targetsoptimality of process parameters for intermittent airflow assisted tray dried Posola (Musa balbisianaColla. pseudo-stem) vegetable sample based on trial and error andstatistical design approaches. The chosen response variables were moisture content, antioxidant activity and vitamin C. Finally, proximate parameters have been evaluatedfor optimal drying conditions. Trial and error based study was associated with variationof response variables with drying temperature and time, fitness of drying models, determination of moisture diffusivity and activation energy. On the other hand, statistical design method involved model fitting with associated parameters defined byanalysis of variance (ANOVA) and numerical optimization of process variables. Among both approaches, later has been proven to provide better process variable values. Thecorresponding optimal values obtained were 57.59 ºC drying temperature, 389.42 mindrying time, 2.84% moisture content, 53.38 mg/100g vitamin C content and 25.72%antioxidant activity. On the other hand, based on drying kinetics study, moisturediffusivity was found to be 1.79 – 7.35×10 -12 m 2 /s with activation energy of 30 kJ/mol. In summary, this work provides an important insights for the development of valueadded products and promote food processing sector in North-East India.

Keywords: antioxidant activity; moisture content; optimization; tray drying; vitamin C

Analysis of Artificial Intelligence based controller for insulin delivery with automated meal detection and carbohydrate estimation for type-1 Diabetes

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OP-03-002

Abstract

Current glucose control systems automatically regulate basal insulin infusion, but usersstill need to manually announce meals (major disturbances) to dose prandial insulinboluses. This issue needs to be solved to reach a fully automated artificial pancreas.Automatic meal detection and carbohydrate amount estimation from readings of bloodglucose (BG) and insulin infusion can improve the artificial pancreas control systemfrom two possible paths: (i) the reconstruction of the carbohydrate intake signal whichallows a reliable identification of a control relevant model, and (ii) the prediction ofmeal onset and amount of carbohydrates ingested, which allows safety supervision ofmanually entered meal announcements. The aim of this work is to formulate anautomatic algorithm to detect the consumption of a meal and estimate its carbohydrateamount in people with type 1 diabetes and to provide insulin delivery with an ArtificialIntelligence based controller. Glycemicbehavior is predicted using a personalizedmodel by means of the patient's functional insulin therapy parameters defined by thetreating physician.

Keywords: artificial intelligence; diabetes; modeling

Optimization of process parameter for refractance window dried Curcuma longa using response surface methodology

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OP-03-003

Abstract

This study addresses the sensitivity of process product characteristics of refractance window dried Curcuma longa. Box-Behnken design based response surface methodology (RSM) was used to optimize the process parameters with varied water bath temperature (65 – 95 o C), dryingtime (80 – 360 min) and air-velocity (0.5 – 1 m/s) to obtain maximum response variables of totalphenolic content, total flavonoids content, curcumin content and antioxidant activity. Resultsinferred that the quadratic model was the best fit model for all response variables. The obtainedresults confirmed that water bath temperature and drying time significantly influenced theresponses but not air-velocity. The optimal data set based on RSM was found to be 95°C waterbath temperature, 95 min drying time and 0.76 m/s air-velocity for optimal responsecharacteristics of 90% (antioxidant activity), 191 mg GAE/g dry sample (total phenolic content),161 mg quercetin/g dry sample (total flavonoids content) and 4.87 % w/w (curcumin content).This study will be useful to study to develop various value added food product.

Keywords: Refractance window drying; turmeric; response surface m

Application of Membrane Bioreactor for Synthesis of Nutra-therapeutic Peptides

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OP-03-004

Abstract

Membrane bioreactor is a physical device that combines the biochemical conversion andseparation in a same assembly. In present study, the concept of membrane bioreactor hasbeen utilised for synthesis of value added peptides from agricultural waste resource andevaluation of functional properties and nutratherapeutics activity. The biomass of interestwas mango kernel which is abandoned in nature, hence, use of this bio wastes for furtherexploitation as high value nutritional as well as therapeutic compound may be of greatimportance. Mango kernel (7.5 g/100g protein) of 'Amrapali' variety has been chosen aswaste biomass for peptide synthesis using membrane bioreactor. The isolated mango kernelprotein hydrolysis and fractionated was attempted in novel type membrane bioreactor toobtain desired products. The antioxidant properties (radical scavenging activity) andantihypertensive properties of the desired fractions were assayed by standard in vitromethods. Results have shown 9.2% scavenging with degree of hydrolysis 30% and 25%Angiotensin-Converting-Enzyme inhibition activity using enzyme system pepsin which isindicative of Nutra-therapeutic potential of synthesised peptides. From the results it may beconcluded that, membrane bioreactor based techniques may be applied in diverse domain forhuman benefits for producing nutritional supplement as well as to manage bio-waste.

Key words: Membrane bioreactor; peptide; nutra-therapeutic compound

Utilisation of Agro-industrial residues for the Production of Endo-1, 4-β- xylanase from Bacillus pumilus

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OP-03-005

Abstract

Endo-1,4- β-xylanase hydrolyses hemicellulose by degrading the linear polysaccharidechain beta-1,4-xylan into xylose. The commercial applications for Endo-1,4- β-xylanaseinclude- paper and pulp industries, in the increased digestibility of silage for animal fodder,in the manufacture of bread and beverages, ethanol, xylitol production, fruit juiceclarification and degumming of plant fibers like- flax, jute etc. In the present work, theAgro-industrial residues like Sugarcane bagasse, Corn cob, Rice straw and Saw Dust havebeen selected for the production of Endo-1, 4-b-xylanase from Bacillus pumilus [MTCC-10209]. As the production of enzyme is highly expensive, an attempt has been made toproduce from Agro-industrial residues. The enzyme was produced by Bacillus pumilus[MTCC-10209] using agro-industrial residues as substrates to make the producteconomical. The maximum Endo-1,4-β-xylanase activity for- Sugarcane bagasse (1338.8U/mL), Corn cob (642.44 U/mL), Rice straw (543.19 U/mL) and Saw Dust (458.93 U/mL)were obtained. The important nutrient components in the medium for enzyme productionwere screened by P-B design. From the ANOVA table, factors with P-values<0.05 wereconsidered to have significant effect on Endo-1,4-β-xylanase activity and thus enzymeproduction. The selected factors with P-values were Yeast extract (0.0037), FerrousSulphate (0.0165), Manganese Sulphate (0.0188) and Sugarcane Bagasse (0.0195).

Keywords: Endo-1,4-β-xylanase; Bacillus pumilus;Plackett-Burman design.

A Study on Green Extraction Method for Gallic Acid from Ficusauriculata leaves

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OP-03-006

Abstract

In this study, gallic acid was extracted from Ficus auriculata leaves using ultrasoundassisted extraction and the process parameters were optimized. The extraction wascarried out using water as the solvent and increasing its efficiency by varying the pH. The influence of time, temperature, sonication level and solid to solvent ratio on gallicacid extraction was investigated. The extraction efficiency of three different solventsviz., 50 % methanol in water, 50 % ethanol in water and alkaline water was compared. The damage on plant matrix caused by sonication which enhanced the extraction wasevident from the FESEM images. Results of the present study indicated sonicationtreatments to be efficient in extracting gallic acid from F. auriculata leaves without theuse of harmful organic solvents.

Keywords: Gallic acid; Ficus auriculata; ultrasound assisted extraction.

Recent Development In Cultured Meat Industry: Production Methodology, Challenges, and Future

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OP-03-007

Abstract

In-vitro meat is a novel concept in food science and biotechnology. Meat alternativesare created to address consumer demands and provide future food nimbly moreoverdodging countless issues with normal meat like butchering, dietary deficiency,emanation of methane adding to global warming etc, driving the market to growexponentially lately. In this scenario supplanting meat alternatives can be useful. A fewmethods being Bio fabrication, Bioprocess design, Tissue engineering, 3D printing, andThermo extrusion. Altogether more significant challenges and investigation areexpected to develop a reasonable refined meat system. Eventually, tissue-engineeredmeat is the inevitable fate for mankind, however, the high prohibitive cost of creationand affirmation among individuals are principal impediment. This review paper coversthe need for in-vitro meat, methodology, challenges, and what's to come.

Keywords: Cultured Meat; Artificial Meat; In-vitro Cultured Meat; 3D Printing;Bioreactor.

Fluorescent Dye-loaded Liposomal nanoOsmoSensors (LinOS) for Diagnosing Dry Eye Disease

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OP-03-008

Abstract

Dry eye disease (DED) is characterized by tear hyperosmolarity. Current techniquesmeasure only the average osmolarity. This leads to inaccurate measurement since it hasbeen recently proven that the osmolarity changes locally in the tear film. Hence, thecurrent clinical need is a non-invasive, sensitive and local measurement of tear filmosmolarity for accurate assessment of DED. In this direction, we propose to developosmosensitive liposomal-nanosensors (LinOS) loaded with two fluorescent dyes, one atsaturation and the other at a low concentration. Using a custom-made spot fluorometer, we intend to measure the local osmolarity of the tear film.

Towards this, liposomes were prepared by thin film hydration technique and subjectedto sonication and extrusion (30 Passes) to get unilamellar structure and reduced size. The average liposome size reduced from 1500 ± 100 nm to 120 ± 50 nm with highmonodispersity. Cryo-TEM confirmed that liposomes were spherical, uniform in size and structurally intact. A test dye Carboxyfluorescein was loaded into thenanoliposomes during hydration and extrusion steps. Sufficient dye loading wasconfirmed using UV spectroscopy, photoluminescence and HPLC techniques. Loadingof the two dyes into nanoliposomes and investigation of osmo-sensitivity are currentlyunderway.

Keywords: Dye eye disease; osmosensitive; liposomes; osmolarity

Cloaking of nanoparticles with stem cell membranes to render stealth and tumor targeting properties for targeted drug delivery

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OP-03-009

Abstract

Anticancer drugs loaded into biodegradable polymer-based nanoparticles possessenhanced bioavailability. However, the host immune system can recognize thesenanoparticles and phagocytose them, thus reducing treatment efficiency. In addition, thenanoparticles do not possess active tumor targeting properties. Thus, the drug can causetoxicity to normal cells. Mesenchymal Stem Cells (MSCs) are immune privileged cellspossessing innate tumor-targeting abilities primarily due to their unique membranebiochemistry. Hence, we hypothesize that by cloaking nanoparticles with MSCmembranes, phagocytosis can be avoided and active cancer targeting may be achieved.

In this direction, MSC membrane vesicles were derived using a spin-cup centrifugationmethod. The average size of the vesicles were reduced from 5500 ± 500 nm to 700 ±100 nm during spin-cup centrifugation. Poly-L-lactic-co-glycolic acid (PLGA)nanoparticles (NPs) were synthesised by nanoprecipitation method. The average size ofthe NPs were 90 ± 10 nm with high monodispersity. Cryo-TEM images confirmed thatthe vesicles were spherical, uniform in size with good mechanical integrity. Fusion ofmembrane vesicles with NPs by coextrusion through polycarbonate membranes ofvarying pore sizes resulted in membrane-cloaked NPs with an average size of 120 ± 20nm and uniform coating.

Keywords: Nanoparticles, Mesenchymal Stem Cells, membrane vesicles, targeted drug delivery

Production of ethanol from food waste

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OP-03-010

Abstract:

One third of food produced for human consumption is disposed as food waste that poses ahazard for the global market and surroundings. Considering the physiochemical andbiological nature, the food waste could be used as a unprocessed raw material for fuel andenergy production. This will facilitate the bio-circular economy and reduce the environmentalimpacts. However, the conventional technologies (i.e., composting and anaerobic digestion) are irreplaceable to maximize the benefits of food waste recycling but require detailedtechno-economic scrutiny for commercialization.

Alcoholic fermentation of sugar syrup observed to be associated with physical and chemical changes. Now sciences are directing the life processes of yeast, bacteria and moldstoproduce chemicals. Fermentation of food waste to get ethanol was done and distillation wasfollowed to cleanse and purify the product.

In the present study, alcoholic fermentation from vegetable waste by using yeast is carriedout for 72 hrs. at 30 to 35°C in the fermenter. Rate of fermentation is found to be 1.515 x 10-4 mole/lit.hr. Through the material balance it is found that conversion of sugar by stoichiometry is 55 %.

Keywords: Ethanol, Food waste, Fermentation, Yeast, Distillation

Hydrodynamics and Drying Kinetics of Food Grains in Tapered Fluidized Beds

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OP-03-011

Abstract

Proper drying of food products can remove moisture in the solid grains upto a certain level, at which microbial spoilage and deterioration chemical reactions are greatly minimized during the storage. A suitable drying method is required for reducing the damage to grain and for economically feasibility. Also, the drying method and conditions effectively determine type and characteristics of the final product. Out of the many methods available for drying of grains, the fluidized bed drying is superior and very effective. Tapered Fluidized beds can be used for high drying capacity due to better heat and mass transfer.

In the present paper, an experimental investigation on hydrodynamics and drying kinetics of wheat grains, sorghum and mustard seeds in tapered fluidized bed dryers are reported. The similar fluidization regimes were obtained for all the three food grains and pressure drops and minimum fluidization velocities were estimated. Further, the drying kinetics for the three food grains were studied by varying tapered angle of the bed, temperature, and gas velocity in tapered fluidized beds. The drying rate was found to increase significantly with increase in temperature and marginally with flow rate of the heating medium and to decrease with increase in solids holdup. The drying rate was compared with various simple exponential time decay models and the model parameters were evaluated. The Page model was found to match the experimental data very closely with the maximum root mean square of error (RMSE) less than 2.5%.

Keywords: Drying kinetics; Tapered Fluidized bed; Hydrodynamics, Food grain drying, Kinetic Model

Significant Role of Metabolic Heat in Deciding the Best Bioprocess Variables

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OP-03-012

Abstract

Optimization of process variables is most time consuming and expensive in anybioprocess production technology, one of the most important variable is the state of theinnoculam, in this study; we have calorimetrically evaluated seed culture of Kluyveromycesmarxianus in liquid and pellet form while fixing all other variables. The metabolic heatpattern obtained showed a longer stationary phase for seed liquid culture (Fig.1) than thepellet form (Fig.2)

It is interesting to note that the longer stationary phases are beneficial for growthassociated processes while sharp heat pattern observed in the case of seed pellet would beadvantageous for non-growth associated bioprocess, thus the measurement of metabolic heathelped to distinguish the merit and demerits of the state of the innoculam. The presentationwill discuss the correlation between the different process variables to the metabolic heat.

Keywords: Calorimetry, Innoculam, Metabolic heat

Peptides in Food Preservation and Vaccines

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OP-03-013

Abstract

In today's time, there is a never-ending demand for food. Hence, the need for minimallyprocessed food has increased. Over the last decades, it has become essential to look fornew natural sources of preservation that extends the shelf-life of food products. Biologicallyactive peptides isolated from food proteins are emerging as a natural food preservative. Peptides are of immense importance in biological science, especially in studying syntheticpeptide-based vaccines. The peptide-based vaccine is a promising alternative strategy toconventional vaccines that shows enhanced immune response and resistance to certaininfectious diseases and allergies. In this review, we discuss the use of peptides as foodpreservatives and the current stand of peptide-based vaccines. The study also proposes thechallenges in implementing bioactive peptides as food preservatives along with a possiblesolution to overcome these challenges, as well as the problems incorporated in syntheticpeptide-based vaccines and the possible outcomes to achieve the targeted immuneresponses by using peptide-based vaccines.

Keywords: Peptides; Food Preservative; Peptide Vaccine

Production of Foam Mat Dried Fruit Powders

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OP-03-014

Abstract

The growing concern on the wastage and perishable nature of certain tropical fruits hasled to the precautional measure of employing a suitable drying technique. Experimentswereconducted for the optimization of process parameters for the production of fruitpowder using foam mat drying. Foams were prepared from seasonal fruit by addingthree different foaming agents such as Egg Albumin, Glycerol Monosterate and Methylcellulose. The effect of different foaming agent concentration of 2.5 , 5 and 7 wt/vol %basis at 3 different whipping time of 2 , 3 and 4 minutes on the foaming propertieswas investigated. It was found that 7.5 wt/vol% of GMS concentration and a whippingtime of 4 minutes tended to express best foaming properties for fruits. Under theseoptimized conditions the foamed pulp juice was subjected to drying under 50, 60 and70˚C in a hot air oven. The powder properties and nutritional values of the foam matdried powder were determined. It was found to be best at 60 ˚C for fruits.

Keywords: Foam Mat Drying; Optimization; Egg Albumin

Study on herbal nutraceuticals in health management

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OP-03-015

Abstract

Nutraceuticals are products, which other than nutrition are also used as medicine.Nutraceuticalsmay be used to improve health, delay the aging process, prevent chronic diseases, increase lifeexpectancy, or support the structure or function of the body. A nutraceutical product may bedefined as a substance, which has physiological benefit or provides protection against chronicdisease. Nutraceuticals are of these nutritional supplements which are used for health purposesother than nutrition. A dietary supplement is considered as a product that bears or contains one ormore of the following dietary ingredients: A mineral, a vitamin, an amino acid, a medical herb orother botanical, a dietary substance for use by man to supplement the diet by increasing the totaldaily intake, or a concentrate, metabolite, constituent, extract, or combinations of theseingredients. Specifically, nutraceuticals are formed from active compounds obtained from plantfoods or from foods of animal origin, which are concentrated and provided in the appropriatepharmaceutical form, and also have a pharmacological effect and nutritional value.

Keywords: Nutraceuticals ; Phytochemicals ; Food supplement; Plants ;Nutrients

Role of biocalorimeter in extracellular polymer production from Halomonas variabilis

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OP-03-016

Abstract

The metabolic activity of Halomonas variabilis during extracellular polymerproductionwas studied in a biocalorimeter under optimized conditions. The objectivesof this work are manifold; real-time bioprocess monitoring through the metabolic heatsand its predominant role in quantitative engineering and control. The heat evolvedduring a bioprocess provides information about the metabolic activity of the living cells.Mass of biomass produced per gram of substrate (glucose) consumed (Y X/S ,) was foundto be 1.86, mass of extracellular polymer produced per gram of biomass (Y P/X) and pergram of substrate (Y P/S) was found to be 0.21 and 0.43 respectively and heat generatedper gram of biomass (Y Q/X) and per gram of substrate (Y Q/S) was 3.28 and 14.03respectively.The oxidative metabolism and physiological state of the bioprocess waswell understood from the oxygen uptake rate (OUR) and carbon dioxide evolution rate(CER). Influence of glucose and sodium chloride upon the rate of polymer productionand a clear understanding of turbidity, pH during the reaction was inferred bycontinuously monitoring them throughout the reaction. The presumed growth kinetics ofHalomonas variabilis was verified under optimized conditions with its most compatiblenutrient medium components and the specific growth rate was estimated to be0.156 h -1.

Keywords: Biocalorimeter; Halomonas variabilis; extracellular polymer.

Studies on medicinally important Aromatic Plant species

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OP-03-017

Abstract

Aromatic plants are often used as natural medicines because of their remedial and inherent pharmacological properties. These plants are from a numerically large group of economically important plants. Aromatic plants are mainly exploited for essential oil extraction forapplications in industries, for example, in cosmetics, flavoring and fragrance, spices, pesticides, repellents and herbal beverages. These plants possess odorous volatile substances which occur asessential oil, gum exudate, balsam and oleoresin in one or more parts, namely, root, wood, bark, stem, foliage, flower and fruit. The characteristic aroma is due to a variety of complex chemicalcompounds. Aromatic plants are those that contain aromatic compounds – basically essential oilsthat are volatile at room temperature. Many plant extracts have been reported to containantioxidants that scavenge free radicals produced due to radiation exposure, thus impartingradioprotective efficacy. It is a well-known fact that radiation is a powerful cytotoxic agent.

Key words: Aromatic, Oil, Antioxidant, Flowers, Cosmetics

Enzymatic Degumming of Natural Fibers For Textile Applications

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OP-03-018

Abstract

Global fiber production contributes 107 million MT in 2018 and expected to 145million MT by 2030. Fiber production can be plant-based, animal-based, man-made, andsyntheticfibers. Plant-based fibers including jute, ramie, and hemp have market share of5.7%. The emerging interest in plant-based fibers, agricultural residues could be addressed byadopting banana plant fibers. Banana fiber is renowned for incredible durability, biodegradability, spinning quality, fineness, and tensile strength. Textile processing of bananafiber necessitates the removal of hemicellulosic substance. The major concern of thisinvestigation is degumming of banana fibers by an eco-friendly method. The ideology isfocused on production of hemicellulose degrading enzymes through solid substratefermentation and utilization of enzymes in banana fiber degumming. Degumming of fibercanbe performed by hemicellulose degrading enzymes such as Pectinase, Xylanase, andLaccases. The neglection of non-cellulosic layer corresponds to an increase in tensilestrength, crystallinity, fineness, removal of non-cellulosic substances. The degummed bananafiber has remarkable application in fabrication, cutlery application, and textile industries. Inthis investigation, we have reported utilization of agricultural residues for production ofhemicellulose degrading enzymes and their application in natural fiber degumming. Thepractical difficulties in adopting degummed banana fibres have also been discussed.

Keywords: Banana fiber; enzymes; degumming; textile industries

Spent Medium Recycling and Characterization for the Cultivation of Chlorella sorokiniana Microalgae

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OP-03-019

Abstract

Microalgae has gained substantial attention as a potential feedstock for the productionof various green chemicals and fuels. The high water requirement for the production ofmicroalgae biomass increases the water footprint which is one of the major challengesin the production of microalgae and it might limit the microalgae production. Therefore, recycling of culture medium is necessary to reduce the water foot print of microalgaebiomass production. In this study, recycling of culture medium for the cultivation ofChlorellasorokiniana (microalgae) and the effect of medium recycling on its growthwas investigated. Microalgae were cultivated in recycled spent medium up to threerecycled stages. Specific growth rate of microalgae culture in BG-11 medium was found1.303 Day -1 and it was declined to 1.076 Day -1 after repeated recycling of spent medium. Total dissolved solids increased to 1647 mgL -1 after repeated recycling of spent mediumas compared to fresh BG-11 medium in which it was estimated to be 824 mgL -1 . Theconcentration of total dissolved solids in spent medium cultures increased to 49.9% ascompared to fresh BG-11 medium culture. The decline in growth rate in spent mediumwas majorly due to inorganic compounds accumulation in the medium.

Keywords: media recycle; microalgae; spent medium

Molecular modeling investigation for novel nutraceuticals against proteases of SARS-CoV-2, H1N1, and Ebola hemorrhagic fever

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OP-03-020

Abstract

Global pandemics are serious threats to human life. While well-established and characterized viruses such as The human immunodeficiency virus (HIV) and Hepatitis are still killingmillions of people, the emerging viruses are also problematic and have caused several serious outbreaks in recent years, such as the Severe Acute RespiratorySyndrome-Coronavirus(SARS-CoV) in 2002–2003, Swine influenza A (H1N1) in 2009, and Ebola Haemorrhagicfever outbreak in 2014 which has caused thousands of deaths worldwide. The widespreadproblem of a 2019-novel coronavirus (SARS-CoV-2) strain outbreak has prompted a searchfor new drugs to protect against these viral infections in the future. It is necessary toimmediately investigate this due to the mutation of the viral genome and there being nocurrent protective vaccines or therapeutic drugs. In silico screening, strategies were employedto determine the potential activities of seven HIV protease (HIV-PR) inhibitors, two fludrugs, and four natural nutraceuticals including, gingerols, curcumin, mangiferin, and piperincompounds. The computational approach was carried out to discover the structural modeswith a high binding affinity for these nutraceuticals on the homology structure of thecoronavirus protease (SARS-CoV-2 PR). From the theoretical calculations, all thenutraceuticals demonstrated various favorable binding affinities. An interesting finding wasthat nutraceuticals tested had a higher potential binding activity with the pocket sites ofSARS-CoV-2 PR compared to the conventional HIV-PR inhibitor drugs. This result supportsthe idea that all four nutraceuticals could be used individually or in combination to treat viralinfections. This study sought to provide fundamental knowledge as preliminary experimentaldata to propose an existing nutraceutical material against viral infection. Collectively, it issuggested that molecular modeling and molecular docking are suitable tools to search andscreen for new drugs and natural compounds that can be used as future treatments for viral diseases.

Keywords: Severe Acute RespiratorySyndrome-Coronavirus (SARS-CoV), Swine influenza A (H1N1), Ebola Haemorrhagic fever, 2019-novel coronavirus (SARS-CoV-2), nutraceuticals, molecular modeling, docking

Nanotechnology in the Food Industry

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OP-03-021

Abstract

Nanotechnology is the characterization, production, and application of structures bycontrolled manipulation of size and shape at the nanometre scale with at least onesuperior characteristic. Technology is moving at a rapid pace and transcends from onevisionary paradigm to another. Food technology is linked with nanotechnology througha wide range of applications. When a scientific truth synergizes with a scientific vision,for a deep scientific understanding in this field, we are veritably challenging thescientific landscape of our present day human civilization. In this current study, we areprimarily focused on the blooming effects of nanotechnology in food industries,nanotechnology in food processing, the science of nanofibers, Nano emulsions, Nanocoatings, and the varied world of nanomaterials. With the scientific prowess of humanendeavour and its roots embedded deeply in technological motivation, the scientificobjectives will be at the frontline for the true acknowledgement of nanoscience andnanotechnology today. The treatise deals comprehensively with the scientific successand tremendous potential of Nano filtration and nanotechnology. Water technology andscience are the cruxes of science and engineering. This paper unfolds a plethora ofinnovation and scientific adjudication in the field of modern scientific pursuit in the food industry and nanotechnology.

Keywords: Nanofibers; Nano emulsions; Nano coatings

Efficient uptake of microtubule stabilizing drug loaded nanoparticles by donor corneal endothelium towards prophylactic drug delivery

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OP-03-022

Abstract

The standard care for treating corneal disorders is corneal transplantation. The barrier function of corneal endothelium (CE) maintains corneal transparency. During storage, donor CE isinevitably exposed to hypothermia and challenged by cytokines after transplantation. They bothinduce microtubule disassembly and subvert barrier function of CE. Therefore, the objective ofthis project is to develop a nanoparticle-based strategy for delivering microtubule stabilizingdrugs (Paclitaxel and Epothilone-B) sustainably to donor CE during storage and aftertransplantation to enhance the success of corneal transplantation.In this direction, CE cells were isolated from fresh porcine cornea and grown using a definedmedium. Paclitaxel was mixed with biodegradable poly-L-lactic-co-glycolic acid (PLGA)polymer and nanoparticles (PNPs) were prepared using nanoprecipitation technique. NPs werespherical and homogeneously sized with an average size of 95 ± 10 nm. Drug entrapmentefficiency of NPs was about 91% and drug release sustained up to 4 weeks, followed zero orderkinetics at 4 °C and first order kinetics at 37 °C. The surface charge of NPs was increased to +25± 4 mV by coating poly-L-lysine, which resulted in a better uptake of NPs by CE cells,confirmed by confocal fluorescence imaging. CE exposed to hypothermia and cytokine (TNF-_I)stressdemonstrated significant microtubule disassembly and sustained intracellular drug releaseresulted in the stabilization of microtubules in NP-internalized CE cells under stress.

Keywords: Paclitaxel, microtubules, barrier function, corneal endothelium, nanoparticles, controlled drug delivery

Sophorolipid synthesis from Starmerellabombicola using fleshing oil assecondary carbon source

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OP-03-023

Abstract

Industries are moving towards Biosurfactant produced by living organisms because they are biodegradable, non-toxic, eco-friendly and microbicidal. Bacteria/fungi produce biosurfactant having an amphiphilic nature which helps them to survive in a hydrocarbon rich environment bydecreasing the surface tension and interfacial tension between two immiscible liquids. Biosurfactant, a bio-product is used for awide range of applications. The current work deals withthe use of alternative secondary substrate for the synthesis of sophorolipid-a glycolipid. Leatherindustry stands on top ten foreign exchange earners for India. The fleshing waste contributes to80% of the pre-tanning waste produced from the leather industry can become the source of thesecondary substrate in the production of sophorolipid (sustainable alternative).In the current study sophorolipid was synthesized using Starmerellabombicola MTCC1910 withfleshing oil as a secondary substrate. The amount of glycolipid produced was about 19 g/L. Thestructural analysis of the product was done by FT-IR spectroscopy for sophorolipid and GCanalysis of the fleshing oil shows the presence of hydrocarbon such as palmitic acid, stearic acid,oleic acid, palmitoleic acid and myristic acid. The antibacterial activity of synthesizedsophorolipid was studied against gram positive and gram negative bacteria (Salmonella sps., E.coli, Bacillus sps., Clostridium sps. and Pseudomonas sps.) isolated from purified skin. Thesophorolipid inhibited lowest MIC 4.8 µg/ml against Enterococcus sps, Staphylococcus sp. Andhighest MIC of 7.5 µg/ml against Salmonella sps., E.coli and Bacillus sps. MBC showed 5x10 -5 ,4x10 -2 , 3x10 -4 , 5x10 -2 and 10x10 -6 CFU/ml of bacterial cells for sophorolipid antibacterial activityagainst Salmonella sps., Enterococcus sps, Bacillus sps., Staphylococcus sps. and. E. coli.

Keywords: Biosurfactant, Starmerellabombicola, sophorolipid, fleshing oil and antibacterial activity.

Optimization of Extraction Methods to Isolate Keratin from Feathers –A Critical Review

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OP-03-024

Abstract

Keratin is a scleroprotein which are plenty in nature. They are mostly found in hairs,nails, horns and in feathers of birds. It is highly biodegradable and have high mechanicalstrength. Billion tons of keratin processing feather waste are produced as a byproductfromindustries of poultry, wool, textile etc. Keratin extracted from these poultry feathers had beenused for preparation of hydro gel for wound healing similar to wound dressing woven fabric,keratin stabilized nano-particles and protein-PLA films. Keratin containing materials are alsouseful in agricultural, nanoparticles, food chemistry and biomedical applications.As the feathers of different types may have different structural and functionalproperties, the extracted keratin has been used to evaluate different techniques for finding theamino acid and protein concentration. To optimize the study of various methods forextracting pure keratin, the present study focuses on comparison of different methods ofkeratin extraction and the characterization of various criteria involved in the extraction ofkeratin from different types of feathers. Possible and potential applications of the pure keratinwill also be critically reviewed.

Keywords: Keratin; Feathers; Extraction methods;

Petroleum Refining & Petrochemicals (PRP)

Bioethanol from Banana Waste: Current Status, Issues, and FuturePerspective

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OP-04-001

Abstract

Waste to energy has become one of focal areas of research in view of progressiveincrease in energy demand. Surplus lignocellulosic biomass, in particular, agriculturalcrop residues, is being extensively explored as a key renewable source of energy in ourquest for eco-friendly biofuels. Biofuels, in particular, bioethanol has receivedtremendous interest and efforts are on to increase the production of bioethanol fromvarious possible bio-resources. After going through the literature pertaining to theproduction of bioethanol from various surplus lignocellulosic biomass, it was revealedthat a good number of researches on production of bioethanol from banana waste areavailable. Since banana waste comprises quite a few types of wastes, viz. bananapseudostem, banana leaves, banana rachis, banana peels etc., it becomes imperative toanalyze the pertinent literature. It is very important to note that India is the largest producer of banana in the world and in turn generates maximum banana agro-wasteglobally. The present paper aims to bring together various facets of production ofbioethanol from various types of banana wastes in a coherent manner on a singleplatform. The present communication is expected to be useful to the researchers andpracticing engineers working in the area of bioethanol.

Keywords: Banana waste; Pre-treatment methods; Fermentation; Bio-ethanol

Failure Analysis: A Comparative Study Between Conventional Methods and Resilience Engineering

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OP-04-002

Abstract

We report the application of resilience engineering (RE) methods to assess thefailure analysis of the industrial components in the process industry. The REconsists of diagnostic and prognostic investigative methods. The former approachdetermines the root cause of the event whereas the latter identifies structuraldeterioration of the industrial equipment. To evaluate the efficacy of the RE, theliterature data are analyzed using both the conventional and diagnostic failuremethods using preliminary data. Based on our initial findings, we have performed a thorough comparative analysis to evaluate the probability of the failure amongst theevent tree analysis and RE methods (Functional Resonance Analysis Method andResilience Analysis Grid). The comparison approach is aimed to demonstrate theefficiency of the Resilience Engineering methods over the current existing analysis.To refine the results, an attempt was made to assess the safety compromises inthe industry using Machine learning (ML). The results obtained from the RE-MLmethods are more effective than the conventional engineering analysis inpredicting the probability of failure.

Keywords: Resilience engineering, failure analysis, Feedforward NeuralNetwork, Support Vector Machine, Resilience engineering models FRAM and RAG

Application Of Artificial Intelligence and Machine Learning In High Hazard Oil And Gas Industries

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OP-04-003

Abstract

Hydrocarbon spill in the pipelines increases the maintenance cost and corrodes the gaspipelines in the oil and gas industries. Identifying the leak in the lines is a cumbersomeprocess and it requires modern diagnostic tools. Digital gas company data, automatedsensing systems, infrared (IR) based robotic systems, unmanned aerial vehicles andspecialised drones are strategically employed to detect leaks in the pipelines. Thepipeline companies use these tools to quantify the events at the pre-installation stage.Artificial Intelligence (AI) and machine Learning (ML) approaches are widelyemployed to address the leaks and risks associated with the pipeline systems. In thiswork, we report the risk analysis and the effects of gas leaks in the oil gas industry. Wedemonstrate the use of AI and ML to detect the leak in the pipelines with comparativeanalysis to compute the efficiency of the AI based system against the conventional methods. The use of AI tools and its correlation with the weather data and satelliteimages are provided. The study and the risk analysis of the hazardous leakages confirmthat the early detection of the leaks achieved by use of AI and ML can greatly minimisethe hazardous material leakage.

Keywords: Oil and gas leaks; Leakage detection system; AI and ML; Thermal imaging; Automated inspections; Risk management; Weather data based AI system

Atomistic Investigation of Asphaltene Aggregation in Aqueous Solution

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OP-04-004

Abstract

Asphaltenes are the heaviest components of crude oil. Asphaltenes are complexmolecules, consists of polycyclic aromatic hydrocarbons, aliphatic side chains and polar-hetero atom containing functional groups. Asphaltenes have high tendency to formaggregates and are responsible for the high viscosity of crude oil. Destabilized asphaltenescan cause serious problems in oil refineries such as coke formation, catalysis deactivation,pipeline blocking and many more. Asphaltenes released in environment could havenegative impacts on soil and marine life due to their non-biodegradable nature. Theaggregation behaviour of asphaltene in aqueous solution is systematically investigatedbased on a classical molecular dynamics study [1]. In this talk, a novel approach adoptedin order to probe the structural properties of the asphaltene nanoaggregates using differentwater models and effect of the various water models along with dynamical properties willbe discussed.

Keywords: Aggregation, Hydrocarbons, Molecular Modelling

Optimization of Base Catalyzed Transesterification Process for Synthesis of Biodiesel from Jatropha curcas oil

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OP-O4-005

Abstract

The main objective of this research work is to produce Biodiesel from Jatropha curcas oil using base(KOH and CaO catalysts) catalyzed transesterification process, test its properties using variouscharacterization techniques and compare the results with ASTM standardized fuel properties tovalidate its potential applications as a replacement for diesel. Experimental results have shown that theobtained jatropha based biodiesel from base catalysts has their properties (Flash point: 100-170; Cloudpoint: 2oC- 4oC; Pour point: -1oC to -2oC) well within the specified ASTM range. From thecharacterization results, the physical properties of biodiesel produced from jatropha oil using the KOHcatalyst (Example: Fire point: 126, Specific gravity: 0.87) were found to be within the ASTMspecified limits. Also, biodiesel characteristics like specific gravity and density are close to that ofpetrol and diesel.Therefore, the major outcome of this research work is that a systematic comparisonbetween two different catalysts has been carried out and it has been observed that KOH is an optimumcatalyst that is economical and can be scaled up to produce maximum yield. This process can beconsidered as a zero-waste process as the by-product (glycerin) was further considered as a rawmaterial to produce commercial-grade product like glycerin soap.

Keywords: Biodiesel; Jatropha curcas oil; KOH and CaO catalysts; Transesterification.

Nano-based drilling fluids in oil and gas sectors- A potential game changer

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OP-04-006

Abstract

The application of nanotechnology in the oil and gas industry is on the rise as evidenced bythe number of researches undertaken in the past few years, According to leading oil industryresearchers nanotechnology could benefit numerous areas in the oil and gas sector. The quest to develop more game-changing technologies that can address the challenges currently facing the industry has spurred this growth. Using specialist techniques to synthesis nanoparticles at atomic level, these particles have been shown to have remarkable mechanical optical andmagnetic properties which have potential applications both upstream and downstream, Applications are being tested with promising results using nanoparticles in drilling fluids to reduce torque and drag, stabilizing the well bore, controlling fluid loss, improving therheological and filtration properties, decreasing frictional resistance in the well, preventing formation damages, enhanced oil recovery, nano-based catalysts, membranes for betterseparation of gas stream and impurities. This paper emphasizes the recent developments and researches made on the novel nano-based drilling fluids, and technologies for the efficient oil and gas recovery.

Keywords: Nanotechnology; Drilling; Rheological properties; Downstream

Re-generation of base oil from waste lubricating oil by the re-refining process of Solvent Extraction using two different solvent

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OP-04-007

Abstract

With modernization of various industries and after prolonged use of lubricating oil, resulted in generation of increased amount of waste lubricating oil which may damage the environment severely. Waste lubricating oil can damage soil, water and air if not properly disposed of. Indiscriminate disposal of waste lubricating oil create a severe environmental threat. As a mitigated measure against environmental threat and convert the waste to energy, the present study aimed at to regenerate base oil from waste lubricating oil by the process of re-refining. This can be achieved by most promising technique called Solvent Extraction. In the present work, two low-cost recoverable solvents, Methyl ethyl ketone and 2-propanol has been tested in reclamation of waste lubricating oil. Percentage oil loss and percentage yield were investigated at varying solvent to waste oil ratio. Results showed that percent oil loss decreased substantially to 0.13 % and the yield of recovered oil increased to 97.5% with solvent to waste oil ratio of 3:1 using MEK which is comparatively found to be the best. The various physico-chemical properties of regenerated base oil were determined and found to be in close proximity with virgin lubricating oil.

Keywords: Waste lubricating oil; Extraction solvent, Solvent to oil ratio.

A Review on Biodegradation of Hydrocarbons using Micro Organisms

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OP-04-008

Abstract

Hydrocarbons fall among the most widely utilized category of chemical substancesacross the globe. Acceleration of industrial activities and progress in various disciplines hasresulted in the contamination of the environment with hydrocarbon residues. This is a severeissue that needs to be addressed effectively since hydrocarbons tend to deteriorate theenvironmental standards and also cause adverse health effects. Biodegradation of hydrocarbonsis an effective, economical and environmentally benign method to handle the pollution caused bythe same. Several soil bacteria and other microorganisms are known to bring about Physico-chemical changes that tend to break down the complex hydrocarbons into simple, non-pollutingproducts. This review has been written with a hope to elucidate the microorganisms that act asnatural degrades of hydrocarbons, their identification and isolation, methods of microbialstimulation involved in microbial degradation, the pathway that the microbe adopts and themolecular mechanism of biodegradation and the enhancement of degradation using microbes forthe abatement of environmental concerns raised by hydrocarbon contamination.

Keywords: Hydrocarbons; Biodegradation; Microbial Activity; Environmental Abatement;

Simulation of Fluid Catalytic Cracking Unit For Propylene Production

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OP-04-009

Abstract

This paper deals with the simulation of the Fluid Catalytic Cracking unit forproduction of propylene. Propylene, often called "The Crown Prince of Petrochemicals", isthe second most important starting product in the petrochemical industry whose demand hasbeen constantly increasing for the last few years. With the constantly rising demand,operators of FCC units look more towards the petrochemicals production to make better theirrevenues by taking benefit of economic opportunities that arise in the market. Steam crackersand FCC units are the two important sources of propylene in the refinery. There is a shortagein the supply of propylene from the modern steam crackers, which are now producingrelatively less propylene. Further, Fluid Catalytic Cracking (FCC) is a process, which isflexible to various reaction conditions, which makes the unit as one of the possible means tobridge the gap between supply and demand of propylene. In this work, simulation of the FCCunit for the production of propylene was performed in the Aspen HYSYS v10 software tool.Vacuum gas oil from imported from the FCC feed library, Atmospheric gas oil and Naphthafrom the atmospheric distillation unit were used as feed to the FCC unit with af3 as thecatalyst. Peng-Robinson model was chosen in the fluid package to represent the phaseequilibriumbehavior and energy levels of pure components and mixtures because of itssuperiority in handling hypothetical components (pseudo-components). Simulation of theatmospheric distillation was also carried out to find out the composition of the feed thatwould enter the riser reactor and then, the FCC unit was simulated to get the final yield ofpropylene. Later, the effect of parameters like the reactor temperature, catalyst to oil ratio, feed temperature and amount of ZSM-5 additive on the yield of propylene was studied.

Key Words: FCC unit, Propylene, Aspen HYSYS, Simulation, catalyst.

Process Modeling, Stimulation & Optimization (PMS)

Biomedical image processing to diagnose brain tumor Using deep learning

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OP-05-001

Abstract

Brain tumor is one of the most dangerous and deadly cancer among adults and children. Early diagnosis of brain tumors plays an important role in improving treatment possibilities and increases the survival rate of patients. Magnetic resonance imaging (MRI) is a widely used imaging technique to assess these tumors but the manual segmentation using the MRI images is atime consuming task. Deep learning methods can enable efficient processing and objectiveevaluation of the large amount of MRI based image data. The objective of this project is theautomatic segmentation of MRI images of brain tumor (specifically glioma) using deep learningmethods with maximum possible accuracy. The four main stages used are pre processing, featureextraction, classification via convolutional neural network(CNN) and post processing. Trainingdataset of brain tumor into the machine and developing a code so as to classify them is thefundamental of this project.

Keywords: Preprocessing, feature extraction, CNN , post processing

Forced convection heat transfer from a Tilted Square cylinder in Nano fluids: Effect of Confinement ratio (λ)

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OP-05-002

Abstract

Numerical investigation of forced convection heat transfer from a tilted square cylinder (α = 45) in water base Nano fluids has been carried out to elucidate the effect of confinement ratio (λ) and dimensionless numbers related to fluids flow and heat transfer characteristics. In this present study, CuO nanoparticles (NPs) of two different diameters of and have beenconsidered Extensive numerical results in terms of wake characteristics (length), streamline (velocity profile) and isotherm contours (temperature profile), local and average Nusselt Number have been obtained and discussed to elucidate the effect of Reynolds number ( ), nanoparticle volume fraction ( ) and confinement ratio kept between 0.1 to 0.6. Over the range of conditions, the recirculation length shows positive dependence on Reynolds number (Re) and particle size (but it exhibit negative trend with respect to and λ. A significant enhancement in the rate of heat transfer over conventional fluids (water, oil etc.) is observed and it seen to increase with increasing value of Reynolds number (Re) and confinement ratio (λ). Finally, a simple predictive correlation for the average Nusselt number is developed which itenables the estimation of the Nusselts number for the intermediate values of the parameters reported in a new application.

Keywords: Nanofluids, Forced convection, Nusselt number, tilted square cylinder, CuO nanoparticles. Figure 1: Schematic diagram of forced convection heat transfer from tilted square cylinder

The flow of power law fluid over a sphere in a confined cylindrical pipe: Effect of Confinement

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OP-05-003

Abstract

The flow of fluids past confined geometries, particularly circular and square cylinders, represents an idealization ofmany industrially important applications, and therefore, it has received a great deal of attention over the years. Most studies ofthis phenomenon have been concerned with the flow past a circular cylinder under free-flow unconfined conditions; there is alot of scope for confined circular cross-sectional geometries. This work represents the flow of the power law fluid across arotating Circular cross-sectional geometry whose cross-section increases in the middle, over the following ranges of conditionsas Reynolds number ($1 \leq Re \leq 80$), power law index ($0.3 \leq n \leq 1.8$). The cylinder possesses an obstacle of spherical shape withdiameter d. The largest cross-section of the cylinder is of diameter D and the smallest cross-section of the cylinder is d 1 (d 1 =d/2).

The paper discusses the nature of the flow for some blockage ratios of D/d= 2.5, 5, 8. Momentum equations and continuityequations describe the steady flow of power law fluids past the cylinder have been solved numerically using a finite volumemethod. Combining all the equations governing the flow and extensive numerical analysis the paper visualizes the nature offlow through the given geometry.

Keywords: Power law fluid, Confinement, Reynolds number, Blockage ratio

A new tuning less PID controller design for First Order plus Time Delay systems

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OP-05-004

Abstract

This paper aims to present tuning free PID controller design for stable First Order plusTime Delay systems. The proposed method is developed on model matching, coefficientsof corresponding powers of s in the denominator and numerator and the closed loop transferfunction of PID controller transfer function of the servo problem. The proposed PIDcontroller design gave superior control performance compared to other methods whichearlier reported in the literature. Closed loop performance is evaluated using error analysisand total variation, and the robustness of the proposed method has been verified usinguncertainty in the process model. PID controller design is experimentally validated using aTemperature Control lab device and it is to be noted that the simulation and controllervalidation results, substantiates the proposed method better. The proposed PID controllerdesign provides the advantage of tuning free while being analytically derived and modelbased.

Keywords: PID controller design; FOPTD model, Set-point tracking.

Staedy flow of power-law fluid past a solid cone in a pipe: Effect of Confinement

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OP-05-005

Abstract

Numerical investigation of the flow of a power-law fluid past a conical body in a confined domain has been carriedout to analyze the effect blockage ratio and the shape of bluff body on the flow of the fluid. The governing differential equationsfor mass, momentum, and energy with appropriate boundary conditions have been solved using a finite element method basedsolver. Extensive results on streamline (velocity profile) and isotherm contours(temperature profile), recirculation length, dragcoefficient and local and average Nusselt Number have been obtained and discussed to elucidate the effect of Reynolds number($1 \leq$ ���� ≤ 80), Power law index ($0.3 \leq n \leq 1.8$) and type of thermal boundary condition (CWT). The inlet flow of fluid isfully developed and no slip boundary condition has been used on the wall. The blockage ratio used for the range of D/d=2.5, 5and 8. The confinement has an inlet and outlet thickness as d1 and the side of cone is d where the condition holds as: d1= d/2.The channel length is D. A correlation of the blockage ratio can be seen with the changing values of the dimensions of thechannel and body. Finally, this correlation enables the estimation of the blockage ratio for the power-law fluid passing theconical body.

Keywords: Power-law fluid, confined domain, cone, blockage ratio, Reynolds number

Steady-dynamic simulation and control studies of the cryogenic distillation for separation of synthetic natural gas

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OP-05-006

Abstract

A cryogenic distillation column is used for the purification of synthetic natural gas from coke ovengas. The coke oven gas, obtained from coke production plants, is one of the notable unconventionalsources of natural gas. The simulation and control studies of the cryogenic distillation process arecarried out using Aspen software. For steady state simulation, equilibrium stage model and Peng-Robinson-Boston-Mathias (PR-BM) equation of state is used. Sensitivity analysis is carried out onindependent variables for obtaining optimal parameters using model analysis tools. Aspen dynamicsis used for dynamic control of the distillation column. The main disturbances to the system are feedflow rate and feed composition change. Therefore, the control structures are designed based ontheses disturbances. Three major control structures are proposed to control the overall operation,
namely fixed reflux flow rate, fixed reflux ratio and dual-composition controllers. After carefulevaluation, the most effective control structure is chosen and implemented to the distillationcolumn.

Keywords: Steady state, Dynamic simulation, cryogenic distillation, control

A new method for PID controller design for critically damped second order plus time delay systems

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OP-05-007

Abstract
This paper aims to present tuning free PID controller design for stable critically dampedsecond order plus time delay systems. The proposed method is developed on modelmatching, coefficients of corresponding powers of s in the denominator and numerator ofthe closed-loop transfer function of the PID controller of the servo problem. The proposedmethod gave superior control performance compared to other methods in critically dampedsystems. Closed-loop performance is evaluated using error analysis and total variation, andthe robustness of the proposed method has been verified using uncertainty in the processmodel. The proposed PID controller settings were validated using the experimentation andsimulation results. The proposed method provides the advantage of tuning free whileanalytically derived and model based.

Keywords: PID controller design; CDSOPTD model, Set-point tracking.

Flow of Power law Fluid Across A Cone with Flat Side Upward

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OP-05-008

Abstract:

The Power law fluid does not follows Newton Law of Viscosity. Stress in Power Law Fluid isproportional to some power of shear rate. The flow behaviour of steady and incompressible power lawfluid is analysed numerically. The momentum and continuity equations describing the steady flow ofpower law fluids across a cone have been solved numerically using the COMSOLE software. Thenumerical results highlighting the roles of Reynolds number and power law index on the global anddetailed flow characteristics have been presented over wide ranges of conditions as $1 \leq Re \leq 80$ and$0.3 \leq n \leq 1.8$ i.e. covering both shear-thinning and shear-thickening behaviour. All computations willbe done for D/d = 2.5, 5, 8 and d 1 = d/2.

Keywords: Reynolds Number; COMSOLE; Power Law Fluid

Comparative Study on Optimum Reflux Ratio

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OP-05-009

Abstract

This work is intended to compare equivalent annual operating cost (EAOC) ofthe distillation columns employed in the separation of the three binary systemsBenzene-Toluene, Benzene-Ethyl Benzene and Benzene - n Propyl Benzene. EAOC isthe overall cost of constructing and operating the column for optimizing the reflux ratio. The objective function for minimizing EAOC of the column is formulated in relation tothe capital cost of the equipment (column, reboiler and condenser) and the operatingcost of the utilities (cold water and steam). The relationship between reflux ratio, R, andthe number of trays in the column, N, is given by Fenske-Underwood-GillilandCorrelation (F-U-G). Effect of the parameters like reflux ratio (R), relative volatility (α)and latent heat of vaporization (λ) on EAOC are studied and compared. Results showthat EAOC is first observed to take an inverse dip and increase with R. Operating costsshow an increasing trend with increase in latent heat of vaporization. Also, independently for each system considered, variation of EAOC with relative volatility ispresented to obtain a correlation.

Keywords: EAOC; objective function; Binary system; Reflux Ratio; F-U-G;Relative Volatility; Latent heat of Vaporization.

Parametric Study of Pressure Swing Distillation through Non-commercial Software DWSIM

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OP-05-10

Abstract

Acetone-methanol mixture is a minimum boiling azeotrope. Among other techniques,pressure swing distillation (PSD) offers an advantage of exemption from the requirement of addition of third component. In the present work, pressure sensitivity for the PSD of this mixture was theoretically investigated using different thermodynamic models. The effect of azeotrope composition shift on reboiler duty was studied. The optimum best operating pressure configuration, based on total energy consumption, was determined. All thesimulations of the present work were performed using open source simulation software DWSIM and the results were compared with the results obtained using commercial PRO II software, as reported in open literature. Effect of high pressure column pressure on heat duty was also studied. Primarily, it is observed that exact decision to choose over the rangeof pressure in high pressure column depends on the possibility of heat integration and capital cost that would incur in the case.

Keywords: DWSIM, Pressure Swing Distillation, Heat Duty, Minimum boiling azeotrope.

Simulation of Cryogenic Distillation of Atmospheric Air Using Aspen HYSYS

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OP-05-011

Abstract

Nitrogen in both gaseous and liquid state is something of higher significance both commercially and scientifically. Atmosphere which is a rich source for the same can be utilized as a raw material for obtaining it. But the technology and the possibility of implementing certain procedures and machineries seems challenging always. It is under this scenario, we are focusing on the methodology of cryogenic distillation of atmospheric air to separate out nitrogen from the mixture under the most possible purest form. Simulation and modelling of this technique using the software Aspen HYSYS is something we are working upon. For steady state simulation, Peng Robinson equation of state is used. The process in real mainly consists of a prepurifier unit which mainly compresses the air along with the major use dual bed adsorbtion column for this. Cold box, that consists of integrated heat exchangers, mainly plate type, is the soul of the process by which the process of cryogenic distillation is carried out. Absence of external reagents and using a part of the process streams for regeneration and instrumentation air purposes make the method more interesting. Obtaining the best parameters for the process and thus obtaining the purest form of nitrogen, through simulation is the main objective of our project.

Keywords: Distillation, Aspen HYSYS, Adsorption.

Enhancements in micro mixing amidst junction variation coupled with induced cavities for immiscible fluid

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OP-05-012

Abstract

Proper mixing inside microchannelhas always been a concern whiledealing with immisciblefluidsystemsuch as (oil and water) due to theirtendency of phase separation whichwill eventually affects the reaction.A micro-channel of 400µm diameterwas annexed with a T-junction andthat junction was modified in such away that that a hemispherical andconical cavity were created at thejunction. The presented modifications were in the shape of spherical, hemispherical and conicalcavities mounted across the length of the microchannel. A micro reactor with expanded junctionand cavities with different geometric shapes based on channel cross-sectional areas and volumewere prepared. The equivalent diameter was then proposed for a T-shaped microreactor toenhance mixing because of the decrease in size of the droplets formed. The formed droplletthereby increases the interfacial area which is justified employing ComsolMultiphysics.Furthermore, the effect of pulse input and normal input representing these modifications werealso calculated. The best degree of mixing is obtained for hemispherical conditions with pulseinput.

Keywords: micro mixing, COMSOL Multiphysics, immiscible fluid

Development and Evaluation of Empirical Correlations for Estimation ofGas holdup in Internal Loop Airlift Contactor

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OP-05-013

Abstract

Internal Loop Airlift Contactor (ILAC) is an important multiphase contactor that findsincreasing use in aerobic fermentation, treatment of wastewater and other similar processes.The performance of an ILAC such as mixing etc. depends on the knowledge of gas holdup.Numerous investigations have been carried out in the past to predict the gas holdup inILAC and thereby develop better design procedure for the operation of ILAC. Theobjective of the current work is to: (i) Evaluate the empirical correlations for gas holdup inthe riser section of ILAC based on the available experimental data in literature and(ii) Develop power law type models based on the characteristic dimensionless groups forthe prediction of riser gas holdup. About 228 data points of gas holdup were consolidatedas part of the work. The performance of correlations was assessed by computing AverageAbsolute Relative Error (AARE) and Root Mean Square Error (RMSE). Linear regressionwas performed to estimate the parameters of the proposed power law model. It was foundthat the available correlations did not satisfactorily predict (min AARE 39.20 % and minRMSE 3.07 %) the riser gas holdup. The proposed power law model significantly improvedthe gas holdup prediction with AARE of 21.35 % and RMSE 1.69 %

Keywords: Internal loop airlift contactor; gas holdup; riser; power law

Optimized Enhancement of Crude Oil Distillation Process Using Artificial Intelligence (Ai) Techniques

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OP-05-014

Abstract

Crude oil extraction process considered to be complex process has various operationsassociated with it. Depending on the region of extraction properties of crude differ widely.Each stage of the multistep process during oil extraction The extraction process is a multistep process and each stage can be split into further steps so as to apply optimization techniques.Machine Learning (ML) and Artificial Neural Networks (ANN) tend to show a lot ofapplications and promising results. Optimizing the layer step by step not only shall improve the operation efficiency but also shall reduce the costs associated with operation. The purpose of this research is to provide insights on the various Artificial Intelligence Methodologies that promises to deliver the most Optimum Production. These methods not only increase the profit but also produce maximum yield of the required range of distillates. A Neural Network can emulate almost any function, provided given enough training samples and computing power. A neural network's core functioning depends on the parameters of the training sets,Activation Function, Bias, Error function and hyper-parameters. This study starts with thecharacterization of the physical properties of crude by Ensemble Random Weight NeuralNetworks which addresses the issues faced in backpropagation algorithms that are easy tosuffer local optimum. SVM Algorithm for optimization of the ADU column is adopted. The structural variablesinclude the location of the feed tray, side-stripper draw streams, number of pump arounds and number of trays in each section of the column. Operation control variables include feedstock inlet temperature, temperature drops along the column, reflux-ratio and stripping steam flow rates. The data for the surrogate model is generated using multiple rigorous simulation. For each set of input data simulation is carried out on HYSYS to obtain the set of outputvariables. The input variables including both structural and operational are adjusted toimprove the column performance. The output variables represent product flow rates, productquality (T95 and ASTM T5), Boiling temperatures of each product), enthalpy changes,diameters of each column and target temperatures of stream. The ANN predicted the crudeoil properties with which the SVM model was trained which classifies and filters the designsbased upon column structures and operating conditions and gives the column performanceand the most optimum operating conditions for the given design of the column.

Screening of variables by factorial Minimum Run Resolution IV design for treatment of paper mill wastewater through electrocoagulation

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OP-05-015

Abstract

Examining and screening of variable objectives is an important part when optimization of wastewater treatment method is necessary. It is because this serves as the basis fordevelopingthe right concept for selection and range of variables. The aftereffects of optimization are alwayscustomized to your individual objectives. In this study minimum run resolution IV design waschosen as a screening design for variables involves in the Electrocoagulation treatment ofrecycledfiber-based paper mill wastewater. The pH, Conductivity, electrode distance, currentdensity, mixing speed and electrolysis time was the main variables that directly affect thetreatment process. Based on the Shapiro-Wilk test normal probability graphs were plotted againstthe standardized effect of variables for all selected responses like Chemical oxygen demand, Color, Total organic solid and total organic carbon. The normal probability plot shows thestandardized effect of variables with their magnitude and direction of significant effects. The p-value for all response was more than 0.05 by the Shapiro-Wilk test, which representsinsignificant error. The Pareto chart was also analyzed to check for one more significant effectthat was not obvious on the normal plot. By using Pareto chart variables t value limit

andBonferroni limit was obtained. Final results suggested that variables range should be betweenvalues of pH 6.5, conductivity 675 µS/cm, distance between electrodes 1.75 cm, current density12.5 mA/cm 2 , mixing speed 350 rpm and electrolysis time 37.5 min. The variables which mostaffect the process are pH, conductivity, distance between electrodes, current density andelectrolysis time. These selections and screening of variables may further be used for processoptimization or used as it is for Electrocoagulation treatment of recycled fiber-based paper millwastewater.

Keyword: Minimum run resolution IV design (MRR- IV), Screening design, Shapiro-Wilk test,Pareto chart

Prediction of air quality using fuzzy logic modelling

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OP-05-016

Abstract

Pollutant concentration in air is increasing day by day especially in urban areas. WHO data shows that about 90% of people breathe air that exceeds WHO guideline limit containing high level of pollutant. This causes various human health effects and environmental effects. Recently, artificial intelligence methods are used to predict the environment related problems. Prediction of air quality using fuzzy logic is one of the effective ways for the prediction of future air quality with past observed data, also an efficient way of protecting human health and environment by creating awareness against harmful pollutants.

Keywords: Air quality; fuzzy modelling; pollutant

Understanding the 2D and 3D simulation behavior for heat transfer problem

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OP-05-017

Abstract

The main idea of this work is to compare the 2D and 3D models for heat transfersimulations. Steady state heat transfer through a copper slab and through a solid circularcone was studied using COMSOL Multiphysics software. The simulation results werevalidated with the numerical solution results. Usually 3D simulations are complex and timeconsuming compare to 2D simulations. It was observed that the results of the steady stateheat transfer through a copper slab were same for the two and three dimensionalsimulations. But the results of the heat transfer through a solid circular cone were differentfortwo and three dimensional simulations and it was also observed that three dimensionalsimulation results are comparable with the numerical results.

Key words: 2D and 3D models; Heat Transfer; Numerical Problem; Copper slab; circular cone

Simulation of Fluid Flow and Mixing in a Helix Element Static Mixer

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OP-05-018

Abstract

The performance of single helix inserts as static mixing elements is studied for various flow rates in the laminar flow regime using Computational Fluid Dynamics (CFD) simulations. It is compared with a model of a Kenics TM static mixer containing 6 elements. The helix type static mixer is evaluated for varied radius of the coil, axial pitch and number of turns, using glycerol solution as the test fluid. The effect of the dimensions of the helix on the velocity distributions, pressure contours and visualization of mixing in the pipe for the compared geometries are presented. Analysis of Residence Time Distribution is also done for both devices and compared with data generated for an empty pipe. This is to assess the possibility of using the helical insert for reactor applications. From the RTD data, Kenics TM static mixer shows narrower spread, but the easily customisable parameters of the helix element inserts allow this design to be a viable option in mixing applications. It can especially be considered when power consumption is a major factor in the design, because the pressure drop in the helix element static mixer is lower compared to that of the Kenics TM static mixer for the same operating conditions.

Keywords: Static mixer; CFD simulation; Kenics TM; pressure drop; residence time distribution

Process Modeling, Simulation and Optimization using Artificial Intelligence of Things (AIoT) to Prevent, Mitigate and Manage Hazards during StartupofIndustrial Operations Post Lockdown

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OP-05-019

Abstract

The outbreak of the highly contagious disease COVID 19 is globally pandemic and has spread tomore than 220 countries. There is global lockdown for containment of the virus transmission.Now, slowly nations and humanity are trying to resume their activities following the lockdownin a phased manner, it is also important for industries to restart their operations after dulyconsidering both the hidden and obvious hazards during such transitions. This particular whitepaper would be focusing on the major impacts with respect to safety that the industries hasencountered during the shutdown and start up process during nationwide general lockdown.Unsteady state conditions prevailing during different stages of the life cycle of industrial plantssuch as commissioning, startup, maintenance / emergency shutdown and decommissioning arepotentially dangerous operations, which need to be evaluated using appropriate hazardidentification techniques such as Process Hazard Analysis (PHA), Pre-Startup Safety Review,Hazard& Operability Study (HAZOP), What-if / Checklist Analysis, Management of ChangeReview, Safety Audit and Emergency Response Disaster Management Planning. Thesequalitative techniques need to be supplemented using Artificial Intelligence of Things (AIoT) inorder to model, simulate and optimize the different operations and manage safety.

Key words: AIoT; Accidents; Process safety; Lockdown

Modelling of Chromatographic Reactor for Esterification of Acetic Acid

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OP-05-020

Abstract

Chromatographic reactor (RC) is a multifunctional reactor that combines chromatographywith reaction and offers flexibility in operating temperature in case of thermolabile chemicalspecies and catalyst. In this work, we evaluate the applicability of RC for esterification ofacetic acid into esters. Esterification being a reversible reaction, simultaneous separation ofwater by RC helps obtain high conversion of acid. In RC, the selection of packing material isan important factor as it should not only act as a catalyst (Amberlyst-15) for the reaction butalso adsorb one of the products, selectively. Acetic acid flows over packing material such thatesterification and separation of products occur simultaneously. The reaction rates and relativeaffinities of the components towards the packing material together, decide the feasibility ofRC for a given reaction. Fixed bed chromatographic reactor (FBCR) can be conveniently used to evaluate feasibility of RC for a given reaction. The performance of FBCR is analysedusing the breakthrough curves. Once the feasibility is proven, the reaction can beconveniently conducted in a continuous mode reactor like simulated moving bed reactor(SMBR). Advantages of RC are the operating temperature is not limited by the vapor-liquidequilibrium thereby providing a greater temperature window to minimize catalystdeactivation. Furthermore, one can conveniently use lighter and more reactive alcohols suchas methanol/ethanol in this case. The choice of methanol/ethanol as the reacting alcohol isbased on the fact that they can be produced economically and from bio-sources. Furthermore, being reactive, the reactions take place at relatively low temperatures thereby suppressing theside reactions and hence the catalyst deactivation observed otherwise at high temperature. Inthis work, we perform systematic experiments to evaluate applicability of RC for thisapplication. Since RC is found to be a promising option, we generate relevant data on kineticsand adsorption isotherm to develop a reactor model and validate it experimentally.

Keywords: Reactive chromatography, Adsorption, Acetic acid, Esterification, Amberlyst-15.

Simulation Studies For The Production Of Mtbe By Using Pro/Ii

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OP-05-021

Abstract

Methyl tertiary butyl ether (MTBE) is primarily used in gasoline blending as anoctane enhancer to improve hydrocarbon combustion efficiency of all oxygenates, MTBE is attractive for a variety of technical reasons.

There are two ways to produce MTBE, one is the conventional process which ismainly a reactor and separate distillation column with conversion range 87-92%. Anothermethod is to produce MTBE by using Reactive Distillation Process, and there are a lot offeatures that makes this process attractive and practical with a conversion reached 99.2%. Reactive distillation column (RDC) technology gives drastic change in the productionquantity and quality and improved the energy efficiency and cost redundancy.

The development of simulation is the main reason that this technology evolved andgotutilized in industries. The main objective is to produce MTBE via reactive distillationcolumn at steady state simulation by using (PRO/II) Software. PRO/II software has thecapabilities of solving Reactive Distillation Processes utilizing ChemdistAlgorithmprovided by the software. The conclusion of this work is that the higher conversion of IBTEto MTBE can be obtained by applying Reactive Distillation approach. We have obtained99.2 % IBTE conversion and high selectivity for MTBE with 99.7%. The optimum numberof trays for Reactive Distillation column is 30 trays.

Unsteady flow past a triangular array of heated elliptic cylinders

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OP-05-022

Abstract

Numerical investigation of drag force and heat-transfer characteristic for three twodimensional elliptic cylinders arranged in an equilateral-triangular array using FLUENT-v19R3 has been conducted. The configuration mentioned herein is tantamount to asimplistic depiction of some large-scale heat-transfer equipment, viz. shell-and-tube heatexchanger. The purpose of the current study is to determine an optimal arrangement whichmaximizes heat transfer and minimizes the drag. The flow is computed for Pr=10 (PrandtlNumber) and Re=100 (Reynolds Number). The Angle of attack or AOA (angle betweenmajor-axis of the cylinder and direction of incoming flow) are 0°, 45° and 90°; and 1.5Dand 2D as triangular pitch respectively (D = Major axis of the cylinders). The Aspect Ratioof cylinders is kept constant (ε=0.5). Time evolution of stream function, vorticity contoursand isotherms around the cylinders are plotted. Drag coefficients (C d) and Surface-Averaged Nusselt numbers (Nu s) are analyzed once the flow becomes fully-developed.Results show that C d and Nu s values of all cylinders increase for a pitch of 2D. Comparativeanalysis suggests that the arrangement with 0° AOA and a pitch of 1.5D is mosteconomical. Computations for circular cylinders are also performed at same parameters todemonstrate the merit of Elliptic cylinders over circular ones.

Keywords: Elliptic cylinders; Surface Nusselt Number; Drag coefficie

Ibuprofen Crystallization: Effect of Cooling Rate On Metastable Zone Width

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OP-05-023

Abstract

Ibuprofen Crystallization, Metastable zone width, UnseededCrystallization is an important separation and purification technique widely practiced inalmost all pharmaceutical industries. The control of crystal properties duringcrystallization process to obtain the finished product of desired quality and consistencyrequires an understanding of interplay between different aspects of crystallization suchas supersaturation, nucleation, growth etc. and operating parameters, like seeding, cooling profiles etc. The operating conditions maintained during crystallization process, determines the qualities of the product such as stability, dissolution profile, bioavailability and tableting properties. Ibuprofen is a widely used non-steroidal anti-inflammatory drug (NSAID). It is used as analgesic and anti-rheumatic drug. Severalstudies in the literature have been dedicated to manipulation of shape of Ibuprofencrystals by crystallizing in various organic solvents 1 and modeling of seededcrystallization 2 from ethanol. Little attention has been given to unseeded crystallization. Thus, the objective of this study is to carryout unseeded cooling crystallization ofIbuprofen in ethanol and study the effect of cooling regime on the metastable zonewidth (MSZW) through induction time experiments. It is observed that MSZWincreases with sharper cooling rates, whereas controlled slow cooling results inconsiderably small MSZW. This study forms a basis for crystallization modelingthatcan be ultimately used for optimization and control purposes.nt

Simulation of Static Mixers In COMSOL Multiphysics And It's Application in Oil-Water System

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OP-05-024

Abstract

Mixing two immiscible fluids like water and oil can be difficult. Water and Oilgenerally get separated when introduced to a pipe from a different inlet. The purposeof this research is to analyse the use of different static mixers in order to improvehomogeneity in oil-water dispersion through COMSOL Multiphysics. Static Mixersof two type cylindrical and square duct with 6 mixing elements is designed, Diameterof cylindrical duct and side length of square duct are same and is equal to 0.132,length of pipeline is 1 m, 75% of the pipe is covered by mixer baffles. With ReynoldsNumber from 1300-1400 with increment of 10 and properties of working fluid theinlet velocity is calculated and different parameters like pressure drop, velocityvariation, shear rate and flow number are analyzed to determine the efficiency ofstatic mixer.

To study the interaction and mixing between oil and water, initially at the inletconcentration of water to oil is 98:2 mol/m 3 and then the Water-Oil ratio is analyzedatdifferent points of the Static mixer to determine the mixing efficiency. The passivemixing in cylindrical configuration proves to be the most efficient in the mixing of oiland water.

Keywords : COMSOL Multiphysics; Static Mixers; Oil-Water System

Combining Column Targeting & Exergy Analysis for Energy Efficient Distillation Column Configuration

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OP-05-025

Abstract

To achieve better energy efficiency in distillation system, the column targeting tools needs to becomplemented by thermodynamic tool like exergy analysis. The strength of both approachesfacilitate modifications for energy target improvement of a base-case design of distillationcolumn. This combined approach facilitates to identify process sections that arethermodynamically inefficient. The combination of process options like feed stage location, reflux ratio modification, feed conditioning, side-reboiler and side-condenser etc greatlyenhances the separation and reduces exergy loss throughout the column. In this work, thethermodynamic analysis of distillation column was studied for propane-propylene binary system. The converged simulation of distillation column obtained from Aspen Plus were assessed withcolumn targeting tools and exergy loss distribution. The energy efficient column targeting byboth CGCC and exergy analysis achieves ~29% and ~15% reduction in reboiler and condenserduties respectively. This resulted in improvement in the distillation column energy efficiency inthe range of 33% as compared to base-case design due to reduction in total exergy losses. Thecombined approach of column targeting and exergy analysis resulted in reduction inthermodynamic imperfections.

Keywords: Column targeting, CGCC, Exergy Analysis, Pinch Point, Distillation, Thermodynamic Efficiency

Gasification performance of high-ash Indian coal in a down-draft fixed bed gasifier using Aspen Plus

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OP-05-026

Abstract

Gasification performances of five freshly mined high-ash Indian coal samples in adowndraft fixed bed gasifier are evaluated using Aspen Plus simulation software, which utilizesa reactor model based on Gibbs free energy minimization. Gasification parameters like modifiedequivalence ratio, ER, steam supply ratio, SSR, lower heating value, and CO 2 as the gasifyingagents are considered for their impacts on the gasification process. Cold gas efficiency (CGE), carbon conversion (CC), and net CO 2 emission are selected as an indicator for assessing thegasification process. The model developed for coal gasification provides results in termsequilibrium composition of product gases with minor error. The CC is greater than 80 % and thecold gas efficiency is found to be 72.23 % and 73.92 % for air and air-steam at 900°C in case ofthe first sample. Higher yields of syngas (H 2 and CO) favor higher temperatures, whereas higheryields of CH 4 and CO 2 favor lower temperatures. Maximum yield of syngas is observed at ERand SSR values of 0.23 and 0.94 respectively. The yield of H 2 is higher when steam is used air asa gasification agent. The yield of CO is higher when CO 2 is used as a gasification agent.

Keywords: Indian Coal, Gasification, Aspen Plus, CO 2 , syngas.

Simulation of Static Mixers In COMSOL Multiphysics And its Application in Oil-Water System

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OP-05-027

Abstract

Mixing two immiscible fluids like water and oil can be difficult. Water and Oilgenerally get separated when introduced to a pipe from a different inlet. The purposeof this research is to analyse the use of different static mixers in order to improvehomogeneity in oil-water dispersion through COMSOL Multiphysics. Static Mixersof two type cylindrical and square duct with 6 mixing elements is designed, Diameterof cylindrical duct and side length of square duct are same and is equal to 0.132,length of pipeline is 1 m, 75% of the pipe is covered by mixer baffles. With ReynoldsNumber from 1300-1400 with increment of 10 and properties of working fluid theinlet velocity is calculated and different parameters like pressure drop, velocityvariation, shear rate and flow number are analyzed to determine the efficiency ofstatic mixer.
To study the interaction and mixing between oil and water, initially at the inletconcentration of water to oil is 98:2 mol/m 3 and then the Water-Oil ratio is analyzed atdifferent points of the Static mixer to determine the mixing efficiency. The passivemixing in cylindrical configuration proves to be the most efficient in the mixing of oil
and water.

Keywords : COMSOL Multiphysics, Static Mixers, Oil-Water System

Thermodynamic Analysis of Dry Reforming of Methane for the Production of Syngas using Aspen Plus at Equilibrium Conditions

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OP-05-028

Abstract

Dry Reforming of Methane (DRM) to syngas (H2 +CO) has drawn wide attention because of the simultaneous utilization of greenhouse gases (CH 4 and CO 2) and the production ofSyngas. The thermodynamic analysis (TA) for the DRM was performed using Aspen Plus(Aspen Technology) by Gibbs free energy minimization (GFEM) techniques for a nonstoichiometric reacting system. The effects of temperature, pressure, inert in the feedstream, and a molar ratio of feed composition were observed for the conversion of feeds(CH 4 and CO 2), the yield of products (CO and H 2), and product ratio (H 2 /CO). The reactiontemperature was varied from 573-1473K and the results revealed that conversions, yields,and product ratio were increased with increasing temperature while, decreased onincreasing pressure from 1-10 atm. The conversions, yields, and production ratio wereincreased at the addition of inert (N 2) from 0-80% of the feed. The feed composition waschanged by varying the molar ratio of CH 4 /CO 2 from 0.5-2. The conversion of CH 4 wasdecreased with increasing molar ratio of CH 4 /CO 2 from 0.5-2, while the conversion of CO 2was increased. The maximum feeds conversion, product yield, and H 2 /CO ratio wereobtained at CH 4 /CO 2 =1 at higher temperature; atmospheric pressure. The % equilibriumconversions for CH 4 and CO 2 were obtained around 52%, 63%, and % equilibrium yields for H 2 andCO were obtained around 47% and 58% respectively for a molar volumetric ratio of CH 4 :CO 2 :N 2 as1:1:3 at 873K; 1atm. Hence, DRM is favorable at high temperature, low pressure, addition of inert,and CH 4 /CO 2 =1.

Keywords: DRM; Thermodynamic studies; Gibbs free energy minimization; Aspen plus; Greenhouse gas, Syngas

A Review on Applications of Machine Learning Models on Design of Catalysts

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OP-05-029

Abstract

Catalysis has been the most integral part of Every chemical process which involves areaction. One of the crucial challenges for any development of any process is theselectivity of the catalyst and there has been tremendous research going on in this area.At this crux of the catalyst design, involving the latest and most efficient technologiesand models of Machine learning embedded with DFT calculations is the mostfascinating approach. In our literature survey, we have seen various applications ofthese DFT calculation models in the catalyst design, their selectivity, and also in theeffective comparison of the regression models to predict surface coverages, site activity,and catalyst performance. Our study aims at giving a deeper overview of different typesof Machine learning models available along with suitable DFT calculation methods forcatalyst designing in various commercial processes.

Keywords: DFT calculations, Machine learning, Regression

A Simulation Study For Carbon Dioxide Hydrogenation Towards Methanol Using Single And 2 Reactor Configurations

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OP-05-030

Abstract

Modern technology leads to environmental pollution. Industries like coal-fired power plants, chemical process industries, and plastic factories, etc., are the major sources of air pollution. Industries have been releasing a large quantity of carbon dioxide (CO 2) since the industrial revolution. CO 2 utilization is the only way to reduce the releases from industries and atmosphericCO 2 . Recently many authors studied the carbon dioxide utilization towards value-added productslike synthesis gas, DME, methane, and lower olefins. Moreover, direct hydrogenation of CO 2 tomethanol is an efficient way to store energy as fuel. This paper describes the detailed study ofsteady-state simulation by Aspen plus for methanol synthesis by CO 2 hydrogenation using anequilibrium reactor. In the first configuration, methanol synthesis is carried out in a single reactorwhich resulted in CO 2 conversion of 30.43%. Another configuration considered is a two-reactorsystem with separation of products (methanol and water) continuously from each reactor at theoutlet of the reactors using separator to increase the conversion of CO 2 towards methanol. It isobserved that 53.2% CO 2 conversion in this reactor system. The study showed that the formationof methanol is also more with continuous removal of products compared to the single reactorsystem.

Keywords: CO 2 hydrogenation, Aspen Plus simulation, Methanol synthesis, CO 2 conversion,Intensification.

Simulation Studies for the Optimization of Butyl Levulinate Production

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OP-05-031

Abstract

With the diminishing fossil fuel resources and the trepidation of them exhausting in a few decadeshas led to escalating studies in the field of renewable energy, especially biofuels. Levulinic acid isproduced abundantly from biomass processing; it serves as an eminent precursor for the synthesisof a variety of levulinate esters as fuel additives. The studies for the optimization of butyllevulinate production are essential for considering future commercialization of this fuel additive asit possesses excellent fuel blending properties. Various catalysts have already been studied formanufacturing butyl levulinate; experiments have also been carried out in this area to optimize theoperating conditions. Conventional esterification reactions are seriously affected by equilibriumlimitations thereby reducing their efficiency. The simulation for the production of butyl levulinateusing Reactive distillation (RD) will be studied, to achieve almost qualitative conversion. Also,the optimization of the RD column design is done for economic feasibility. The increased
conversions will mark a great step in the production of fuel additives.

Keywords: renewable energy; biofuels; fuel additive; butyl levulinate; optimization; reactive distillation.

Prediction of Multiphase flow and Partition curve for a 76 mm Dense Medium Cyclone Using Computational Fluid Dynamics

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OP-05-032

Abstract

The Dense medium cyclones (DMCs) are the gravity separator devices, which separate the clean coal from rejectcoal based on their densities. DMCs have gradation of densities from feed inlet to discharge outlet of the conicalregion. This observance of gradation of density might be due to the initial segregation of magnetite in the conicalregion. Analysis of variation in the velocity profile all along the length of the cyclone for the pulp flowing fromthe top to bottom influences the separation of particles. This implies that coarse particles are being separated at theupper region and finer particles separated at the lower region. To establish this measurement of velocity profilealong the length of the cyclone for the media – pulp, studies were performed with help of computational fluiddynamics (CFD). In particular, the present work utilizes the CFD analysis to carry out the separation studiesof coal particles having size range -3+0.5mm on the basis of densities using 76 mm diameter Dense mediumcyclone. The present study is focused on the dynamics of the particle-fluid flow on the 76 mm DMC using theEulerian Multiphase Model and k-omega (SST) turbulence model. The predicted numerical results are validatedagainst the experimental findings. The results were focused on the magnetite media segregation from top tobottom of the cyclone body, which influence the performance separation of the cyclone. In addition to thisprediction of dimensionless parameter i.e. Gravity of cut (SG 50) and Ecart- probable (Ep), partition curve wasdrawn to measure theperformance of the Dense medium separator. The predicted results of coal separation studiesand particle-fluid flow dynamics will be presented.

Keywords: Dense medium cyclone, Gravity coal preparation, Multiphase modeling, Partition curve, SG

Design of Double Pipe Heat Exchanger Using MATLAB

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OP-05-033

Abstract

Design of heat exchanger involves Sizing and Rating. Rating of heat exchanger is done when it is desired to know whether the Heat Exchanger sent by the vendor fulfills the required load or not. Sometimes, periodically there is a need to check the performance of the existing heat exchanger for a given operation. The current work is aimed at the determination of designparameters of double pipe heat exchanger. In this work the, the overall heat transfercoefficient is maximized by varying the design parameter using matlab software. Manualcalculations were also performed using kern method. The rating analysis was also done using the same designed heat exchanger. The results calculated using MATLAB are in goodagreement with the manual calculations with an absolute error less than 5%.

Keywords: MATLAB, Double pipe Heat Exchanger, Design, Rating

Modelling of extraction of acetic acid in aqueous phase using toluene in packed bed extractor

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OP-05-034

Abstract

Liquid-liquid or solvent extraction is the method of separation where distillation isfailing. Separation is done by adding the phase of a liquid solvent to the feed liquidcontaining the components to be extracted. Liquid- Liquid extraction in packed columnis one of the simplest and cost-effective separation methods, it also provides a highcontact surface area. In this work, the extraction of acetic acid from aqueous solution byusing toluene as the solvent is carried out to study the liquid-liquid equilibrium inpacked bed extractor. The thermodynamic models like NRTL, UNIQUAC, UNIFACavailable in Aspen Plus simulations are used to find out the concentration of acetic acidin extract phase, solubility diagram and tie-line data were determined at variouscompositions of solvent. Also performed sensitivity analysis on various parameters likefeed composition by increasing the concentration of acetic acid in feed, temperature,and flow rates of feed and solvent.

Keywords: Packed bed Liquid-liquid extraction; toluene; acetic acid; ASPEN PLUS simulation.

Supervision and Control to Improve the Productivity of Stirred Tank Batch Reactor

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OP-05-035

Abstract

Batch reactor control provides a very challenging problem for the process controlengineer. This is because a characteristic of its dynamic behavior shows a highnonlinearity. Since applicability of the batch reactor is quite limited to the effectiveness ofan applied control strategy, the use of advanced control techniques is often beneficial. Thispaper investigates experimentally the identification and the control of a semi-batchchemical reactor. The control objective is to keep the reactor temperature and pressurewithin safe operating specifications by manipulating the electrical heating power andpressure control valve. Experimental results demonstrate that these multiple model andmultiple control strategies work well in the presence of huge time delay and disturbances.A good tracking, a relatively low control signal variance and a good rejection ofdisturbance were recorded.

Keywords: Stirred tank chemical reactor; pressure control; supervision system;temperature control, control system.

Green Chemistry and Industrial Chemistry (GCH)

Plastic Eating Bacteria

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OP-06-001

Abstract

Plastic is a synthetic material made from a wide range of organic polymers such, polyethylene, PVC, nylon, PET, can be moulded into shape \ while soft and then set into a rigid or slightly elastic form. PET-polyethylene terephthalate 1 , IUPAC name is poly (ethylbenzene -1,4-dicarboxylate. About 311 million tons of plastics are produced annually worldwide, mostly used for packaging such as drinking water. Most plastics degrade extremely slowly, constituting a major environmental hazard, especially in oceans, where micro plastics are matter of major concern. To resolve this problem many scientists in the world had tried many ways. A scientist named Kohei Oda and his team from Kyoto institute of technology first identified a bacteria named Idonellasakensis 2 after collecting a sample of PET-contaminated sediment near a plastic bottle recycling facility in Japan. This bacterium uses two hydrolytic enzymes 3 to degrade the common plastic polymer PET.Theseenzymes converts the PET into its monomers. Idonellasakensis is a gram negative 4 , aerobic beta proterobacteria. It first adheres to the PET material and secrete enzyme which generate mono(2-hydroxyethyl) terephthalic acid. Then MHET taken up by the cell and hydrolyzed by second enzyme MHETase to furnish the two starting monomers. These monomers are then catabolized by the bacterium as its sole carbon source.

Keywords: 1-It is shortly called as PET and it is the most commonly used thermoplastic in the world;2-It is a bacterium from genus idonella and family comamonadaceae capable of breaking down PET'S as a sole of carbon and energy source;3-the used enzymes are PETase

Water Quality Assessment and Heavy Metal Detoxification via Bioremediation

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OP-06-002

Abstract:

Water is quintessential for sustenance of life. But, industrialization, mining and overuse of pesticides has led to deterioration of water quality by release of large quantities of heavy metalsin the ecosystem. Heavy metal accumulation in living systems beyond permissible levels cancause metal toxicity that poses serious risks to life. This is an alarming concern in developingnations like India. The methods to remove heavy metals from aqueous media can be grouped intotwo broad categories. The conventional methods fall under the physico-chemical approach.These methods can be carried out on a large scale but have their limitations. The other categorywhich is the focus of this review explores biological methods used to remove heavy metals. Thisapproach is called bioremediation. Bioremediation can involve various methods and can begrouped into phytoremediation (using plants) and microbial remediation (using microbes). Thisreview describes some methods under bioremediation, mainly biosorption and bioaccumulation,and the differences between these methods. To improve the efficiency of these methods, sometechniques have been discussed. These are immobilization and modifications of the cell wall.Further, case studies involving bioremediation and commercial applications of bioremediationhave been touched upon. These are use of Gynurapseudochina (L.) as a hyperaccumulator plantand the use of Heliathanthus sp. for remediation of uranium rich soil. Scope for ourexperimentation is mentioned for further study in the area.

Biodegradable Plastics From Mixed Starch

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OP-06-003

Abstract

Every product has a shelf life, but sadly that is not the case with plastics. According to the study of UN-Plastic Collective (UPC), launched by the UN-Environment Program-India, Confederation of IndianIndustry (CII) and WWF-India at CII's Sustainability Summit, globally, over 8.3 billion tonnes of plasticshas been produced since 1950 and around 60 percent of that has ended up in landfills. On the other handIndia generates 9.46 million tonnes of plastic wastes annually, of which 40 percent, remains uncollected.The non-biodegradability of these petrochemical-based materials has been a source of environmentalconcerns and hence, the driving force for 'greenalternatives' for which starch remains the frontline. Theadvantages of starch for plastic-production include its renewability good oxygen barrier in the dry state,abundance, low cost and biodegradability. Most starch based composites exhibit poor material propertiessuch as tensile strength, yield strength, stiffness, elongation at break and also poor mixture stability. Inorder to overcome this, we add four vegetable starch like Sago, Corn, Potato and Barley starch to increasethe tensile strength and to applications over the food stuffs, packaging etc…,

Keywords: plastics; Sustainability; biodegradability; starch; tensile; packaging

Microwave-irradiated catalytic conversion of lignocelluloses to biofuel precursors by employing Protic and Aprotic Ionic liquids

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OP-06-004

Abstract

This work presents a green pathway for microwave-irradiated catalytic conversion oflignocelluloses such as Sunn hemp fibre (75.6% cellulose, Crystallinity Index (CI) 80.1%) and June grass (82.3% cellulose, CI 54%) to biofuel precursors such as glucose and 5-Hydroxmethylfurfural by employing protic (PIL) and aprotic (APIL) ionic liquids. While the APIL forms a large supramolecular complex, the PIL rapidly ionizes to form a Lewis acidcatalyst with metal chloride and water and creates a metal-aqua complex. Since the APIL and the PIL follow different reaction mechanisms for microwave-irradiated catalytic conversion, catalyst-substrate loading, IL-substrate loading, water concentration, temperature, and time are optimized to regulate the product distribution. The APIL is a better solvent/catalyst for high crystalline substrates (with CI > 70%) to produce glucose, whereas the PIL, which is much cheaper than the APIL, produces more high-value products such as 5Hydroxmethylfurfural. The Sunn hemp fibre produces a maximum glucose yield of 78.7% and 75.6% (using the APIL and PIL, respectively), while the June grass produces a maximum glucose yield of 88.2% and 84.2%, and maximum 5-Hydroxmethylfurfural yield of 23.4% and 34.9% (using the APIL and PIL, respectively). The economic viability and the scale-up potential of the above processes are also explored.

Keywords: Sunn hemp; June grass; Catalytic hydrolysis; Ionic Liquid; Microwave-irradiated process; Biofuel precursor.

Demulsification of Crude Oil Emulsion using Plant Extracts and its Derivatives as Green Demulsifiers

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OP-06-005

Abstract

Crude oil dehydration is an important process in oil and gas industry during drilling orrecovery of oil. The water coming along with crude has to be separated for both operationaland economic balance. The most commonly used method to break the water in oil (w/o)emulsion is a chemical demulsifier. But this chemical demulsifier method is toxic and maycause environmental degradation during water disposal. Alternatively, using plant extractsand its derivatives as solvent for the formation of green demulsifier and it shows considerableimprovement in separation of water and also eco-friendly process. The present article briefly reviews the various plant extracts as green demulsifier and methods for extraction.

Key Words: Crude oil, Emulsion, Green Demulsifier, Plant extracts

In-Situ DRIFTS during the vapor-phase oxidation of cyclohexane over supported Fe-Mn catalysts: synthesis, characterization, and reactivity

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OP-06-006

Abstract

Different ratios of bi-metallic (Fe-Mn) catalysts supported on alumina weresynthesized by incipient wetness impregnation method and characterized by using variouscharacterization techniques such as specific surface area, XRD, Raman analysis, and H 2 -TPR analysis. The adsorption and oxidation of cyclohexane (Cy-H) was conducted byconsidering the in situ DRIFTS studies. The manganese-impregnated catalyst showed lowsurface area as compared to the only iron impregnated catalyst. The mixed-oxide supportedcatalysts possessed a small surface area compared to the alumina supported catalysts. TheXRD study suggested that the manganese-oxides are highly dispersed, whereas iron-oxideremained as a crystalline phase in the catalysts. The Raman analysis indicated that themanganese and iron-oxides both disperse by the addition of magnesia in alumina. However, the addition of silica resisted to the dispersion of manganese-oxides in thecatalysts. The H 2 -TPR study suggested decreased reduction temperature of the catalyst20Fe 50 Mn 50 /Al 2 O 3 . The decrease of reduction temperature may be due to the synergisticeffects of the iron-manganese oxide species (Fe-Mn) present in the catalyst20Fe 50 Mn 50 /Al 2 O 3 . The catalyst 20Fe 50 Mn 50 /Al 2 O 3 was found to be the most active for thevapor phase oxidation of cyclohexane with the temperatures at 220 o C and 1 atmpressure. The adsorbed-cyclohexanone and phenoxy species detected over the surface of the catalystduring the oxidation reaction. The lattice oxygen of the catalyst participated in theactivation of the C-H bond of cyclohexane.

Keywords: Cyclohexane oxidation, Fe-Mn catalysts, XRD, Raman, H 2 -TPR, in situ DRIFTS

Technological Applications of Super-HydrophobicCoatings: Needs and Challenges

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OP-06-007

Abstract

Super-hydrophobcity is the property of a surface to repel water drops and a surface istermed as a superhydrophobic surface only if the surface possesses a high contact angle (>150°) low contact angle hysteresis (<10°), low sliding angle (<5°). Efforts have been made to mimicthesuperhydrophobicity which is found in nature (example, lotus leaf), so that artificialsuperhydrophobic surfaces could be prepared for a numerous of applications.Due to theirversatile use in many applications, such as water-resistant surfaces, antifogging surfaces, anti-icing surfaces, anticorrosion surfaces etc., many methods have been developed to fabricate them.The present study focused on properties of superhydrophobicity with its characterization ofsuperhydrophobic surfaces and followed by some recent synthesis techniques. Technologicalapplications are then described followed by a discussion of the major problems which needed tobe overcome before these applications become widespread. Finally, some proposals arepresented for future directions on the synthesis and application of superhydrophobic.

Keywords: Superhydrophobic, contact angle,self-cleaning, non-wettability, lotus effect

Green Chemistry and Engineering For Carbon Capture, Utilisation And Storage

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OP-06-008

Abstract

Increasing the amount of carbon dioxide in the atmosphere is a major environmentalproblem. The alternative energy sources are not efficient to meet the values of thisemission reduction. Carbon, capture, storage and utilisation (CCSU) is recognised ashaving potential to play a key role in meeting climate change targets, delivering low carbonenergy needs, and its ability to remove carbon dioxide from atmosphere. The presentarticle describes the effective methods for carbon capture, utilisation and storage as animportant step towards many environmental problems. The development of thistechnologies and its path for carbon mitigation technologies for the developing countrieslike India is important. Carbon capture, utilization, and sequestration (CCUS) is one of themitigation strategies that India could adopt in this context, in the backdrop of an energyindustry largely dominated by coal.

Keywords: Carbon dioxide sequestration; Carbon capture; Carbon mitigation technology

Others area of Chemical Engineering like Advanced Separation Processes, Catalysis Process Intensification & Process Automation (OCH)

Development of Hydrotalcite loaded Mixed Matrix Membrane for Enhanced CO 2 /N 2 Separation

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OP-07-001

Abstract

The journey of CO 2 separation technology from conventional methods to hybrid combinations ishighly commendable in this recent era of the energy crisis and environmental degradation. In thiswork, the substantial CO 2 selective effect offered by the combination of poly (amidoamine)dendrimer (PAMAM) and hydrotalcite (HT) has been discussed in details. PAMAM and HThave been loaded to a bio based polymer matrix to fabricate a thermally stable and moistureresponsive mixed matrix membrane (MMM). Further, using various spectroscopic andmicroscopic techniques the membrane has been characterized. Later, the CO 2 separation studywas accomplished for the MMM varying the temperature from 60 to 110 °C and the PAMAMand HT loaded membrane exhibited the optimum CO 2 permeance as ~ 123 GPU with the CO 2 /N 2selectivity ~ 67 at 90 °C under a constant water flow ratio of 2.33 (sweep/feed).

Keywords: CO 2 separation, membrane, carboxymethyl chitosan

Synthesis of Performic Acid in A Continuous Micro Reactor

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OP-07-002

Abstract

Continuous production of Performic acid (PFA) has drawn major attention as it has wide applications in Chemical, Food and Oil industries because of its oxidizing properties. Micro reactors are small in size with greater mass and heat transfer. In the current study performic acid is synthesized in a continuous flow micro reactor made of polytetrafluorethylene capillary micro reactor with and without heterogeneous catalyst and reactants being formic acid and hydrogen peroxide.The major focus of the present study is to analyze the effect of temperature, concentration of hydrogen peroxide and heterogeneous catalyst (Amberlite, Amberlyst) on formation of PFA. The experimental results revealed that the conversion of PFA is influenced by increment in temperature and catalyst concentration. The use of solid catalysts lead to maximum formation of PFA within short residence times. Further, the performance of amberlyst is better compared to amberlite. The heterogeneous catalysts are beneficial over homogeneous catalysts as they decrease corrosion and segregation of catalyst. Equilibrium conversion to PFA is attained in 6 min at 30 0 C with amberlyst and in 8 min at 30 0 C with amberlite.

Keywords: Performic acid, capillary micro reactor, heterogeneous catalyst, amberlite, amberlyst,

Biodiesel production via ultrasound assisted transesterification of microalgae: Recent inroads, issues, and plausible solutions

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OP-07-003

Abstract

Algal biomass is making deep inroads as a third generation feedstock for the productionof biofuels, in particular, biodiesel to complement the progressive demand of biodiesel. Biodiesel production from green algae such as Spirogyra and Chlorococcum(polysaccharide-based feedstocks) through various routes warrants prior pretreatmentand saccharification. To increase the efficiency of transesterification, various advancedintensification methods are being investigated. A detailed literature review revealed thata number of investigations as regards the biodiesel production with the aid of ultrasoundassisted transesterification of microalgae are published in the recent past. Theoverarching aim of the present work is to get various facets of production of biodieselthrough ultrasound assisted transesterification of microalgae on a single platform and topresent the analysis in a coherent manner. Different types of catalyst explored in therecent past for the transesterification process via acoustic cavitation have beendiscussed. Effect of various reported parameters, viz. catalyst concentration, temperature, methanol to oil ratio, time, and ultrasound frequency and power on biodiesel production along with the challenges involved have been deliberated. Analysisrevealed that ultrasound assisted transesterification of microalgae has significantprospect to be a part of emerging intensifying techniques leading to enhancedproduction of biodiesel.

Keywords: Algal biomass; Microalage; Biodiesel; Ultrasound; Transesterification; Catalyst

Process Intensification though mechanical vibrations in biphasic flow systems through micro-domain

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OP-07-004

Abstract

Process intensification (PI) is a rapidly growing field of research and industrial developmentthat has already created many innovations in the chemical process industry. Miniaturization promote process intensification as miniature reactors provide a high surface-to-volume ratio, which results in enhanced mass transfer and reaction rates. Pharmaceutical industries facemany problems and one of them is the extraction process of any drug which is primarilybased on batch processes in which the mass transfer efficiency is relatively low. Therefore, itis of utmost importance to enhance the extraction process of costly drugs which can be donethrough enhancing the effective mixing in micro-domain. Slug-flow which is oftenencountered in reduced dimensions can enhance mass transport. The present works aims toextend the range of slug flow in micro domain in various geometries by application ofmechanical vibration. The effect of frequency on flow patterns and on the range of slug flowhave been studies by using high speed imaging techniques.

Keywords: Slug flow; Microchannel; Mass transfer; Microreactor; M

Reclamation of sodium lignosulfonate from the spent sulfite liquor by ultrafiltration using polyethersulfone membrane

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OP-07-005

Abstract

The treatment of spent sulfite liquor - a dark brown color waste stream generated in sulfitepulping, prior to its discharge and its valorization by the way of possible recovery of useful chemicals assume paramount importance. Sodium lignosulfonate (SLS), a water-soluble and anionic surface-active derivatives of lignin, is a much-touted byproduct obtained fromthe spent sulfite liquor having appreciable surface activity, adsorption, dispersion, andbinding propensity. Thus, recovery and concentration of SLS constitutes an important yetless focused area of research. In the present work ultrafiltration of spent sulfite liquor, wascarried out in a laboratory unit using a commercial hydrophilized polyethersulfone flat-sheet membrane with molecular weight cutoff of 5 kDa. Effects of feed dilution factor onthe trend of permeate flux, observed and actual solute rejection coefficients wereinvestigated as a consequence of the formation of concentration polarized layer on themembrane surface. The permeate flux was measured as a function of time at different trans-membrane pressure and cross flow velocity. Out of three different dilution factors (20, 30and 40) the permeate flux was observed to be the highest for the 40 fold diluted feed. Inaddition, the fouling index of the membrane and specific energy consumption of thepressure pump were determined under standardized laboratory conditions. SLS obtained inthe reject stream was characterized following UV-VIS, Fourier Transform infrared (FTIR)and nuclear magnetic resonance (NMR) spectroscopy and scanning electron microscopy.

Keywords: Ultrafiltration; Spent Sulfite Liquor; Membrane; Sodium Lignosulfonate

Core Competence for Sustainable Development in India beyond the Year 2020

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OP-07-006

Abstract

The COVID Pandemic that claimed more than10 lakhs of lives and infected more than 6 croresof human beings in this world (1 WHO site) is definitely being discussed as the singular mostimportant issue in the year 2020. To take stock of the projections of self reliant India asenvisioned in Prof. Kalam’s book "India 2020" one dicovers strategic superiority emphasizingsimultaneous growth of production and service sectors, as well as increase in entrepreneurshipfor a financial revolution and also a niche to establish leadership in manufacturing and processbiotechnology (2a). Despite the pandemic the Indian stock market swelled from its nadir to itszenith. The stock market is characterized by extreme volatility and inflow of foreign directinvestment. While much of the plans for reaching a reserve of foreign currency had been realised, the pandemic of 2020 draws attention to the lacunae in management of “healthcare for all” (2b). Despite enhancement of foreign earnings in the era of business process outsourcing, maintenanceof core competence in process and energy industries is imperative for growth and healthcarebeyond 2020.

Keywords: Sustainable development, Core competence, Growth beyond 2020.

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Trihexyl tetradecyl phosphonium chloride as an efficient catalyst for ultrasound-assisted oxidative desulfurization of fuel

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OP-07-007

Abstract

A phosphonium based ionic liquid (PIL), trihexyl tetradecyl phosphonium chloride([THTDP]Cl) catalyst was synthesized. In the ultrasound-assisted oxidativedesulfurization (UAODS) process, a liquid-liquid catalytic oxidative desulfurizationsystem containing synthetic fuel, hydrogen peroxide, and PIL was observed at 30 °C andmaximumsulfur removal of 98.67% was obtained. After completion of the reaction, PILwas separated from SF. PIL was then regenerated and recycled 5 times without asignificant decrease in efficiency. The influence of UAODS of SF containingdibenzothiophene, benzothiophene, thiophene, and 2-methyl thiophene was alsoobserved, which shows fast oxidative desulfurization capability under ultrasoundirradiation. The oxidation reactivity of sulfur compounds follows the order of DBT > BT> TH > 3-MT. The quantity of PIL, H2O2/DBT mole ratio, sonication temperature, andtime all played significant roles in sulfur removal, which were also analyzed in detail to optimize the reaction conditions during UAODS.

Keywords: Phosphonium based ionic liquid, ultrasound-assisted oxidativedesulfurization, trihexyl tetradecyl phosphonium chloride, hydrogen peroxide

Synthesis, Characterization and Application of PVA membrane for the Pervaporation Separation of Isopropanol - Water mixture

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OP-07-008

Abstract

Pervaporation (PV) is widely recognized to be an environmental and eco-friendly novelseparation process in which a liquid mixture is separated through a dense lyophilizedmembrane. PV is safe and considered as cleaner separation technology compared toconventional unit operations like distillation, extraction and drying which demandextensive amount of energy, external entrainer and downstream processing to recoverkey component. The present study would involve synthesis of polyvinyl alcohol (PVA)membrane, characterization and its application for the separation of aqueousisopropanol (IPA) solution. The prepared membrane is cross linked withglutaraldehyde. Sorption study of the membrane would be carried out at differenttemperature. The synthesized membrane would be characterized by Fourier transforminfrared (FTIR), thermo gravimetric (TGA), and field emission scanning electronmicroscopy (FE-SEM). The Membrane would be further screened for its functioning onlab scale pervaporation unit for the separation of IPA-water binary mixture.Pervaporation results were analysed using the Karl-Fischer titrator and presented in terms of flux and separation factor. In general the permeation flux was found to bedecreased and the separation factor was increased as feed concentration increases. Theintrinsic membrane properties like permeability, selectivity and diffusivity would alsobe evaluated. Findings of this work may provide useful insights to the pervaporationfundamentals, system design and scale up for IPA dehydration.

Key Words: Pervaporation, polyvinyl alcohol, Sorption, Flux, Selectivity, Permeability

Steady State, Dynamic Simulation and Control Studies of Production of TAME through Reactive Distillation

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OP-07-009

Abstract

Tert-amyl methyl ether (TAME), an oxygenated additive for green gasoline ismanufactured by reactive distillation of C 5 -hydrocarbons derived from naphtha cut andmethanol. This process requires a methanol recovery unit due to the presence of iC 5 -methanol azeotrope, which results in a significant amount of methanol in distillate from thereactive column. Combination of multiple chemical reactions and multi-componentdistillation in a counter-current column, strong interactions between process variablesmakes the process highly nonlinear. Model Predictive Control (MPC) is an effectivemethodology in controlling such highly nonlinear dynamic processes. MPC gives smootherand better control performance than conventional PID controllers for both servo andregulatory problems for TAME reactive distillation column. Plant wide implementation ofMPC for TAME production and methanol recovery can enhance the overall performancemore economically and efficiently. Therefore, in the present work, MPC is designed usingMATLAB and incorporated in ASPEN by developing an interface MATLAB-ASPEN forTAME production and methanol recovery by extractive distillation is implemented usingASPEN dynamics and quantitative comparison is made for the performance of PIDcentralized, PID decentralized and MPC controlled system.

Keywords: Robust MPC, ASPEN, ASPEN Dynamics, Nonlinear, TAME, Reactivedistillation, Extractive Distillation

Application of green additives to lower the pour point of Indian crude oil

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OP-07-010

Abstract

Effect of green additives on reduction of pour point and viscosity of Indian crude oil was studiedusing sesame oil. Crude oils are complex mixtures that contain aromatics, paraffins, naphthenes,asphaltenes, resins, etc. Of these compounds, long-chain paraffins (n-alkanes) and somenaphthenes, which are wax components, cause severe problems because they tended to depositon the cold pipe wall. Green additive was synthesis with the help of fatty acid of sesame oil andoctanol by transesterification process. Further, it was polymerized with triethanolamine to get thefinal product. Effect of various important factors such as temperature, shear rate, oilcomposition, and concentration, to check additives' efficiency was studied. FTIR studies of crudeoil and additives showed different functional groups such as alkanes, alcoholic, and acidicgroups indicating the characteristic property. Pour point measurement was done with the help ofstandard ASTM 5853. After the addition of additive, it reduces pour point of crude oil by 12°C at2500 ppm dosage. It was found that the wax deposition thickness decreased by increasing thetemperature from 30°C to 50°C in the finger wall. The viscosity measurement showed that theaddition of green additives with 2500ppm reduced crude oil viscosity by 70% at 50 °C.

Key words: Crude oil, Green Additive, Viscosity, Pour Point, Flow assurance.

A low-cost CO 2 gas detection with user interface using mobile system

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OP-07-011

Abstract:

The industrial and transportation growth with an increase in power requirement has led to an increase in outdoorpollution and this has contributed to an increase in harmful gaseous percentage within the environment. This hascontributed to low air quality index in the vicinity with the increase in harmful gases such as CO, CO 2 and SO 2 .Thispaper presents an economical, low cost, miniaturized and portable CO 2 gas detection mechanism using low-costteensy system interfaced with various commercial VOCs available within the market such as MQ2, MQ5 andMQ135 sensors for its realtime PPM measurement alongwith the LCD display for the graphical data representationand a buzzer to indicate the presence of the safe gaseous threshold. A signal processing with the data fusion isperformed here to obtain the CO 2 data from various gaseous sensor sources connected to the system. In addition, awireless interface using the bluetooth interface present within the mobile system is developed to provide aconvenient HCI user interface with an additional processing, analysis and representation mechanism of the real timeCO 2 gas measurement. The data is also stored locally in a high-capacity SD card for a long duration record withhours, days and months format for its future applications. With the use of GPS present within the mobile, a locationand time stamp is also provided to display the air quality index with the presence of CO 2 .

Keywords: Gas sensor, CO 2 , VOC, Mobile

Green Synthesis of sub 10 nm Silver Nanoparticles in Gram Scale by Using Free Impinging Jet Reactor

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OP-07-012

Abstract

We report the feasibility of controlled synthesis of sub 10 nm Silver nanoparticles at 30g/day at room temperature condition using a green protocol by using a free impingingjet reactor. The visualization of the collision structure was done using high resolutionstatic imaging. Micro-mixing studies using iodide-iodate reaction was carried out forjets of 200 and 400 micron diameters in the Weber number range 10 - 320.Impingement of two 400 micron jets (We = 10 - 40) was selected for studying influenceof mixing condition on mean size of Silver nanoparticles. The mean particle size wasfound to vary as jet velocity raised to the power (-5/4). Influence of horizontalcomponent of jet velocity on mixing and particle size was established. Smallest andmost uniform (5 ± 1.2 nm) particles could be synthesized at We = 40. A careful designthat provides for an array of nozzles, fed using common headers and pressurized tankscan lead scaled-up production at a rate of kg/day.

Key words: silver nanoparticle synthesis; free impinging jet reactor; micro

Effect of nanoparticles on hydrodynamics of liquid-liquid flow in macro channels

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OP-07-013

Abstract

Process intensification (PI) through miniaturization is extensively utilized now a day inpharmaceutical and petrochemical industries. The smaller conduits have lower diffusiondistances and attributes higher interfacial surface area, and mixing rates that facilitate bothradial and axial mass transport. The mass transfer efficacy of the channel improves with the reduction of conduit diameter. Although, miniaturization of conduit comes with higherpressure drop, increased pumping cost, and logistic issues. The use of nano particles embeddedmilli channels can be an alternate solution to address the problems faced in processintensification by miniaturization in terms of cost and logistic issues. The nanoparticleintroduction in millimeter sized channels improves mass transfer as it improves micromixing and lowers diffusion distance. In this present study metallic nanoparticle embeddedmillichannel systems tested to investigate the effect of nanoparticles on flow patterns. Thecomparative study of flow patterns done in with and without nanoparticles embedded system for liquid-liquid extraction of acetic acid from the toluene-water-acetic acid system. Theobservations reveal that slug flow behavior increased with the transition of larger to smaller
slugs in nanoparticles embedded system.

Keywords: Nanoparticle; Millichannel; Mass transfer; Liquid-liquid extraction; Slug flow.

Synthesis and Characterization of Fat-Liquor from Waste Fat

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OP-07-014

Abstract:

The physical and chemical properties of the leather can be improved by fat-liquoring process which iscarried out by treating leather products with the fat-liquors before drying. Fat-liquors are sulphonatedorsulphited oils used to fill fibrous leather to render soft, stretchy and looseness properties. Theseemulsions can be classified into natural fat-liquors (vegetable based and animal based) and syntheticfat-liquors. The charge of the emulsion may be anionic, cationic or nonionic. In the presentinvestigation, fat-liquor has been prepared from a bio-waste, namely, tallow which is available fromslaughter house as a waste while processing hides and skins of animals towards leather. Thus the fathas been converted into useful product. This animal fat mainly consists of triglycerides, a combinationof oleic, stearic, and palmitic fatty acids and glycerol. Preparation of fat-liquor follows a sequence of reactions. They are amidation, esterification andsulphitation. Pretreatment process like de-colorization and de-odorization of waste fat has been doneby physical-adsorption. Amination reaction has been carried out to increase the hydroxyl groups inwaste fat. Alkylated amines having extensive emulsifying property are used to react with fat. In thenext step, anhydrides originated from di-carboxylic acids have been esterified with aminated fat. Thisesterification reaction is carried-out under controlled conditions. The stability of the emulsion producthas been tested by varying process recipe and an optimization on the requirement of rawmaterialshasbeen obtained. Emulsion process is followed by sulphitation using aqueous hydrolyzed sodium metabisulphite which forms bisulphite and hydroxide ions. The final product has a clear edge overconventional fat-liquoring methods. The reactions are carried out in a triple necked continuous stirredtank facility in a laboratory scale. The acid values and saponification values were calculated. Theprocess flow sheet has been made and a material balance & energy balance were carried out. Apreliminary reactor design has been done for scaling-up of the process. In amination reaction, theoptimal ratio of fat to alkyl amine was found to be 1:4. equal mole and 20 % (mass) of acid-anhydridewas esterified with aminated fat for the stable emulsion requirement. 20% to 30% of sodium metabisulphite solution with an equal amount of water was added to the reaction to obtain the finalproduct. Effects of the grain structure in the skin after retanning has been observed by SEM. FTIR images reveal the degree of fat-liquoring and performance of the process.

Keywords: fat-liquor, process intensification, bio-waste-material

Separation Efficiency Optimisation of Tolune- Benzene Fraction using Binary Distillation Column

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OP-07-015

Abstract

This work has been carried out to simulate a binary distillation column to separate Benzene and Toluenefrom B-T fraction using Aspen Plus software. Benzene-Toluene separator is a normal two-phase distillation for pure aromatics.In Steel Plant Crude benzol recovered from the coke gas is fed to the Benzol Plant where benzolised oil undergoes benzoldistillation, hydro refining and extractive distillation and aromatic stripping column to produce pure BT fraction which is furtherpumped to BT Separation column in order to produce pure Benzene as top product and pure toluene as bottom product. Thus anattempt made to increase the production of high purity Benzene and Toluene at optimum condition using Aspen Plus. In thispaper, the feed flow rate, reflux rate and column stages are optimized using Aspen Plus as well validated by using Mc-ThileandPonchonsavaritMethod,with keeping the feed temperature and pressure constant. The purity of Benzene and Toluene isachieved as 99.99% and 99.70% respectively at different conditions such as feed flow rate 3165 kg/hr, reflux rate 1.2 kg/hr,temperature 80°C and pressure 0.7 kg/cm 2 . This high purity of solvents is achieved at 60 th stage whereas current running plantachieved the same purity at 65 th stage. As compared to current running condition of the plant,the production rate of benzene isachieved43%more than the existing plant data. At these optimized condition high purity and high production is achieved atexpense of less energy consumption. It is validated by running the process in the industry at same conditions using thedistillation column. The data is almost matching with the simulated data.

Keywords: Benzene; Distillation; Aspen Plus; Energy consumption; Toluene.

Experimental study of AISI 304 stainless steel with very-high mass- flux spray and varying water temperature

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OP-07-016

Abstract

The spray cooling performance investigation takes place with very-high mass-flux anddifferent temperature coolant spray. First, the spray with these features is characterizedfor its role in cooling enhancement; after that, 1030 o C furnace heated 6 mm thick AISI304 stainless steel plate is quenched using spray average impingement density (231kg/m 2 s) and temperatures (30 o C, 40 o C, 50 o C). Commercial inverse heat conductionsoftware (INTEMP) is employed for heat transfer analysis, wherein steelthermophysical properties are temperature-dependent. The performance assessment interms of heat transfer parameters such as cooling rate, surface heat flux, and heattransfer coefficient shows cooling improvement with a rise in coolant temperature. Moreover, with increasing coolant temperature, Ohnesorge number decrement causessurface heat flux enhancement. The cooling efficiency increases, and coolantconsumption decreases with coolant temperature augmentation; lastly, the contour plot shows betterment in plate cross-sectional temperature distribution with coolanttemperature enhancement. Results indicate cooling performance improvement withrising coolant temperature in transition and nucleate boiling regimes. However, performance dominates in the transition boiling regime due to liquid film thicknessdecrement and transient conduction enhancement supported by favorablethermophysical properties, improved latent heat extraction duration, and the raisedcoolant temperature.

Keywords: very-high mass-flux spray cooling; ultra-fast cooling; water temperature; AISI 304 stainless steel

Vapor-phase oxidation of cyclohexane using 20Fe 50 Mn 50 /Al 2 O 3 catalysts:Effect of support

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OP-07-017

Abstract

A series of silica and magnesia impregnated alumina supported iron-manganesecatalysts prepared by the incipient wetness impregnation method (IWI) and characterized. The adsorption of Cy-H and In situ DRIFTS during the oxidation of Cy-H studied. The iron-manganese oxides dispersed as increased the addition of silica or magnesia. The iron-oxide was crystalline and the iron-oxide dispersed as increased the loading. The manganese-oxides highly dispersed in all the catalysts. However, it dispersed more with increased addition of silica loading. The in situ DRIFTS study suggested that the formation of adsorbed-cyclohexanone and adsorbed-phenolate species during the oxidation of cyclohexane. Itindicated that the lattice-oxygen of catalyst assisted in the formation of active-cyclohexanol. The active-cyclohexanol further dehydrogenated to cyclohexanone, and dehydrated tocyclohexene. The active-cyclohexanol elutes from the surface of the catalyst form the product cyclohexanol. The conversion and product selectivity depends on the surface properties of the catalysts.

Keywords: Adsorption, oxidation reaction, Cyclohexane, Cyclohexanol, iron-manganesecatalysts, In Situ DRIFTS

Transesterification of Algae Oil using Ultrasonicator

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OP-07-018

Abstract

Biodiesel is gaining importance as an “alternative” diesel fuel that is becoming popular and is gaining acceptance in growing numbers in countries around the world. As biodiesel comes fromdomestically produced renewable resources, it contributes to the domestic energy security. Biodiesel is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatics.In the present work, the trans-esterification reactions were carried out in a horn type ultrasoundreactor in which horn is attached with the transducer which produces ultrasound irradiation in themixture. Methyl alcohol and potassium hydroxide are mixed and stirred till potassium hydroxideis dissolved in alcohol and mixed with Algae oil. The ultrasound horn is dipped into the preparedliquid mixture. The temperature of mixture is varied between 30-60°C and reaction time variedfrom 10 to 60 minutes. During the reaction the generation, subsequent growth and collapse ofbubble cavities result in very high irradiation densities more than 91% conversion was foundduring the process.

Keywords: Biodiesel; Transesterification; Algae oil; Ultrasonicator; Ultrasonication.

Advanced Oxidation Processes In Wastewater Treatment

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OP-07-019

Abstract

Advanced Oxidation processes (AOPS) are the most enticing and conducive option for theeffectual removal of organic pollutants in wastewater. Advanced oxidation automation ispositioned on the "in situ generation of strong oxidants, i.e. hydroxyl radicals and sulphate radicals, can promptly degrade organic pollutants and remove certain inorganic pollutants in wastewater. Some of the AOPs use Ozone, UV, Fenton, Persulfate salts, Permanganatephotocatalysis, 03/H2O2, UV/O3, UV/H2O2, O3/UV/H2O2, and Fe+2/H2O2. Most AOPs automation have already been established and initiated at full scale for the treatment ofdrinking water reuse. The objective of this study was to review the fundamentals of previousand recent advances in the advanced oxidation processes for wastewater treatment. The paperhas compared various processes and tried to formulate suitable process for every situation inthe industry. Along with comparative analysis, the paper consists its applications. AOPs arevery well known for bridging the gap between the treatability physicochemical and biologicalprocesses, and from day to day more demanding are set by the environmental laws asextensive research is going on in AOPS from the last two decades, still these automation arewell thoughtful, and there are again some fields estimable of research.

Keywords: Advanced oxidation process; radical generation; wastewater treatment.

Modes of electrocoalescence of droplets under an application of electric field

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OP-07-020

Abstract

The coalescence of aqueous drops in oil is the fundamental process in the dehydration ofemulsions of water in insulating oils or crude oils. The great difference in the conductivity of the aqueous phase (conductor) and the oil (dielectric) used as a suspending medium suggests that the conductivity of the oil medium should not affect the coalescence process. In thiswork, we have used two kinds of experimental setups, namely freely levitated drops systemand anchored drops system, to demonstrate the dependence on the conductivity of oils phase. In freely drop system, we have used high viscosity oils to levitate the drops and found twomodes of coalescence, cone-cone and cone-dimple. Experiments are also reported usingsilicone oils, vegetable oils, and hydrocarbons, in the anchored drop setup that also facilitatesthe use of low viscosity and low-density oils. Our study in case of anchored drops systemindicates that the droplet shows the cone-cone mode of interaction at low conductivities ofthe oil medium. On the other hand, when the conductivity of the oil is increased, the cone-dimple mode of coalescence is observed. These results should be important in the design ofindustrialelectrocoalescers.

Keywords: Electrocoalescence; Desalting; Water-in-oil emulsion

Synthesis and characterisation of metal organic framework

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OP-07-021

Abstract

Metal-organic frameworks (MOFs) are hybrid crystalline compounds made up of metal clusters and organic molecules coordinated together such that the organic molecule act as the ligand forming repetitive cage-like structures. The MOFs are more stable, highly porous, with adjustable pore size and highest recorded surface area in comparison to other sorbent materials. MOFs are versatile materials having various applications in the field of adsorption, catalysis, gas storage, super capacitance and so on. However, the real challenge lies in finding the optimal method for improving the efficiency and cost-effectiveness of the process and developing techniques for the bulk production of thematerial.

This work focuses on the synthesis and characterization of UiO-66, a MOF with zirconium as a metal source and terephthalic acid as the ligand. UiO-66 was synthesized through the conventional solvothermal technique and the emerging dry gel conversion (DGC) method where the solvent can be recycled and the results were analyzed and compared. Although the solvent consumption is higher in the solvothermal method, the yield is higher than in the dry gel conversion method.

Keywords: Metal organic frameworks; dry gel conversion; solvothermal technique; hybrid crystalline compounds;

Formulation of moisturizing Cream from natural dyes in marigold

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OP-07-022

Abstract

In India marigold is most popular cultivated flower being offered during puja and decoration of the house during festival. Fresh marigold flower are rich in carotenoids source essential oil and also having anti nematode property. It is bright yellow and orange in color like sun considered as a source of vitality and energy. It is believed that Marigold flowers help to eliminate negative energies and lift the mood are used in many Asian countries for various occasions, rituals and offerings. Beside of this it is also havingimportance in Ayurveda to treat Pitta and KaphaDosha. It is also having applications such as coloring for food, make-up, dying fabrics and medicinal uses. Cultivation of Marigold is easy on wide variety of soil. For growing successful crop the most suitable soils are sandy loam with well aerated, deep, fertile, have good water holding capacity and pH 6 to 7. Best time for raising the nursery in northern India is mid-September to mid-October. Marigold can be propagated by seeds at optimum temperature ranges 18 to 30 0 C and by cutting. Flowers harvesting is done in the morning Work was carried out to check cosmetic uses of marigold flower. The study mainly deals with extracting natural dyes from marigold and to formulate moisturizing cream. Formulated cream had a cosmetic appearance and smooth texture. Cream appearance and texture was checked for different concentration of dyes and they were all homogenous in nature.

VLE Prediction using Activity Coefficients for Binary Systems

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OP-07-023

Abstract

Distillation operations are inevitable in many chemical industries and all the petroleumindustries. The vapor liquid equilibrium data are very much essential in design of distillation columns. Generation of the VLE data using experimental methods are quite expensive and timeconsuming due to the enormous number of experimental runs needed. Theoretical means ofestimating the VLE for non ideal mixtures using activity coefficient models has been afascinating research area in the field of fluid phase equilibria. In the present work, a new two parameter activity coefficient model (TPACM) has been framed to obtain the VLE for three binary systems, namely Chloroform - Benzene, Carbontetrachloride - Cyclohexane, Carbontetrachloride - Ethanol. The VLE computed from TPACM for these systems (isothermaland isobaric) were validated using the experimental VLE from literature and Redlich –Kisterthermodynamic consistency test. The parameters for the systems are reported along with theerror analysis.

Keywords: VLE, Activity coefficient, Thermodynamic consistency, TPACM, JAVA

A Comparative study of performance of various types of constructed wetlands for automobile wash water treatment

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OP-07-024

Abstract

The current situations of enhanced water pollution and the upcoming thrive for waterusage has led to the need for more economical, scientific and effective strategies ofwater treatment. The notions of current researches indicate the effectiveness ofconstructed wetlands that precedes the natural and artificial water treatment methods.

Constructed wetlands classified under free water surface flow, sub-surface flow,horizontal sub-surface flow, vertical sub-surface flow etc. can be used efficiently for thetreatment of oil produced water and effluents of petroleum industry. Studies prove thatdifferent classes of constructed wetlands can be used effectively for the treatment ofautomobile wash water as well.

This study focuses on various constructed wetlands for the treatment of automobilewash water by comparing the results obtained from different studies reported in theliterature in terms of physiochemical parameters. The reduction in physiochemicalparameters from various literatures is juxtaposed and the conjectures are stated asgraphs and analytical tools providing a distinct representation of the efficiency ofconstructed wetland systems and other treatment frameworks.

Keywords: Constructed wetlands; Physiochemical parameters; Natural treatment methods; Artificial water treatment methods

A Comparative Study on Extraction Techniques of Essential Oil of Natural Plant Herbs

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OP-07-025

Abstract

A dry distillation at atmospheric pressure and microwave heating combinedly done in Microwave-assisted distillation (MAD). In distillation, isolation and concentration of volatile compounds arecarried out, without any solvent, water or steam. The motive of this work is to assess theperformance of MAD when isolating the essential oil of plant herbs (such asLemon Grass, SteviaLeaves, Rosemary etc;). For this intend, first, optimization of two major parameters, microwavepower and extraction time is done. Efficiency of extraction is affected by these two. Then, tosignify the feasibility of the method, obtained oil under optimal conditions was compared with thatobtained by steam distillation (SD) using Clevenger apparatus. Extraction of essential oil fromplant herbs with MAD offers some significant advantages over traditional SD in terms of time ofextraction, energy saving and extraction yield. However, there is an important advantage of MADover SD in qualitative analysis also.

Keywords: Microwave-assisted distillation; essential oil; steam distillation

JAVA based VLE prediction using activity coefficient model for binary systems under isobaric conditions

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OP-07-026

Abstract

VLE data is the basic requirement in the design of distillation columns. Numerousmodels are available to generate VLE data for ideal and non ideal systems using thermodynamicapproach. Raoult's law and its modified form with activity coefficient have been utilized intheoretical calculation which require models for activity coefficient computation. In thisperspective a novel activity coefficient model has been used to compute the VLE data for fourbinary systems, namely Chloroform-Hexane, Acetone-Hexane, Acetone-Chloroform, Acetone-Water for isobaric conditions. The model parameters of the chosen model for each of thesesystems are presented along with the error analysis. The model validation was accomplishedusing Redlich - Kister thermodynamic consistency test and experimental data from literature.

Keywords: Distillation, Raoult's law, Redlich - Kister method, Non ideal systems, VLE

A review on advance separation process for CO 2 capture using supported ionic liquid membranes

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OP-07-027

Abstract

The continuous increase of renewable resource utilization results in severe damage toEarth's environment by extensive CO 2 releases into the surrounding. Unrestrainedrelease of CO 2 is the main constituent that causes global climate change, which affectsthe ecosystem. In the last few years, CO 2 capture and storage (CCS) is a big point ofdiscussionamongresearchers. Among all the present technologies for CO 2 capture, themembrane separation shows excellent results in the most economical way. Membraneswith Ionic liquid inclusion shows great results in CO 2 capture as most of the novel ionicliquid has the unique characteristic of CO 2 affinity. In this review, the main focus is onionic liquid as a good additive for supported membranes. SILMS shows excellentstability and shows better permeability and selectivity with the pure gas study of CH 4 ,CO 2 , H 2 , N 2, and mixed gas study.

Keywords: Ionic Liquids, Supported ionic liquid membranes, Gas permeation, Gas,Separation, CO 2 separations etc.

JAVA based VLE prediction using activity coefficient model for binary systems under isobaric conditions

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OP-07-028

Abstract

VLE data is the basic requirement in the design of distillation columns. Numerousmodels are available to generate VLE data for ideal and non ideal systems using thermodynamicapproach. Raoult's law and its modified form with activity coefficient have been utilized intheoretical calculation which require models for activity coefficient computation. In thisperspective a novel activity coefficient model has been used to compute the VLE data for fourbinary systems, namely Chloroform-Hexane, Acetone-Hexane, Acetone-Chloroform, Acetone-Water for isobaric conditions. The model parameters of the chosen model for each of thesesystems are presented along with the error analysis. The model validation was accomplishedusing Redlich - Kister thermodynamic consistency test and experimental data from literature.

Keywords: Distillation, Raoult's law, Redlich - Kister method, Non ideal systems, VLE

Surface Modification of PVDF Membrane by Blending with PANi for Heavy Metal Removal from Waste Water

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OP-07-029

Abstract

The present study focus on removal of heavy metals from industrial wastewater and toevaluate the fouling properties of PVDF by modifying its surface using poly aniline (PANi).We focus on the removal of Pb 2+ , Cd 2+ from the industrially mimicking wastewater using themembranes synthesized by varying the concentration of PANi keeping PVDF constant. Themembranes synthesised were characterised using SEM, FTIR, XRD, EDS and AFM. Theresults of study showed that the blend between PVDF and PANi was efficient until the PANiconcentration was increased up to 14% beyond which the membrane formation was notuniform. FTIR, EDS and XRD confirmed the interaction of both PVDF and PANi, inparticular confirmed the decrease in fluoride content with increase in PANiconcentration.AFM studies confirmed the formation of porosity with the incorporation of PANi that is inpar with the SEM results. The increase in porosity was due to incorporation of lone pair ofnitrogen group on the PVDF membrane, which was evidenced from the removal of Pb 2+ andCd 2+ from wastewater. The percentage of adsorption of heavy metal was observed to bearound 94.3±2, which is comparatively high compared to the existing membranes. Thefouling property of synthesized membrane were appreciable compared to the commercialPVDF membranes and the efficiency of heavy metal removal was high in case of Pb 2+ , Cd 2+which is very high compared to other membranes reported. Thus, synthesized membranecould possibly be an alternate to the existing commercially available polymer membrane for the removal of heavy metal.

Keywords: PVDF, PANi, Heavy Metal, Membranes, Fouling.

Liquid-Liquid Equllibrium Of Polyethylene Glycol (Peg-1500) - Tri-Ammonium Citrate - Water Based Aqueous Two Phase System

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OP-07-030

Abstract

The liquid-liquid equilibrium of PEG 1500 + tri-Ammonium citrate +water ATPS system were determined at different temperatures (20, 25and 30 °C). The experimental binodal curve data were correlated withavailable empirical equations. The effect of temperature on the binodalcurve was investigated. The binodal curve moves toward the origin withan increase in temperature, resulting in an increase in the twophaseregionat higher temperatures. The effective excluded volume (EEV) of thestudied ATPSs was determined from the binodal data. The salting-outcapacity of the system increases with the temperature and is explained bythe increase of EEV with increase in temperature. Equilibrium phasecomposition were also determined at different temperatures (20, 25 and30 °C). The experimental tie-line compositions were related withOthmer-Tobias and Bancroft equations, and the linear dependency wasconfirmed. As the temperature rises, the difference in PEG and saltconcentrations between the top and bottom phases increases, resulting in an increase in tie-line length (TLL) and slope of tie-line (STL).

Keywords: Aqueous two phase system,binodal curve, separation process,Liquid-liquid equilibrium

Removal of Anionic Surfactants from Domestic waste water using Acidified Sawdust by sorption process

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OP-07-031

Abstract:

Surfactants are the compounds which reduce the surface tension between two liquids orbetween solid and liquid such as detergents, emulsions, wetting agents etc.There are different types ofsurfactants such as anionic, cationic, zwitterionic, non-ionic. Aionic Surfactants such as sulfate,phosphate, sulfonate and carboxylates. Alkyl sulfates includes Sodium Dodecyl Sulfate(SDS), SodiumLaurylSufate(SLS) etc.Anionic surfactants are potentially dangerous environmental pollutants due totheir high-volume use in laundry and cleaning products ,they are omnipresent water contaminants . Theaim of the research work is to investigate the optimized conditions for removal of anionic surfactantsfrom domestic waste water using acidified saw dust. The initial concentration of anionic surfactants indomestic waste water is 20 ppm. After the sample is treated with acidified sawdust the anionic surfactantsconcentration is estimated by solvent extraction by using as solvent and Acridine orange as indicator andat 467 nm in UVSpectrophotometr.The optimum conditions for removal of anionic surfactants were Timeof 90min, Adsorbent dosage of 5%(W/V), pH-7 and at 25?C temperature obtained. From the obtainedoptimal conditions, the removal efficiency was 70% and it was improved to 90% using chemicallyAcidifiedsawdust.Column Chromatography and their kinetics were also studied. InColumn,Chromatographic studies the sample is feed to column in batch process. For every 10 min thesample is collected and concentration of Anionic Surfactants is estimated by solvent extraction methodthe maximum % Removal of Anionic Surfactants is obtained at 45min of 90%, and their kinetics wereestimated pseudo second order is best for the process the correlation coefficient is 0.99.

Keywords: Keywords: Surfactants, Optimization, Acidified sawdust, Column Chromatography, Kinetics.

Microreactors for enhanced catalysis of reactions: A critical review

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OP-07-032

Abstract

Microreactor (MR) technology have already attracted significant attention as it has theadvantages such as high area/volume ratio, enhanced mass and/or heat transfer, better energy and material utilization, good operational safety, and design flexibility due to which theyhave greater performance efficiency in terms of high conversions, improved yield andselectivity compared to conventional reactors. The microreactors have many microchannelsthrough which the catalyst is sprayed and coated in the tubes either by high pressure or byother methods. Usually, for these reactions, the catalyst is prepared in the reactor in thosemicrochannels. It is usually observed that if the catalyst loading is high then conversion isalso high and the product formation also increases. The high heat transfer allows to utilize the full potential of catalysts during highly endothermic or exothermic reactions and avoid hot-spots formation which acts very advantageous for catalytic reactions. Microreactor is used for a multitude of reactions, out of which some were a challenge to the scientific communitysuch as green hydrogen production from Ethylene Glycol (EG) using Rhodium catalyst with α-Al 2 O 3 supported by CeO 2 and La 2 O 3 and CO clean-up in a fuel processor by preferentialoxidation (PROX) using a multi-layered micro-reactor coated with Pt-Co/Al 2 O 3 catalyst andmany more. This critical review will discuss how the catalytic microreactors are moreefficient than the conventional reactors through a detailed comparative study based on thenature of the catalyst used, fluid flow, mass and heat transfer principles, and design of reactors.

Keywords: Micro reactor + (Catalyst / reaction / synthesis / modelling)

Combining Microwaves and Power Ultrasound for Enhancing Solid- Liquid Dissolution Reaction Kinetics: Design Aspects and Safety Challenges

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OP-07-033

Abstract

Acidic dissolution of oxide fuel is challenging due to its ceramic nature in thenuclear fuel cycle. The enabling technologies like Power ultrasound (US) and Microwave(MW) can be used to enhance dissolution reaction. Indeed, intrinsic nature of MW and USis different, MW belongs to electromagnetic (EM) radiations and US is acoustic in nature.EM radiations in the range of 0.3 to 300 GHz heats the matter through dielectricmechanism that involves "dipolar polarization" and "ionic conduction", though MWfrequency for heating restricted to 2.45 GHz and 900 MHz respectively. MW possessesdistinct advantages over conventional heating viz. fast, selective, volumetric heating, easycontrol over reactions by quick on/off etc. On the other hand, US exist in the frequencyrange of 20 to 100 kHz which affects reaction rates through 'cavitation'. US enhancessolid-liquid reaction rate by particle size reduction by shock waves, formation of microjetsand microstreaming at solid-liquid interfaces causing enhancement of intrinsic masstransfer. Cavitation also forms free radicals which improves reaction rates. Hence, MW andUS can be combined to take advantages of superior volumetric heating and efficient micro-agitation caused by them to enhance solid-liquid dissolution reaction.In the present study, the mechanism of MW-material interaction, type of MWapplicators, electro-magnetic field distribution in the cavity is discussed. US and itsapplication to heterogeneous chemical reactions, factors affecting cavitationalactivitydistribution, type of US systems, their feasibility for application in simultaneous microwaveultrasound irradiation (SMUI) reactor is also discussed. Configurations of SMUI, differentchemical reactions conducted in the SMUI and enhancement of the reaction yield has been
reviewed. Finally, SMUI reactor configuration, its design and safety aspects,instrumentation and its challenges are presented.

Keywords: Power ultrasound; microwave heating; solid liquid dissolution kinetics

Review On Methodologies for Recycling Of Refinery Waste Spent Catalyst

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OP-07-034

Abstract

The catalyst used in refining processes gets deactivated in the due course of itsutilization. The catalysts have to be regenerated after the catalyst activity decreases belowits acceptable limit but this regeneration process is not always feasible because the activityof catalysts may decrease at very low level after few cycles of regeneration and spentcatalyst are abandoned as solid waste. The treatment, transportation, storage or disposal ofspent catalyst need permit of environment regulation as spent catalyst is hazardous innature. The spent catalysts are one of the cheap sources of metals such as Mo, Co, Ni, Va,etc. In this paper methods such as alkali leaching, acid leaching, chlorination, bioleaching,roasting with salts are used at laboratory scale is reviewed.

Keywords: Spent Catalyst, regeneration, leaching, roasting

A Review on Flow-Models Describing the Operation of Spiral Separator for Coal Cleaning

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OP-07-035

Abstract

Spiral separators have recently come out as one of the most promising gravity separationdevices for processing coal and other valuable minerals. It comprises of an open helicalchannel twisted around the central supporting column. Centrifugal forces acting on themoving particles helps in the separation of pure minerals from gangue. Spiral separatorshave been widely explored experimentally, analytically and numerically by the researchersfocusing on the design and operation of spiral separators since its introduction. Regularattempts have been made to study the flow dynamics of mineral slurry moving over thespiral trough so as to study the performance efficiency. Therefore, in this paper an attempthas been made to carry out a review on the recent developments of models that focus on theoperation of spiral. The state-of-the-art developments of flow models are discussed alongwith the assumptions taken that can prove beneficial for further investigation in this field.

Keywords: Spiral separator; Coal; Flow dynamics; Flow models

Effect of Inclusion of Annular Geometry inside the Feedstock Shell of Supercritical Fluid Extractor

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OP-07-036

Abstract

The synthesis of essential oils from various parts of plants using supercritical carbondioxide at its supercritical phase as a green alternative solvent to the hazardous organicsolvents is one of the most developed areas of supercritical fluid extraction basedtechnologies useful in the industrial scale. In a solid-fluid supercritical extraction module, the high-pressure extraction vessel is the key element where the main separation operationfrom biomass is carried out. Literature review reveals that the variations in the geometricshape and sizes of the extractor unit have a significant impact on the overall extractioncurve and scale up of such processes along with other influencing operational parameters.Conventionally one cylindrical feedstock shell having perforated surface is filled externallywith dry ground solid biomass and loaded inside the main extractor chamber of the module.The present work is intended to study the effects of a specially designed annulus feedstockshell which influences the performance of the supercritical fluid extractor remarkably bymodifying the solvent flow path, flow direction, and distribution inside the extractionvessel. The solid feed samples of clove buds and turmeric rhizomes were charged in theannular space of the feedstock shell and extractor performance was compared withconventional type.

Keywords: supercritical carbon dioxide; supercritical fluid extraction; cylindrical feedstock shell; annulus feedstock shell.

Passive droplet sorting of an emulsion in a constricted branched microchannel

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OP-07-037

Abstract

We have brought out an approach of passive droplet sorting of an emulsion in adesigned branched microchannel with converging-diverging cross-sections and differentconstriction ratios and throat lengths. Analysis of drop distribution of the feed emulsionshows that the size of dispersed phase increases with increasing the viscosity ratio. Thedroplet separation-efficiency increases with decreasing the emulsion flow rate and withincreasing the droplet phase viscosity. The sorting ability can be enhanced withdifferent constriction ratios rather than the throat lengths. Our experimental results arein similar fashion with the numerical outcomes, which signifies the perfection of thecomputational model. This experimental and numerical model can be treated as simplerversion of different engineering and biological applications, including enhanced oilrecovery, cell culture, and cell-based sorting.

Keywords: Droplet; Passive sorting; Emulsion; Microchannel.

Spherical Crystallization of Salicylic Acid: Study of Process Conditions

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OP-07-038

Abstract:

Spherical agglomerates of Salicylic acid have been prepared by Spherical Crystallization methodin water-methanol mixtures. Three solvents are used in this process as good solvent, anti-solventand bridging liquid. The effect of amount of bridging liquid, stirring rate, Feed rate, andtemperature on the spherical agglomerates of salicylic acid was studied.The present study shows that the bridging liquid has significant influence on the productproperties, with increasing bridging liquid particle size is increased. The particle size increasedwith stirring rate up to certain rate after that size is decreased with increasing rate. Withincreasing temperature particle size is decreasing. Morphology increased with decreasingtemperature and at 5 o C particles got to be spherical.

Keywords: Spherical Crystallization, Morphology, BSR

Application of Headspace Technique In Extraction Of Fragrance

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OP-07-039

Abstract:

Headspace technology is a technique developed in the 1980s to elucidate the odor compounds present inthe air surrounding various objects. Usually, the objects of interest are odoriferous objects such as plants, flowers and foods. It's a technique developed originally to clone the natural fragrance of certain flowers, from which no oil can be extracted by traditionalmethods. The flower is placed inside a container adapted to its shape to avoid any risk of damage to the flower. AMicro captor, filled with an absorbent substance is used to soak up the perfumed air around the flower, theHead Space, for a period ranging from half an hour to sometimes several hours according the species. Theperfume, 1 to 150 micrograms, absorbed by pre concentration of the air around the flower, can berecuperated by extraction, utilizing the Congruous solvent. The different molecules are disunited by GasChromatography; and identified according to their molecular weight by Mass spectrometry.

The simplicity of the method allows easy coupling to analytical instruments. Loss of volatile compoundsduring sample preparation steps is minimized, compared to conventional methods. This paper explores theprinciple, working and the feasibility of this process in the fragrance industry.

Keywords: Odiferous Objects; Gas Chromatography; Mass Spectroscopy

Selective Hydrogenation of 2-Furoic Acid to Tetrahydro-2-Furoic Acid Over Heterogeneous Catalyst

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OP-07-040

Abstract

Hydrogenation of 2-furoic acid is investigated with different labmademonometallicand bimetallic catalyst for liquid phase hydrogenation. The 5wt % Pd/C; 5wt % Pd/Al 2 O 3 ;5wt % Cu/Al 2 O 3 ; 5 wt%Pd-6 wt% Cu/Al 2 O 3 ; 5wt %Pd-6wt%Ni/Al 2 O 3 ; 5 wt%Pd-6 wt %Ag/C; were synthesized and activated under hydrogen atmosphere. The catalyst werecharacterized by Fourier-transform infrared spectroscopy (FTIR), scanning electronmicroscopy (SEM), energy dispersive X-ray spectroscopy (EDS), X-ray photoelectronspectroscopy (XPS), X-ray powder diffraction (XRD) and inductively coupled plasma massspectrometry (ICP-MS). Hydrogenation was carried at different temperatures (30-150°C),pressures (5-30 bar) and with different solvents (water, toluene, 2 propanol, acetic acid). Theresults showed that monometallic catalyst (5wt % Pd/C; 5wt % Pd/Al 2 O 3) achieved a fullconversion of 2-furoic acid in water within 3 hr at ambient temperature and 30 bar pressure.While the bimetallic (Pd-Cu, Pd-Ag, Pd-Ni-Cu) showed a marginal conversion underdifferent operating conditions. The incorporation of metal to Pd does not provide effectiveactive sites to modify the catalytic properties of bimetallic systems used in the hydrogenation
of furfural.

Keywards: Hydrogenation; Mono-Bimetallic catalyst; 2-Furoic Acid

Studies on the separation of hydrogen isotopes from helium using metallic membrane

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OP-07-041

Abstract

The heavier isotopes of hydrogen (viz., deuterium and tritium) are used as the fuel fornuclear fusion energy program. The availability of tritium is very limited and it is proposed to begenerated using a solid breeder matrix (e.g.) by the interaction of neutron with Li-6 atoms [1].Helium is used as the purge gas to extract tritium generated in the solid breeder. At the outlet ofthe solid breeder, a mixture of hydrogen isotopes along with helium is obtained. The hydrogenisotopes need to be separated from helium and recycle back to fusion reactor for the sustainedoperation. Metallic membrane based separation is one of the promising options for the presentapplication due to its high selectivity and ability for continuous separation. The experimentswere conducted using an in-house developed tantalum based membrane permeator at differenttemperatures up to 450 o C. The experimental observations and the analysis of the results arepresented in detail.

Key words: nuclear fusion, ITER, membrane, hydrogen, separation

Process Intensification Studies on Liquid-Liquid Extraction in Micro and Macro Systems

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OP-07-042

Abstract

Liquid-Liquid extraction is an cost -effective chemical engineering operation used in many industrial processes suchas refining crude petroleum, extraction of metals and processing of nuclear fuels . In this work mass transfercharacteristics in Liquid –liquid extraction using water- acetic acid ethyl acetate as typical example of liquid-liquidtwo phase mass transfer process was investigated in packed column by varying acetic acid concentrations in thefeed, solvent to feed flow rate (S/F) ratio, using random and structured packing. The overallvolumetricmasstransfer coefficient K L a , percentage extraction, NTU,HTU weredetermined quantitatively. A comparison was madebetween the results obtained for structured and random packings. Extraction operation was investigated in microchannels with different diameters of 0.7mm,0.9mm and 1.8mm having same volume. Operation was carried outunder different flow rates of feed and solvent ,but maintained the solvent to feed ratio equal to one. A steady slugflowbehavior was observed with flow rates of 0.04, 0.06 and 0.08 ml/min. A comparison was made between theresults obtained in the different micro channels and Dimensionless analysis was carried out by calculatingReynolds, Weber, and Capillary numbers for each micro channel. An overall comparison was made between the K L aand percentage extraction values obtained in the micro channel with packed columns for the same S/F ratio andacetic acid concentration in the feed. For the S/F ratio=1, it was found that the K L a values obtained in the microchannels were more than two orders of magnitude higher than the above packed column irrespective of the type ofpacking employed and also in conventional liquid-liquid contactors. Very high percentage extraction was obtainedin micro channels when compared with the packed columns. To obtain the same kind of percentage extraction inpacked columns almost S/F =4 must be employed and which gradually needs higher solvent and higher cost ofoperation. Using Dantec Dynamic studio software the hydro dynamics inside the micro channels were investigatedthrough µ-PIV and flow patterns inside the organic slugs were analyzed using vector Cross-correlation and Adaptive–cross correlation methodologies. From the results obtained in micro PIV it was observed that, because of greatchaos in the movement of vectors inside the organic slug and leading to higher internal recirculation of liquid insidethe slug, every time a new surface is created for the diffusion of acetic acid from the aqueous phase in to the organicslug and hence high mass transfer and percentage extraction in micro channels. The significant mass transferintensification implies that the adoption of eco- friendly process through micro channels is beneficial to manyindustrially important Liquid-Liquid mass transfer operations and reactions which dramatically reduces solventconsumption and investment cost.
Key Words: Liquid-liquid extraction, packed column, Aspen Plus, micro channel, slug flow, µ-PIV.

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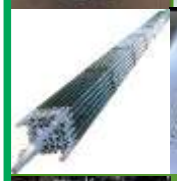




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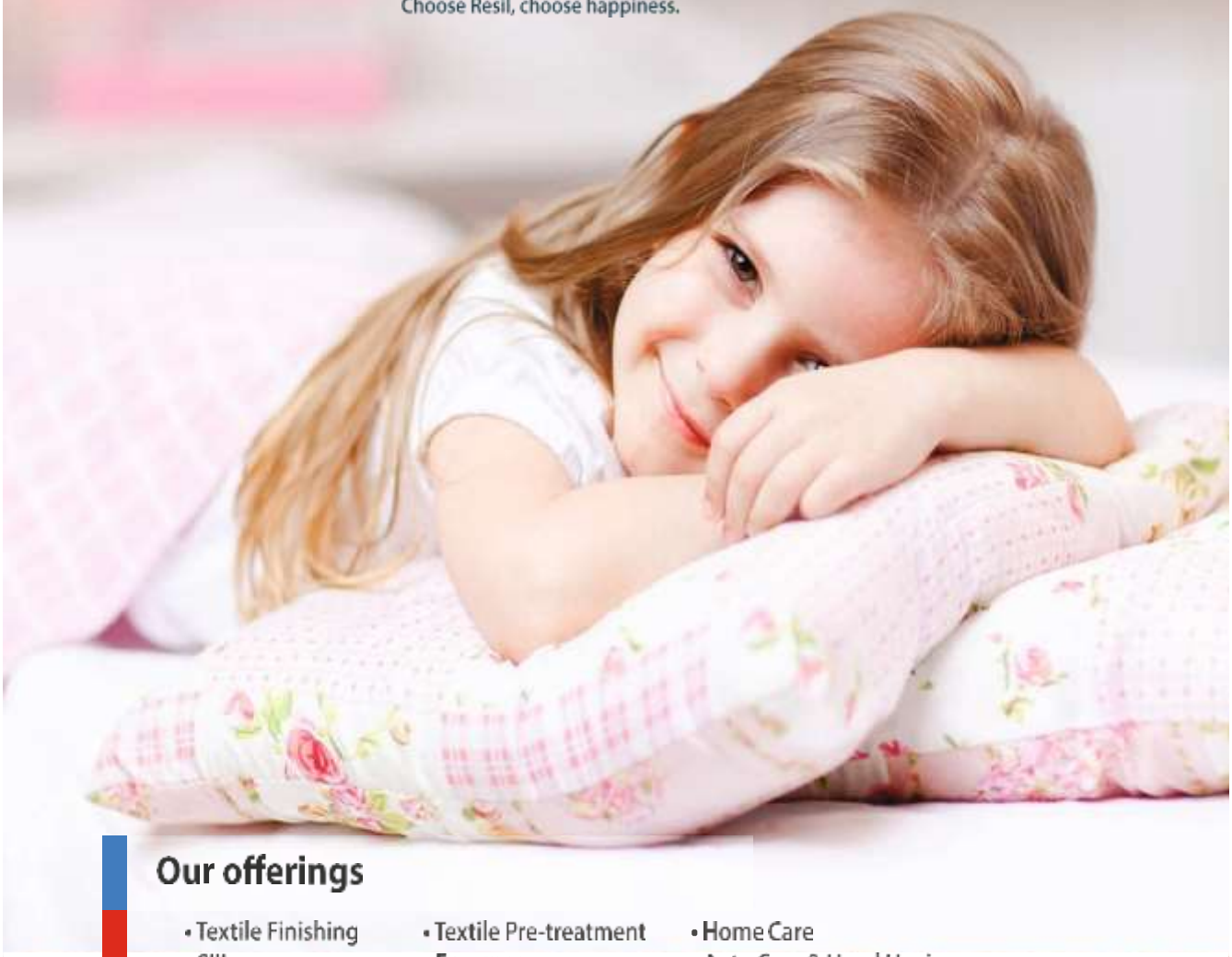

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POWER: Walchandnagar – Pioneer syntex – Sathavahana – Indreshwar – Enmas GB etc

STEEL : FACOR – Sarda Minerals – BMM and many more..

QUALITY CONTROL APPROVED

Clair Engineers Pvt.Ltd,

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