

NEWSLETTER



DEPARTMENT OF CHEMICAL ENGINEERING



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Dedication



*This volume of newsletter is dedicated to the bright memory of **Late Engr. Moazim Gulzar** (Assistant Professor) who passed away on Friday 20th, July 2018. He had been a valued member of Chemical Engineering faculty and will be missed deeply. He always believed in ability to be successful in the academic arena. His services and efforts to make this department more progressive will always be remembered.*

Message From Director



By the grace of Allah Almighty! Traversing through a journey by a passionate commitment to excellence, COMSATS University Islamabad (CUI), Lahore Campus has evolved into one of the flagship campuses of CUI. Its success story spread over a decade is matter of deep pride and honor for all those associated with this prestigious seat of higher education and quality research in emerging technologies.

Our esteemed institution caters to the pragmatic, practical and moral aspects of learners with the strong realization to make its alumni a functional part of society. By taking advantage of their newly acquired skill set and quality learning, our undergraduates and graduates as independent and critical thinkers have stood up to local and international challenges and acclaimed awards in nearly all walks of life. I believe that the need based, research oriented, solution based and innovative teaching-learning ambiance created here is a way forward for our education system that needs to bridge up the gap between the theory and the practice, address the societal demands, and reclaim its recognizable space in the comity of academia. I hope that the symbiotic relationship between the teacher and the taught, the administration and the academia will lead our institution to the new heights of fame and glory. I, as Director, look forward to the opportunity to provide you with this enriching teaching-learning experience.

I compliment Department of Chemical Engineering on publishing this newsletter and look forward to increase success of this endeavor in the coming months.

Prof. Dr. Qaisar Abbas

Director CUI, Lahore Campus

Message From Dean

Engineering at COMSATS University Islamabad (CUI) offers unique opportunities for innovative education and research. At CUI, engineering education was initiated in 1999 with single discipline and now, after more than fourteen years, engineering has grown beyond expectations. It has been consistently ranked among top engineering faculties of Pakistan. When it comes to career development and planning, students at COMSATS University are supported by our career development centres and industrial liaison offices at different campuses. These arrangements reflect CUIs commitment, enabling all of our students to access the maximum possible range of career opportunities in engineering sectors.



Prof. Dr. Shahid A. Khan

Dean of Engineering

Greetings From HoD

Dear friends and alumni of COMSATS University Islamabad (CUI), greetings from Department of Chemical Engineering. I hope this latest edition of the *newsletter* finds you well and happy. I have made changes driven by the question. “How do we ensure our students have the skills and professional opportunities to succeed in this hypercompetitive world?” We have aggressively focused on curriculum reform and infrastructure investment resulting transformational infusion of new instrumentation in many laboratories. Research infrastructure is expanding with the founding of many research groups and induction of expert faculty that broadly supports department and institute activities. I am confident Chemical Engineering Department is on track to produce future graduates. Visit our website <http://lahore.comsats.edu.pk/> regularly for more departmental news.



Prof. Dr. Asad Ullah Khan

HoD Chemical Engineering

Biorefinery Engineering and Microfluidics (BEAM) Research Group

Dr. Saif Ur Rehman as PI and Dr. Fahad Rehman as Co-PI has won project grant of 19.8 million PKR from HEC, Pakistan. They are founding member of **Biorefinery Engineering And Microfluidics (BEAM)** lab and lead researcher of **BEAM Group** at CUI, Lahore Campus. BEAM lab is working on two different horizons: (1) developing energy efficient and sustainable processes for biofuels production and (2) developing advanced oxidation processes for wastewater treatment. The lab is fully equipped with the facilities for bioalgal/biomass development, operation and analysis of microplasma reactors for advanced oxidation processes. The prime focus is given on understanding the kinetics of the process through modeling and exploiting microfluidics to cheat chemical equilibrium via Le Chatleir's principle.



GROUP HIERARCHY

DR. SAIF UR REHMAN	Principal Investigator
DR. FAHAD REHMAN	Principal Investigator
ENGR. SHAHZAD ALI	Lab Engineer
ENGR. FAWAD ASHRAF	Lab Engineer
ENGR. TAHIR FAZAL	PhD Student
ENGR. AINEE HAFEEZ	PhD Student



GRADUATE STUDENTS

Engr. Shahzad Ali, Engr. Fahad Javed

Thesis title: Micro-bubble mediated mass transfer for the production of ethyl acetate

Engr. Sidra Ali

Thesis title: Development of Advance plasma micro reactor for wastewater treatment

Engr. Bilal Masood

Thesis title: Simulation of Heat transport, mass transport and reaction flow of bubble facillated production of ethyl acetate



RESEARCH COLLABORATIONS

The University of Sheffield, UK

Biochemical Engineering Research center, Anhui, University of Technology, Ma'anshan, China

University of Lahore, Pakistan

The university of Punjab, Pakistan

Water Care Services, Pvt. Ltd., Pakistan



CURRENT RESEARCH PROJECTS

- Design of plasma micro-reactor for textile wastewater treatment
- Simultaneous production of biodiesel and treatment of textile wastewater using microalgae
- Design and development of plasma hybrid reactors
- Production and simulation of micro-bubble mediated production of ethyl acetate
- Techno-economical assessment of biodiesel as an alternative and sustainable replacement of petroleum diesel



Faculty Awards & Honors

CONGRATULATION to Dr. Murid Hussain, as a new **CHAIRMAN** of Department of Chemical Engineering. He has been actively participating in various research, academic and administrative activities at Department of Chemical Engineering, CUI Lahore Campus. His research work is published in well known SCI journals in the field with cumulative impact factor around 170 and h-index of 16. He has been ranked among the top productive scientists of Pakistan and received Research Productivity Awards (in years 2015, 2016). In addition, recently he has also honoured with below mentioned two awards for his out standing research contributions:



- Pakistan Council for Science and Technology (PCST)/Ministry of Science & Technology, Pakistan Research Productivity Award (PCST RPA Award 2017-18).
- Ranked 2nd in Chemical Engineering, and 15th (Overall) in Engineering Science Category in the Directory of Productive Scientists of Pakistan-2017.



Prof. Dr. Asad Ullah Khan, Head of Chemical Engineering Department, CUI Lahore Campus, has been selected to the Merging Voices Project as the visiting professor coordinated by Universidade Nova de Lisboa in the framework of the European Programme Erasmus plus International Credit Mobility programme. He is selected by the Merging Voices project to undertake mobility at University of Algarve, Portugal. The programme is to bring mobility of students, professor and administrative staff for international institutions.

Dr. Aqeel Ahmad Bazmi, Associate Professor has received below mentioned two awards in recognition of his out standing research contributions:

- Pakistan Council for Science and Technology (PCST)/Ministry of Science & Technology, Pakistan Research Productivity Award (PCST RPA Award 2017-18).
- Ranked 1st in Chemical Engineering, and 14th (Overall) in Engineering Science Category in the Directory of Productive Scientists of Pakistan-2017.



Dr. Muhammad Aslam, has been awarded with honor for his “ Exceptional Contribution” in research by Inha University, Republic of Korea in February 2018. He has been awarded by two prestigious awards of “Dean’s Choice of Best Researcher” and “Outstanding Research Award” in recognition of demonstrated excellence in research. He did more than 50 research publications including high impact factor journal papers and international conference papers/proceedings during his tenure at Sustainable Environmental Membrane Technology Center, Inha University.

Faculty Awards & Honors

Dr. Zakir Khan, Assistant Professor of Chemical Engineering has been awarded with honor for his “ Exceptional Contribution” in research by University of Glasgow, UK for the year 2016-2017 in 2017. He was doing his post doctorate during this tenure. The award also included a cash price of £1000. The award was result of his project titled: “Real-time control of gasifiers to increase tolerance to biomass variety and reduce emissions” funded by EPSRC, UK.”.



Dr. Abdul Razzaq, is serving the Chemical Engineering Department as “Assistant Professor”. He has a strong research profile and published many articles. Recently he has won the research funded project titled “Development of photocatalytic materials for organic dyes degradation under UV/visible light irradiation” from Higher Education Commission (HEC), Pakistan. He has also been part of many academic and industrial

Dr. Awais Bukhari, received two honours from American Oil Chemist's Society (AOCS). These awards include: (1) AOCS Manuchehr (Manny) Eijadi Award: (Plaque and \$1,000 USD Honorarium) winner at 2017 AOCS Annual Meeting and Industry Showcases, April 30- May 03, 2017, Rosen Shingle Creek, Orlando, Florida, USA. (2) AOCS Honored Student Award: (Travel allowance to USA, Hotel Lodging, Certificate, Complimentary Registration).



Dr. Um-e-Salma Amjad, Assistant Professor, Department of Chemical Engineering has been awarded a research award under TWAS-COMSTECH Joint Research grant of worth US\$ 6000 entitled as “Low temperature steam reforming of waste plastic oil to convert it to energy efficient fuel: A kinetic study”. TWAS-COMSTECH is for young scientists in OIC countries working in science and technology to facilitate them in research activities.



Research Buildup

1

- Process & Energy Systems Engineering Center (PRESTIGE)

2

- Biomass Conversion Research Center (BCRC)

3

- Polymer and Composite Materials Research Group

4

- Membrane Systems Research Group

5

- Biorefinery Engineering And Microfluidics (BEAM) Research Group

6

- Catalysis and Materials Research Group



“ALONE WE CAN DO SO LITTLE, TOGETHER WE CAN DO SO MUCH”

Research Grants

Dr. Murid Hussain, Chairman of Department of Chemical Engineering has won **Technology Development Fund (TDF) 2018/HEC-Industry/Total 5.05M**

Project Title: Pilot plant for development of bio-degradable laundry liquid detergent and dish washer liquid detergent according to European standards

The basic goal of this research project is to synthesize eco-friendly bio-degradable liquid detergents for commercial market in Pakistan at reasonable price. This is an industrial research based project. The project consists of two products which are “Laundry liquid detergent” and “Dish washer liquid detergent”. The question is why liquid detergents are being introduced in future in Pakistan? This is because, the liquid laundry detergents completely dissolve in water, therefore, these do not accumulate in the textile fibers. While using the laundry washing powder, it often does not dissolve completely and is not rinsed from the textile fibers during the washing cycle, thereby causing skin irritation.

One of the most important facts about powder detergent is that it contains fillers like phosphates, EDTA, perborates, chlorides, DTPA and nitro-musks which are not bio-degradable and highly toxic in nature. Whereas, liquid detergent contains biodegradable surfactant. The liquid laundry detergents are not dusty during their use; therefore, do not cause the risk of unnecessary allergic reaction while dosing the product. These detergents are easily degradable and eco-friendly.

In Pakistan, there are many multinational detergent brands. Most of these are producing powder detergents. According to FBR Pakistan report 2016, total market size of laundry detergents is Rs. 19 billion. Unilever, P&G and Colgate Palmolive are the major players in Pakistan detergents market. Up to 90% Pakistan's market is captured by these multinational brands. There is only 10% of detergents market share by local brands like Sufi soap, Azhar corporation etc. and it is an alarming situation for the economy of Pakistan. The main purpose of this project is to reduce multinational market share by manufacturing liquid detergents locally.



Research Grants

Dr. Abdul Razzaq, Assistant Professor of Chemical Engineering has won research project

Project Title: Development of Photocatalytic Materials for Organic Dyes Degradation under UV/Visible Light irradiation

The key goal of this project is to develop new photocatalytic materials via modification/convergence of various synthesis approaches. The new photocatalytic materials should be capable of harvesting the maximum of the solar spectrum with the aim to solve the environmental pollution and health hazards originating from wastewater organic dyes.

The project is mainly composed of various steps starting from preparation of photocatalyst, characterization, analysis and finally evaluation for dye degradation. Attempts will be done to converge and develop some synthesis methods, such as hydrothermal, solvothermal and Sol-Gel methods. The running of this project will further enrich research fields in the renewable energy such as solar fuels generation i.e photocatalytic hydrogen generation and photo-conversion of CO₂ into hydrocarbon fuels.

The possible outcomes expected to achieve at the completion of the research tenure might compose of:

- ♦ Development of new synthesis strategy for synthesis of efficient photocatalysts aimed towards the enhanced degradation of organic dyes.
- ♦ The interest for the utilization of sunlight (which is abundant in Pakistan), as a sustainable and renewable source will be effectively portrayed towards the students and researchers to utilize it effectively.
- ♦ In fact, this topic is directly related to the society, and will directly contribute to the well-being of public health, to reduce the level of toxic dyes in polluted water leading to healthy environment with safe economic growth.
- ♦ Possible collaboration of textile industry and academia for the scientific solution of the treating dyes pollutant at industrial scale.
- ♦ The project will further enrich research fields in the renewable energy such as solar fuels generation i.e photocatalytic hydrogen generation and photo-conversion of CO₂ into hydrocarbon fuels in Pakistan. Hence, one more step forward to produce the clean energies and improve our climate.



Research Grants

Dr. Naim Rashid, Assistant Professor has won the research project

Project Title: The use of micro-algae for bio-diesel production and wastewater treatment in Pakistan

Pakistan is confronting with severe ecological, environmental sustainability and societal challenges which have badly crippled its economy. Among many, energy, water, and health are the most aggravated yet inter-related issues which need an immediate attention. It triggers up the need of exploring alternative and sustainable natural resources to reduce the reliance on existing yet dwindling resources.

In this perspective, this project is designed to exploit domestic resources, in particular, wastewater and turn them into an economic opportunity to reinforce the objectives of sustainable bio-economy. In Pakistan, wastewater is discharged into water bodies without proper treatment which is a potential threat to human health and ecological system at large. Wastewater is a rich source of energy, present in the form of organic carbon, which can be turned into a wide variety of bio-energy feedstocks including biodiesel, biohydrogen, and bio-electricity after biological treatment. In this research, microalgae (a microorganism) will be used to perform biological treatment. Microalgae have unique ability to produce oxygen through photosynthetic system, and thus, replace the need of costly mechanical aeration. This project would offer two-fold benefits including low-cost waste treatment and bio-energy production. It will create an opportunity to translate industrial problems into research questions and provide proper solutions. It will strengthen the industry-academia relationship to broaden the perspective of the researchers by exposing themselves to the industrial challenges. The project involves extensive research trainings, capacity building, and honing interpersonal skills to interact with scientific community. It involves attending scientific meetings, industrial tours, and arranging workshops to promote interdisciplinary research. The project will also provide a monthly stipend of Rs. 25,000/ month to two Ph.D students. It is expected that the outcome of this project will provide an avenue to promote bio-energy production and utilizing waste resources in Pakistan. This study can be of great interest to the policy makers to prioritize this research theme and allocate research funds in the future to explore further opportunities.



Research Grants

Dr. Ume-Salma Amjad, Assistant Professor, Department of Chemical Engineering has won the research grant

Project Title: Low temperature steam reforming of waste plastic oil to convert it to energy efficient fuel: A kinetic study

She has been awarded a research grant under TWAS-COMSTECH Joint Research Grants worth US\$ 6000 in the field of Engineering Sciences. The project aims at observing the catalytic activity and the intrinsic kinetics involved in low temperature catalytic steam reforming of waste plastics to convert it into energy efficient fuel.



TWAS research grant (TWAS-COMSTECH) is for young scientists in OIC countries working in science and technology to facilitate them in research activities. The research grant aims at encouraging the pursuit of scientific excellence in OIC countries by identifying and supporting the best young scientists in these countries; reinforcing and promoting scientific research and strengthening the endogenous capacity in science and technology; and counteracting the brain drain and reducing the exodus of scientific talent from the OIC countries. The project focuses on the energy crisis of Pakistan is increasing day by day as large cities, the problem is minor 4-6 hour load shedding per day, however in rural areas this problem is major as there people face 10-12 hour load shedding daily. This problem usually worsens in the summer when the electricity need rockets sky high while the already available resources like natural gas/petrol/diesel are costly and insufficient to meet the requirement. The plastic waste is a viable energy source as it is previously derived from petrochemical raw material therefore it can be reconverted into petroleum fraction through chemical route. However, before using the waste plastic as fuel, it should be able to deliver an optimum amount of energy, not less than the natural gas or petrol/diesel to be a viable energy source. To prove the benefits of waste plastic as a fuel research must be carried out so that it can benefit and cater the needs of common man. The research intended here is to analyze the energy efficiency of waste plastic. Catalytic steam reforming is a feasible technique to convert the plastic waste into fuel, however kinetic data must be obtained to design a reactor for energy efficient conversion of plastic waste to useful fuel.

New to Department

Department continues to grow, this year with the addition of new faculty members.

Dr. Muhammad Aslam received his PhD degree at Sustainable Environmental Membrane Technology (SEMT) Center, Inha University, Republic of Korea before joining Department of Chemical Engineering, CUI Lahore Campus, Pakistan. He has been working in the area of membrane science and technology at both industrial and academic research level for last six years. During his tenure at the Sustainable Environmental Membrane Technology Center, Inha University, he did pioneering work to develop novel process design in the area of anaerobic membrane biotechnology to control membrane fouling, system operation and bioenergy recovery, being net energy-positive membrane operation which has overwhelm impact to membrane science and technology.



Dr. Muhammad Farrukh Jamil joined the department after completing his MS Chemical Engineering from University Teknologi PETRONAS, Malaysia in October 2013 followed by PhD degree in Chemical and Process Engineering from Sultan Qaboos University, Oman in September 2017. He taught a number of subjects to undergrad classes there including process safety and process instrumentation. He was awarded with 17 research papers and 10 conference papers in his PhD tenure. He also provides expert service to the school research project entitles “Biodiesel production from date seeds”.



Dr. Abdul Razzaq joined the Department of Chemical Engineering after completing his PhD degree in Energy Systems Engineering from Daegu Gyeonkbeok Institute of Science and Technology (DGIST), Republic of Korea. His research area of interest is dye sensitized solar cells, quantum dots sensitized solar cells, photocatalysis for environmental remediation, solar fuels generation and hybrid anodes for microbial fuel cells



Currently, more than 30 faculty members are studying abroad on ex-Pakistan study leave. They are studying in different countries all over the world in USA, UK, Australia, Korea, Malaysia, Europe and other countries. They are going to be a great addition in future building of students.

2nd International Conference on Energy Systems for Sustainable Development (ESSD-2018)

Department of Chemical Engineering, CUI Lahore Campus hosted its Second International Conference on Energy Systems for Sustainable Development (ESSD-2018) on 21-23 February 2018 in Lahore, Pakistan. This International Conference was made successful in collaboration with Higher Education Commission (HEC), Pakistan and Energy Research Centre CUI, Lahore Campus. Our munificent Industrial sponsors were Polymer Group of Industries, Shama Ghee and Cooking Oil Industries, H.A Shah and Sons, Sentron Asia International and Tandlianwala Sugar Mills Ltd.

The aim of this conference was to bring together the best of brains for the presentation of technological advances, latest research and policies in the fields of theoretical, experimental, and applied aspects of Energy and Sustainable Development. The forum provided brainstorming sessions to researchers, engineers, scientists, scholars/students and policy makers in these sectors on the direction and flow of technology for the nation and the world in the next decade.



Participants from different countries as well as from different universities of Pakistan presented their research work. The presence of experts of chemical engineering, electrical engineering, and many other fields made this event INTER-DISCIPLINARY in true sense.

Increased demand coupled with energy security issues, uncertainty in the oil sector, and tightening environmental regulations made this conference a must for those involved in different aspects of energy sector. The program covered innovative and evolving technologies in a forum that encouraged the exchange of information in energy sector and policy issues. Up-to-date technical papers, tutorials, panels and plenary sessions, covering cutting-edge developments on a range of topics were presented by International and local researchers.

The Conference brought together International experts from academia, industry, and authorities to exchange latest advances in knowledge and technological progress, and to share experience in economic and environmental aspects of energy developments. Idea of this International Conference was how best Pakistan can use the energy resources to meet growing energy demand, overcome crisis and achieve sustainable development.



The scope of the ESSD Conference Series was continue to successfully cover (but not confined to) the following areas:

1. Power & Energy Systems
2. Energy, Environment and Sustainable Development
3. Energy Management



The conference also includes paper submission and poster competition. A large number of participants from different universities participated in the conference. Students from various national and international universities also participated in poster competition. Prize distribution ceremony held at the end of closing ceremony of conference. Prizes and awards were awarded to speakers and presenters in different categories.



Membrane Day @ COMSATS

Membrane System Research Group of Chemical Engineering Department, CUI Lahore Campus organized Membrane Day on dated 26th April 2018. The purpose of the Membrane Day was to bring researchers, engineers, academicians and students together from COMSATS as well as other Pakistani universities and provide a platform for sharing ideas and partnerships in their research works. MS and PhD students working in the field of membrane technology presented their research works. The participants of the Membrane Day were able to have a discussion forum for ongoing research works and also emerging area of membrane technology to target in future works.



Membrane Professors @ COMSATS Membrane Day



**Dr. Asim
Laeeq Khan**



**Dr.
Muhammad
Aslam**



**Dr. Mazhar
Amjad
Gilani**



**Dr.
Sikander
Rafiq**

Student Presenters @ COMSATS Membrane Day

**Zaman
Tahir**

**Tanzila
Anjum**

**Iqra
Yasmeen**

**Sudeeha
Ishaq**

**Sidrah
Iqbal**

**Nitasha
Habib**

**Kiren
Javid**

**Tahreem
Butt**

**Hadiya
Amir**

**Muhammad
Raees**

**Mudassar
Jamal**

**Zufishan
Shumair**

**Zabia
Sajjad**

**Muhammad
Naveed**

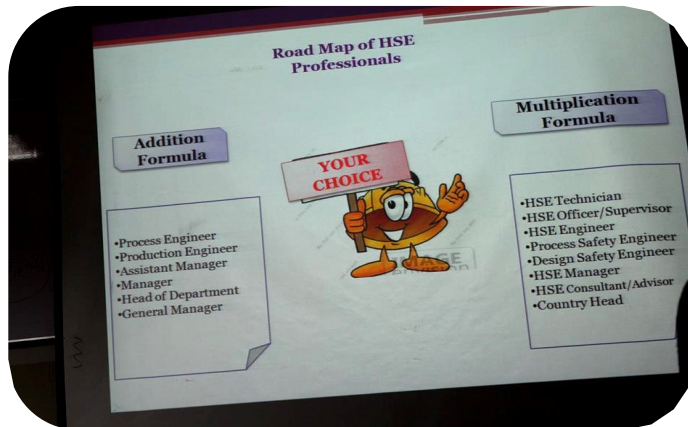
**Manzar
Ishaq**



Seminar on “How to get jobs in GULF countries & Pakistan in health and safety sector”

AICHE student chapter under command of Department of Chemical Engineering aims to enhance skills of their students, that is mainly done with the help of professionals from industries and other sectors. In each semester such activities are introduced along-with curricular activities.

As it is well known that demand for health and safety professionals is increasing day by day in at national and international industries. This seminar was delivered by Engr. Qaiser Raza, CEO of “Institute of International Career Certifications”. He is a principal consultant, trainer and advisor in many national and international companies. More than 250 alumni of our department are now working in this field that is big achievement for us.



Seminar on “Traffic Rules and Road Safety”

Department of Chemical Engineering, with the help of Dr. Zulfiqar Ali and his team, successfully organized a seminar on "Traffic Rules & Road Safety" for faculty, staff and students for whole campus. Chief guest Rai Ejaz Ahmed, SSP (PSP) & Chief Traffic Officer (CTO) Lahore, delivered guest lecture on the subjected seminar and informed audience about ongoing projects & efforts of City Traffic Police in this regard.

Rai Ejaz Ahmed also emphasized on safety precautions to be taken while driving. Every year thousand of people die because of accidents. The guest speaker shared different ways to avoid accidents and keep ourselves safe.

Followed by this learning activity, learner license processing team was also invited twice in the campus to facilitate those who want to get “Learner’s Driving License”. The organizing team of the seminar arranged in-house facility for processing of “learner license” included Dr. Khaliq Majeed, Engr. Waleed Siddiqui and Engr. Mulazim Ali from Chemical Engineering Department.



Chairman/HoD Chemical Engineering Prof. Asad U. Khan encouraged the organizers and said that such seminars should be organized to keep ourselves safe.

At the end of seminar, souvenirs were distributed among honorable guests by Prof. Asad U. Khan and Dr. Zulfiqar Ali.



Student Visit to Pak American Fertilizers

Industrial visits are a great source of learning as they provide a vision to analyze the industrial processes through different perspectives. Department of chemical engineering scheduled industrial tours to various industries for the learning enhancement of the students.

Students of 6th semester visited Pak American Fertilizer Plant at Mianwali under supervision of Dr. Moinuddin Ghauri and Dr. Shahzad Khurram. Students showed great interest in learning technical knowledge from industrial professionals.



Student Visit to Polymer Industry

Students of DDP-FA-14 and SDP-FA15 visited TM Rubbers Co. Ltd. under the supervision of Dr. Zulfiqar Ali and Engr. Mulazim Ali.

The motivation behind arrangement of this trip is that students could visit different sections of polymer industry i.e. QC/QA department, chemical store, production line & inventory etc. Also, it would give them an opportunity to physically observe different machines namely kneader mixer/two roll mill injection molding machine, transfer molding machine, compression molding machine working for their respective processes.



Inter-Departmental Sports Gala

Sport develops a sense of friendliness among the children and develop their team spirit. It helps us to develop mental and physical toughness. Sport shapes the body and make it strong and active. Department of Chemical Engineering strongly encourages its students and staff to participate in sports activities.

Intra department sports gala held at campus in which teams from each batch actively participated in various games.

Overall FA15 batch got first position.



Research Impact

During the year 2017-2018, faculty produced a large number of research publications, some of which were successful in securing place in high impact factor journals. Details of published research articles are given below:

Aslam, M., Ahmad, R., Yasin, M., Khan, A. L., Shahid, M. K., Hossain, S., Khan, Z., Jamil, F., Rafiq, S., Bilad, M. R., Kim, J., Kumar, G. Anaerobic Membrane Bioreactors for Biohydrogen Production: Recent Developments, Challenges and Perspectives. *Bioresource technology*, (2018) In Press.

Saqib, S., Rafiq, S., Chawla, M., Saeed, M., Muhammad, N., Khurram, S., Majeed, K., Khan A. L., Ghauri, M., Jamil, Aslam M. Facile CO₂ separation in composite membranes. *Chemical Engineering & Technology*, (2018) In Press.

Haider, J., Qyyum M. A., Hussain A., Yasin, M., Lee, M. Techno-economic analysis of various process schemes for the production of fuel grade 2, 3-butanediol from fermentation broth. *Biochemical Engineering Journal*, (2018) In Press.

Khan, Z., Yusup, S., Ahmad, M. M., Inayat, A., Naqvi, M., Sheikh, R., Watson, I. Integrated catalytic adsorption steam gasification in a bubbling fluidized bed for enhanced H₂ production: perspective of design and pilot plant experiences. *Biofuels, Bioproducts and Biorefining*, (2018) In Press.

Ahmad, R., Aslam, M., Park, E., Chang, S., Kwon, D., Kim, J. Submerged low-cost pyrophyllite ceramic membrane filtration combined with GAC as fluidized particles for industrial wastewater treatment. *Chemosphere*, 206 (2018) 784-792.

Chawla, M., Rafiq, S., Jamil, F., Usman, M. R., Khurram, S., Ghauri, M., Muhammad, N., Al-Muhtaseb, A H., Aslam, M. Hydrocarbons fuel upgradation in the presence of modified bi-functional catalyst. *Journal of Cleaner Production*, 198 (2018) 683-692.

Charfi, A., Park, E., Aslam, M., Kim, J. Particle-sparged anaerobic membrane bioreactor with fluidized polyethylene terephthalate beads for domestic wastewater treatment: Modelling approach and fouling control. *Bioresource technology*, 258 (2018) 263-269.

Aslam, M., Yang, P., Lee, P. H., & Kim, J. Novel staged anaerobic fluidized bed ceramic membrane bioreactor: Energy reduction, fouling control and microbial characterization. *Journal of Membrane Science*, 553 (2018) 200-208.

Tahir, Z., Ilyas, A., Li, X., Bilad, M. R., Vankelecom, I. F., Khan, A. L. Tuning the gas separation performance of fluorinated and sulfonated PEEK membranes by incorporation of zeolite 4A. *Journal of Applied Polymer Science*, 135 (2018) 45952.

Asghar, H., Ilyas, A., Tahir Z., Li, X., Khan A. L. Fluorinated and Sulfonated Poly (Ether Ether Ketone) and Matrimid Blend Membranes for CO₂ Separation. *Separation and Purification Technology*, 203 (2018) 233-41.

Research Impact

Ishaq, S., Tamime, R., Bilad, M. R., Khan, A. L. Mixed matrix membranes comprising of polysulfone and microporous Bio-MOF-1: Preparation and gas separation properties. *Separation and Purification Technology*, 210 (2018) 442-451.

Eliseus, A., Putra, Z. A., Bilad, M. R., Nordin, N. A. H. M., Wirzal, M. D. H., Jaafar, J., Khan, A. L., Aqsha. Energy minimization of a tilted panel filtration system for microalgae filtration: Performance modeling and optimization. *Algal Research*, 34 (2018) 104-115.

Ilyas, A., Muhammad, N., Gilani, M. A., Vankelecom, I. F. J., Khan, A. L. Effect of zeolite surface modification with ionic liquid [APTMS][Ac] on gas separation performance of mixed matrix membranes. *Separation and Purification Technology*, 205 (2018) 176-183.

Khan, A., Ali, M., Ilyas, A., Naik, P., Vankelecom, I. F. J., Gilani, M. A., Bilad, M. R., Sajjad, Z., Khan, A. L. ZIF-67 filled PDMS mixed matrix membranes for recovery of ethanol via pervaporation. *Separation and Purification Technology*, 206 (2018) 50-58.

Jang, N., Yasin, M., Kang, H., Lee, Y., Park, G. W., Park, S., Chang, I. S. Bubble coalescence suppression driven carbon monoxide (CO)-water mass transfer increase by electrolyte addition in a hollow fiber membrane bioreactor (HFMBR) for microbial CO conversion to ethanol. *Bioresource Technology*, 263 (2018) 375-384.

Khan, Z., Yusup, Y., Kamble, P., Naqvi, M., Watson, I. Assessment of energy flows and energy efficiencies in integrated catalytic adsorption steam gasification for hydrogen production. *Applied Energy*, 255 (2018) 346-355.

Irfan, M., Moniruzzaman, M., Ahmad, T., Osman, O. Y., Mandal, P. C., Bhattacharjee, S., & Hussain, M. Stability, interparticle interactions and catalytic performance of gold nanoparticles synthesized through ionic liquid mediated oil palm leaves extract. *Journal of Environmental Chemical Engineering*, 6 (2018) 5024-5031.

Shehzad, N., Tahir, M., Johari, K., Murugesan, T., Hussain, M. Fabrication of highly efficient and stable indirect Z-scheme assembly of AgBr/TiO₂ via graphene as a solid-state electron mediator for visible light induced enhanced photocatalytic H₂ production. *Applied Surface Science*, 463 (2018) 445-455.

Javed, U., Farooq, R., Shehzad, F., Khan, Z. Optimization of HNO₃ leaching of copper from old AMD Athlon processors using response surface methodology. *Journal of Environmental Management*, 211 (2018) 22-27.

Sultan, T., Chaudhry, I. A., Ahmad, Z., Khurram, M. S., Ghauri, M., Rafiq, S., Jaffery, M. H., Computational analysis of viscous flow using modified sparse point representation method, *Journal of Engineering Technology*, 6 (2018) 435-451.

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