CHEMPHORIA

MAGAZINE

2021

IIChE STUDENT CHAPTER

DEPARTMENT OF CHEMICAL ENGINEERING

TKM COLLEGE OF ENGINEERING

Chemphoria 2021 Edition

“With experience,
A chemical engineer can smell problems”

“Behind the mask”

“Behind the mask is a patient in fear, unsure what will happen after being brought here.

Behind the mask is someone special who, was born for this moment to take care of you.

Behind the mask is someone’s son or daughter, guiding you through these unchartered waters.

Behind the mask, someone comes to you in prayer, full of mission and faith, guiding your care.

Behind the mask, someone is leading the way, planning and supporting the staff through the day.

Behind the mask someone silently prepares, clean rooms, or meals, even meds for your care.

Behind the mask someone can come where you live, bringing care, meds or equipment, more passion to give.

Behind the mask, there is one ministry for all, no role is too big, no position too small.

Behind the mask, is our promise to you, we answered the call, it’s what we were all meant to do.”

HOD's Message

"Hope can be a powerful force. Maybe there's no actual magic in it, but when you know what you hope for most and hold it like a light within you, you can make things happen, almost like magic."

A weak link is better than a strong memory. Nothing exemplifies it better than the nostalgic feeling one gets when leafing through the dusty old pages of his/her department magazine. It can make a reader travel down the lanes of memory, giving rise to a surge of emotions of many hues and colours. TKMCE CHED's Chemphoria is going to give the same pleasure to all the brilliant minds who traverse through the portals of this temple of learning.

We proudly publish the department magazine in order to show to the outside world, and also to remind the denizens of TKMCE CHED, the progress we have made so far. We intend to continue presenting the talent and creativity of our staff and students through Chemphoria every year.

I invite you to read and immerse yourself in the unfolding art and be exulted.

Prof. Femina A.

Associate Professor and Head

Department of Chemical Engineering

TKMCE Kollam

STAFF EDITOR'S EPISTLE

"Success comes to those who work hard and stays with those, who don't rest on the laurels of the past".

As Margaret Mead said, "Children must be taught how to think, not what to think," and to enable this, our motto of Knowledge, Imagination and Innovation is encouraged through a holistic approach.

Each issue of our department magazine is a milestone that marks our growth, unfolds our imagination, and gives life to our thoughts and aspirations. It unleashes a wide spectrum of creative skills ranging from technical writing to editing and even in designing the magazine. Chemphoria 2021 is a perfect blend of technical thinking, knowledge and wisdom which vibrates in the inner soul of various stakeholders. It is natural to find in his ambience, the intensive use of a variety of thinking activities, strategies and group dynamics to make this issue interesting and thought provoking. I congratulate the entire student editorial team for their effort in bringing out this magazine in a very innovative way under the guidance of IIChE staff coordinator Prof. Manikandan P. M.

On this occasion, I seize the moment to congratulate all graduating students 2021.

Prof. Al Ameen A

Assistant Professor

Department of Chemical Engineering,

TKMCE, Kollam

STUDENT EDITOR'S NOTE

This magazine provides a platform for us students and Staff to share information, spread the latest technical Knowledge and cultivate right ways that will equip all of us to stay competent in our respective fields of study and research.

Reading this magazine would definitely be an inspiration and motivation for all students and staff to contribute even more to the forthcoming issues. We hope that everyone would continue to give their full efforts to keep the momentum and continue to enhance the standards of the magazine. The outside world will come to know about the caliber of the students and the faculty through this magazine.

Once again, we extend our thanks to all the contributors for their great contributions.

Alfina S

Pranav K

The department in a nutshell…….

Vision

Attainment of recognition by all stakeholders as well as peers as a department of choice for higher learning in the discipline and allied areas, that strives for excellence in teaching, outstanding research, scholarly activities and apply engineering expertise in meeting societal needs.

Mission

- Prepare the students for graduate study through an effective curriculum and produce Chemical Engineering professional who can serve the industry and the society at large by imparting the best of scientific and technological knowledge.
- Provide competitive and stimulating academic environment to nurture creativity, self-learning and inter-personal skills.
- Foster the pursuit of new knowledge and innovative ideas in chemical engineering through industry-institute interaction and facilitate progressive research.
- Practice ethical approach, pursue sustainable development and instill a passion for lifelong learning.

Program Educational Objectives (PEOs)

- Succeed in their chosen career path, as practitioners in process industries and organizations or pursue advanced technical and professional degrees.
- Exhibit the required mathematical and problem-solving skills and competencies, necessary to adapt to the changing technologies and become lifelong learners.
- Possess integrity and ethical values both as individuals and in team environments and address global and societal issues including health, safety and protection of environment.

Program Specific Outcomes (PSOs)

- Analyze and apply the knowledge of Unit Operations and Unit Processes to function as process engineer.
- Design process equipment and develop processes considering safety, economic, environmental and ethical aspects.
- Communicating effectively with peers and society and function as a member or a leader for managing projects, adapting to technological changes.

Program Outcomes (POs)

Engineering graduates will be able to:

- **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **Problem analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **Conduct investigation of complex problem:** Use research- based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse, and in multidisciplinary settings.
- **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage project and in multidisciplinary environment.
- **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

About IIChE….

Indian Institute of Chemical Engineers is a confluence of streams of professionals from academia, research institutes and industry. It provides an appropriate forum for joint endeavours to work for human beings through application of chemical engineering and allied sciences. Programmes of IIChE are immensely beneficial, opening up doors of new and existing possibilities.

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 are out of their academic precincts

Vision

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

- To promote advancement of chemical engineering and draw up a code of ethics in the profession
- To maintain and widen contacts with chemical engineering professionals in India and abroad
- To 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, monographs, proceedings of seminars/symposia/workshops
- To conduct meeting and transact business in administrative, academic and technical matters relating to the profession

Mission

The primary objective of a student's chapter is to promote among chemical engineering undergraduates a feeling of fraternity, brotherhood and to complement the objectives and activities of the institute. It shall also render all possible assistance to the regional centers in matters relating to student members.

Objectives

The activities of the student's chapter specifically include the following:

- To arrange lectures, film shows and video shows related to the chemical engineering education and profession
- To arrange seminars, workshops, group discussions and debates and to promote interaction of the institute with industry
- To establish and operate book banks for the use of its members
- To arrange excursions and plant visits of interest to chemical engineers' undergraduates
- To assist and guide student chemical engineers in their career planning and placement

IIChE Torch Bearers for the academic year 2021 – 2022

Faculty in charge	:Prof. Manikandan P. M.
Secretary	:Mr. Sidharth J Chand
Joint Secretary	:Mr. Sagar S Kumar
Treasurer	:Miss. Kavya Das
Executive Members	:Mr. Harishankar A R
	Miss. Amritha Sudarsan
	Mr. Anand R P
	Miss. Nithya V G
	Mr. Akash S Babu
	Miss. Vaidehi M J

IT IS WITH GENUINE GRATITUDE AND WARM REGARD THAT

WE DEDICATE THIS WORK TO OUR FRIENDS AND FAMILY

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THE SUPER-ENZYME

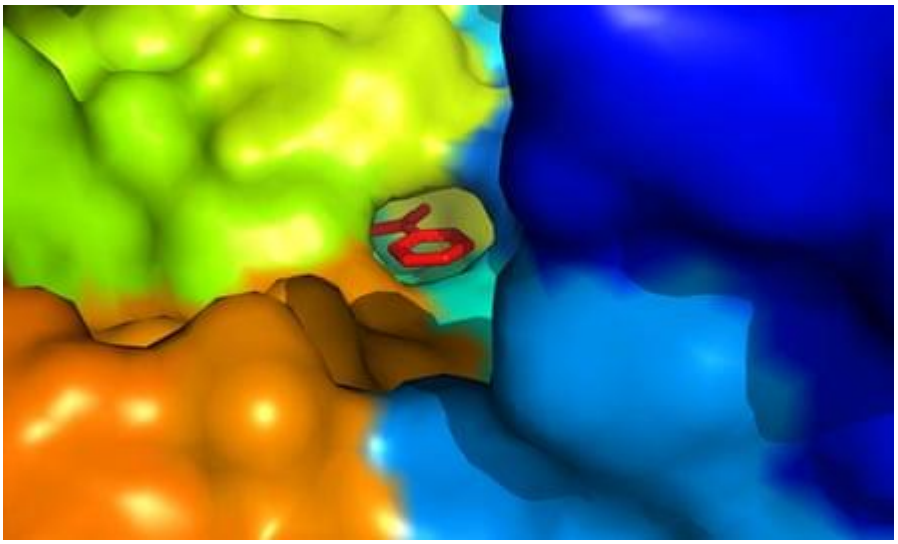
A super-enzyme that degrades plastic bottles six times faster than before has been created by scientists and could be used for recycling within a year or two.

The super-enzyme, derived from bacteria that naturally evolved the ability to eat plastic, enables the full recycling of the bottles. Scientists believe combining it with enzymes that break down cotton could also allow mixed-fabric clothing to be recycled. Today, millions of tons of such clothing is either dumped in landfill or incinerated.

Plastic pollution has contaminated the whole planet, from the Arctic to the deepest oceans, and people are now known to consume and breathe microplastic particles. It is currently very difficult to break down plastic bottles into their chemical constituents in order to make new ones from old, meaning more new plastic is being created from oil each year.

The super-enzyme was engineered by linking two separate enzymes, both of which were found in the plastic-eating bug discovered at a Japanese waste site in 2016. The researchers revealed an engineered version of the first enzyme in 2018, which started breaking down the plastic in a few days. But the super-enzyme gets to work six times faster.

“When we linked the enzymes, rather unexpectedly, we got a dramatic increase in activity,“ said Prof John McGeehan, at the University of Portsmouth, UK. “This is a trajectory towards trying to make faster enzymes that are more industrially relevant. But it’s also one of those stories about learning from nature, and then bringing it into the lab.”



Bacteria that break down natural polymers like cellulose have evolved this twin approach over millions of years. The scientists thought by connecting the two enzymes together, it might increase the speed of degradation, and enable them to work more closely together.

The linked super-enzyme would be impossible for a bacterium to create, as the molecule would be too large. So the scientists connected the two enzymes in the laboratory and saw a further tripling of the speed.

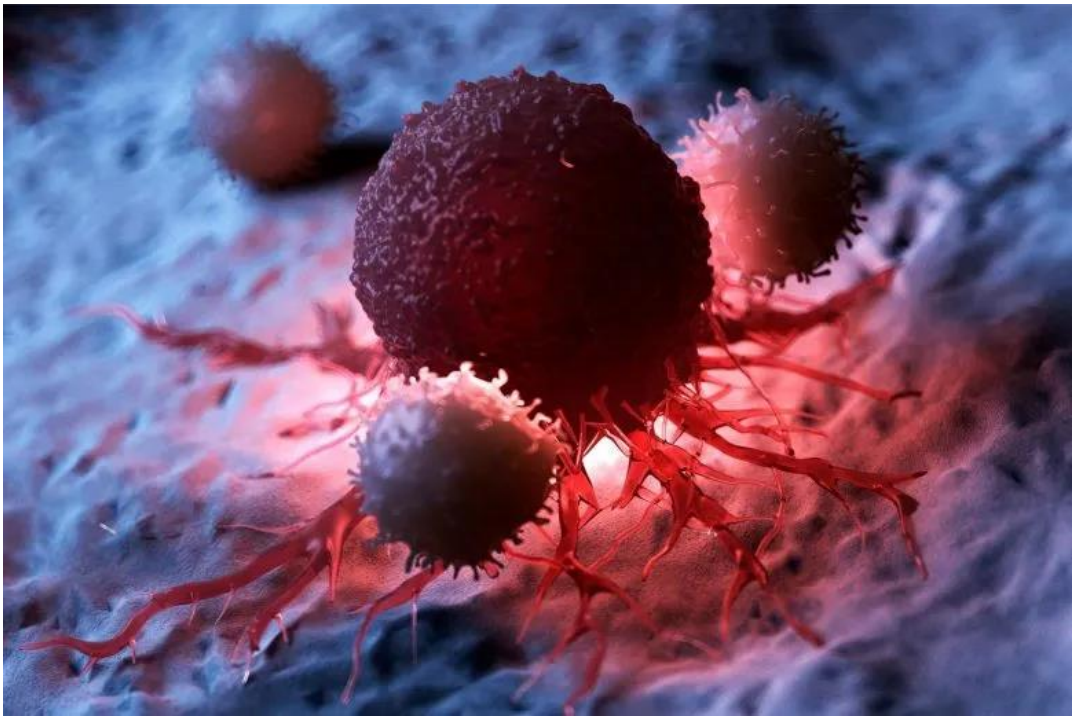
Combining the plastic-eating enzymes with existing ones that break down natural fibres could allow mixed materials to be fully recycled, McGeehan said. “Mixed fabrics [of polyester and cotton] are really tricky to recycle. We’ve been speaking to some of the big fashion companies that produce these textiles, because they’re really struggling at the moment.”

NANOMACHINES

Scientists Develop “Nanomachines” That Can Penetrate and Kill Cancer Cells

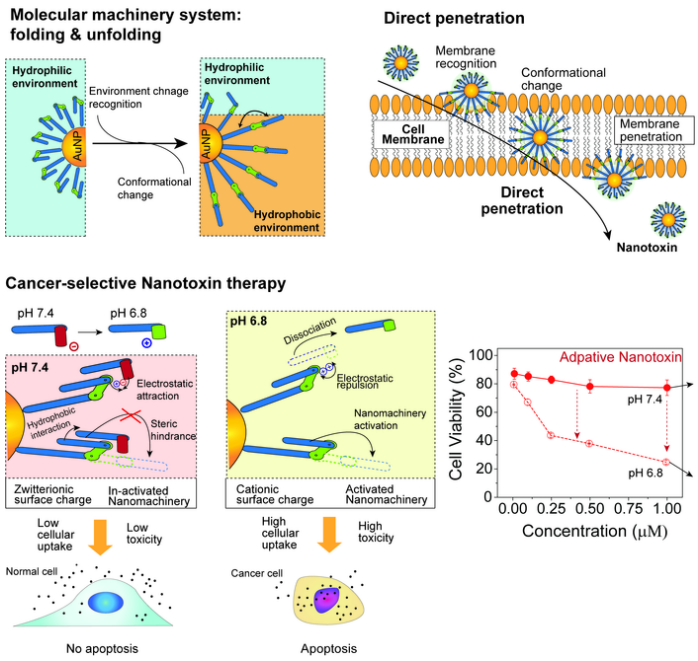
Cancer is a condition where some of the body’s cells grow out of control and spread to other bodily regions. Cancer cells divide continually, leading them to invade surrounding tissue and form solid tumors. The majority of cancer treatments involve killing the cancer cells.

According to 2020 estimates, 1.8 million new instances of cancer were diagnosed in the US, and 600,000 people passed away from the condition. Breast cancer, lung cancer, prostate cancer, and colon cancer are the most common cancers. The average age of a cancer patient upon diagnosis is 66, and individuals between the ages of 65 and 74 account for 25% of all new cancer diagnoses.



Proteins are involved in every biological process and use the energy in the body to change their structure via mechanical movements. They are referred to as biological ‘nanomachines’ since even minor structural changes in proteins have a substantial impact on biological processes. To implement movement in the cellular environment, researchers have focused on the development of nanomachines that imitate proteins. However, cells use a variety of mechanisms to defend themselves against the effect of these nanomachines. This restricts any relevant mechanical movement of nanomachines that could be used for medical purposes.

The research team headed by Dr. Youngdo Jeong from the Center for Advanced Biomolecular Recognition at the Korea Institute of Science and Technology (KIST) has reported the development of a novel biochemical nanomachine that penetrates the cell membrane and kills the cell via the molecular movements of folding and unfolding in certain cellular environments, such as cancer cells. They collaborated with the teams of Professor Sang Kyu Kwak from the School of Energy and Chemical Engineering and Professor Ja-Hyoung Ryu from the Department of Chemistry at the Ulsan National Institute of Science and Technology (UNIST), and Dr. Chaekyu Kim of Fusion Biotechnology, Inc.



A BETTER KIND OF FACE MASK

An N95 respirator mask is designed to provide a very tight fit on the face and highly effective airborne particle filtering.

Researchers at Rensselaer Polytechnic Institute have created a practical method for producing N95 face masks that are both excellent germ barriers and on-contact germ killers. The antiviral and antibacterial masks may be worn for longer periods of time, which would result in less plastic waste as the masks would not need to be replaced as often.

In order to combat infectious respiratory diseases and environmental pollution, Helen Zha, assistant professor of chemical and biological engineering and a member of the Center for Biotechnology and Interdisciplinary Studies at Rensselaer (CBIS), worked with Edmund Palermo, associate professor of materials science and engineering and a member of the Center for Materials, Devices, and Integrated Systems (cMDIS) at Rensselaer.

“The active filtration layers in N95 masks are very sensitive to chemical modification,” said Zha. “It can make them perform worse in terms of filtration, so they essentially no longer perform like N95s. They’re made out of polypropylene, which is difficult to chemically modify. Another challenge is that you don’t want to disrupt the very fine network of fibers in these masks, which might make them more difficult to breathe through.”

Zha and Palermo, along with other researchers from Rensselaer, Michigan Technological Institute, and Massachusetts Institute of Technology, covalently attached antimicrobial quaternary ammonium polymers to the fiber surfaces of nonwoven polypropylene fabrics using ultraviolet (UV)-initiated grafting. The fabrics were donated by Hills Inc. courtesy of Rensselaer alumnus Tim Robson.

“The process that we developed uses a really simple chemistry to create this non-leaching polymer coating that can kill viruses and bacteria by essentially breaking open their outer layer,” said Zha. “It’s very straightforward and a potentially scalable method.”

The team used only UV light and acetone in their process, which are widely available, to make it easy to implement. On top of that, the process can be applied to already manufactured polypropylene filters, rather than necessitating the development of new ones.

Healthcare workers were even reusing masks that were intended to be single-use. Fast forward to 2022 and face masks of all types are now widely available. However, COVID rates are still high, the threat of another pandemic in the future is a distinct possibility, and single-use, disposable masks are piling up in landfills.

5 Ways Chemical engineering is involved in the fight against COVID-19

1. Sanitizers

The development of effective hand sanitizers involves research on quick action effectual alcohols and other chemical which destroy almost all categories of pathogenic organisms. This composition and its large-scale production for the masses is designed by a chemical engineer.

2. Masks

3. PPE Kits

Designing PPE kits that are breathable for the skin while offering maximum protection from the virus to the wearer is another challenge chemical engineers want to tackle. The PPE kits now are not breathable and cannot be worn for long periods without uncomfortable consequences. The development of suitable fabric which achieves the goals of safety and comfort needs contribution from chemical engineers.

4. Medicines
5. Rapid diagnosis and Vaccine development

Chemical engineers are trying to create a membrane-incorporated, viral-particles-separation device. This device could be used to separate virus particles or serum from 15 mL whole blood in 10 minutes without the need for a centrifuge or electricity. This can help in developing methods of rapid diagnosis and expediting vaccine development. Chemical engineers in the pharmaceutical and research fields are directly involved in the development of COVID 19 disease fighting equipment and drugs against the disease.

BASIC CHEMICAL ENGINEERING G K

1. Which one of the following is incombustible ?

   A. H_2

   B. CCl4

   C. C_2H_2

   D. S

Answer: Option **B**

2. The softness or hardness of a grinding wheel depends upon the type & amount of bonding material used. For general purpose cutter grinding _____ grinding wheel is normally used.

   A. hard

   B. soft

   C. silicon carbide

   D. aluminium oxide

   Answer: Option **D**

3. Tin based white metals are used, where bearings are subjected to

   A. high pressure & load.

   B. low pressure & load.

   C. high temperature.

   D. large surface wear.

   Answer: Option **A**

4. Friction factor for fluid flow in pipe does not depend upon the

   A. pipe length.

   B. pipe roughness.

   C. fluid density & viscosity.

   D. mass flow rate of fluid.

   Answer: Option **A**

5. All of the following alloying elements of steel increases hardness but sacrifice ductility, except

   A. nickel

   B. vanadium

   C. molybdenum

   D. chromium

   Answer: Option **A**

6. Chromium molybdenum steel can not be welded using _____ welding.

   A. thermit

   B. electrical resistance

   C. oxy-acetylene

   D. any of these

   Answer: Option **B**

7. Speisses is a mixture of the following:

   A. Arsenides of heavy metals.

   B. Antimonides of heavy metals.

   C. Arsenides & antimonides of heavy metals.

   D. Iron, cobalt and nickel.

   Answer: Option **A**

8. In chemical dehumidification process

   A. wet bulb temperature increases.

   B. dry bulb temperature remains constant.

   C. dew point temperature increases.

   D. dry bulb temperature increases.

   Answer: Option **B**

9. Secondary hardening in steels arises out of the

   A. precipitation of fine alloy carbides at high temperatures.

   B. refinement of ferrite grain size by working.

   C. decomposition of retained austenite upon heat treatment.

   D. precipitation of complex inter-metal-lics upon heat treatment.

   Answer: Option **C**

10. The _____ of a double acting reciprocating pump as compared to the single acting pump will be almost double.

   A. flow output

   B. head developed

   C. overall efficiency

   D. weight

   Answer: Option **A**

11. The most commonly used combustion system manufactured in India for the thermal power plant boilers is the _____ combustion system.

   A. pulverised fuel

   B. travelling grate stoker firing

   C. circulating fluidised bed

   D. fluidised bed

   Answer: Option **A**

12. The transition temperature at which all the ferromagnetic materials become paramagnetic materials is termed as the 'Curie temperature'. Its value for cobalt is _____ °C.

   A. 768

   B. 1127

   C. 1359

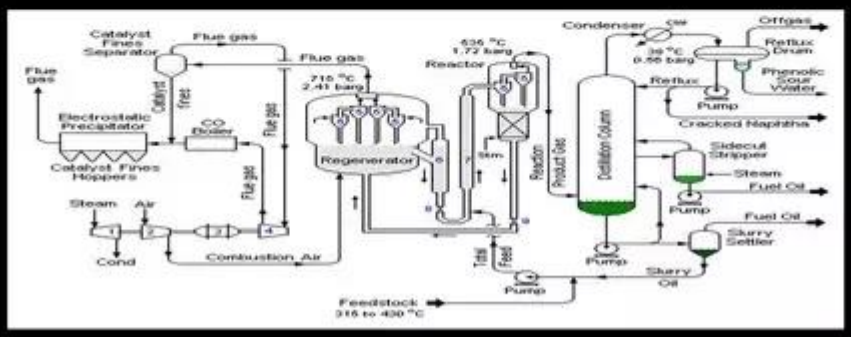
   D. 1480

   Answer: Option **B**

in Chemistry:

$$A + B \rightarrow C + D$$

in Chemical Engineering:



Thank you