PLASTIVISION

Let’s Bring the Change Together!

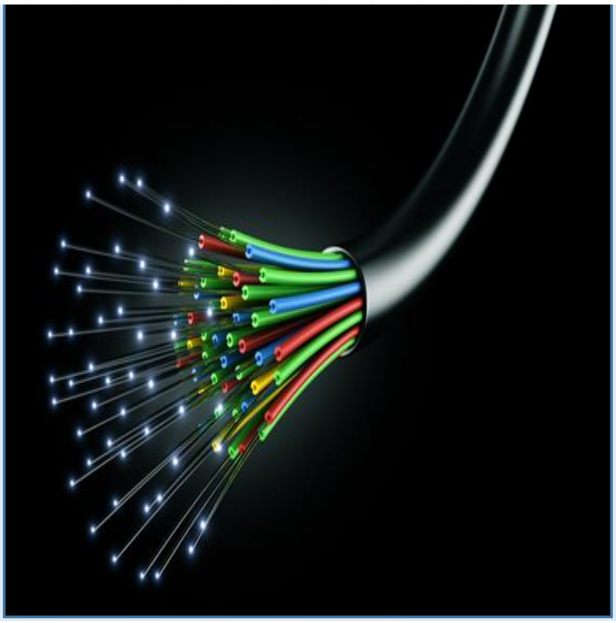
PLASTICS RECYCLING

MACHINERY, PROCESSING AND THE BUSINESS OF RECYCLING

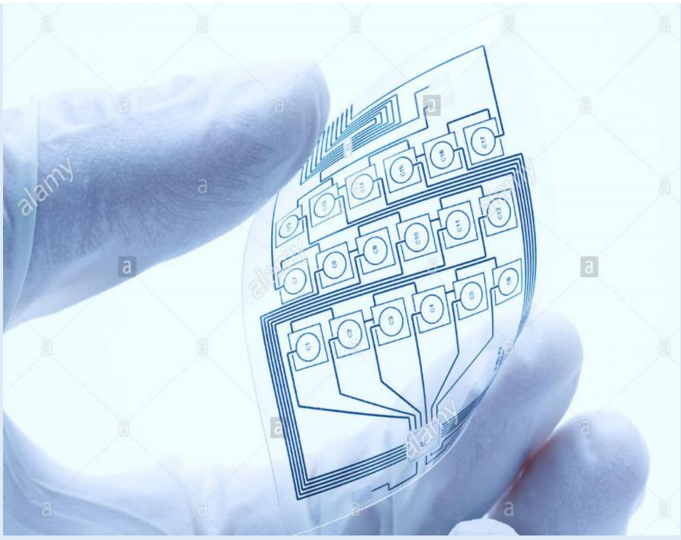
Department of Plastic & Polymer Engineering

MIT™
Quest for Excellence

Gramaudyogik Shikshan Mandal’s
MIT™
A Group of Academic & Research Institutions
AURANGABAD



Welcome to the world of Plastic Advancement



Issue Editor: **Bhargav.A.Patel**

VISION OF THE DEPARTMENT

Department of plastic & polymer engineering aspires to achieve excellence by importing education & training to develop young technocrats as multidimensional personalities for the series of mankind.

MISSION OF THE DEPARTMENT

To impart quality education to the aspiring students for fulfilling technologies and societal needs by providing

~ State of the art infrastructural facilities and competent facilities.

~ Practical training to face challenge of modern plastic and polymer industries.

Content

Message from Hod's Desk

The E-magazine of plastic and polymer engineering is an endeavour of our student, which has paved from last few years. I hope this edition would grow interest among the readers about the application of polymer. It is a great pleasure that our Department of Plastic and Polymer Engineering is releasing Issue 5 of "PLASTVISION", for this academic year to explore the creative ideas and activities of our students. In an era of digitization and e learning, it is apt to go digital for expressing our views on different socio-economic, political or cultural issues. It is an active platform for both staff and students to share information, latest technical knowledge and imaginations in all dimensions. This magazine would not have been possible without the enthusiastic and hard work of all student participants, editorial board members and all faculty members. I register my sincere appreciation to the students and editorial team for their timely effort to bring this issue of magazine. I wish all the staff members and students for success in their future endeavours'.

Dr. Aniruddha Chatterjee

EDITORIAL MESSAGE

Dear Readers,

It gives us immense pleasure and satisfaction to introduce our fifth issue of 'E-PLASTVISION' Magazine for the academic session 2020-21. So this time we have attempted to bring out the talent concealed within our student community, which would help to enhance the practical value of Plastic and Polymer Engineering. This issue includes informative technical as well as non-technical articles and many other things. Plastic and Polymers have given the speed and flexibility to humans to perform their day-to-day task. I express my happiness towards the steps taken by the Institute and the Department in strengthening Engineering and Technology through such a type of activity. We hope you will enjoy reading this issue as much as we have enjoyed while making it. I thank my editorial team, technical team, authors and well-wishers, who are promoting this magazine and making it informative.

Dr. Saurabh Tayde

Co-Editorial Message

Mr Ajinkya M Satdive

Assistant Professor, PPED

"The duty must be performed; let the efforts be successful or not; let the work be appreciated or not. When a man's sincerity of purpose and capacity is proved even his enemies come to respect him"

-Dr Ambedkar

I am glad to pen this wonderful E-Magazine as an appreciation of the commendable efforts put forth by the team for its next issue. The efforts taken to bring about innovative content is appreciable. This E-Magazine is a platform for the students to express their creative pursuit which develops in them originality of thought and perception. The most important aspect we could derive from this stupendous effort is that it brings out the various technical and analytical skills of budding engineers.

I welcome students with more interest in bringing the article with more bright concepts and innovative ideas in the next issue. I wish them to experience victory in all of their future endeavours.

Issue Editor,

Bhargav.A.Patel

(3rd year)

After the Success of our last Issue of E-Magazine. It is my immense pleasure to publish the fifth issue of Plastvision 2021. The objective of this issue is to accumulate latest innovation and technique used in polymer industry for various application in today's life. As we all know this is a very crucial time for all of us during this crisis, I hope we all must stay safe and keep updating our knowledge and ideas.

Glance of Department

MIT-Centre for Industry Relevance in Polymer Science and Technology (M-CIP)

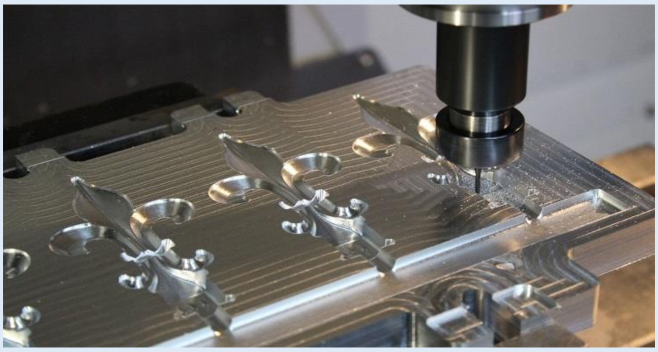
Objectives

- *Establish Training Centre for all Plastic manufacturing processes.*
- *Provide maximum facility to new comers in advanced industrial research and innovation.*
- *Provide support to the industry to student & industrial people.*

Facilities at M-CIP

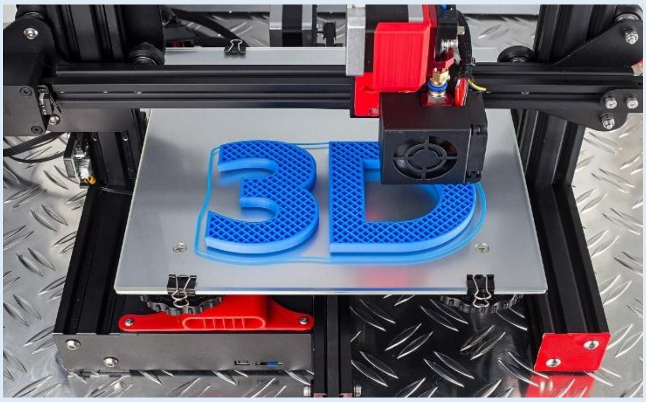
- ❖ *WE PROVIDE QUALITY SERVICE & SUPPORT*
- ❖ *MOLD TESTING*
- ❖ *TRIAL RUNS*
- ❖ *INDUSTRIAL CONSULTANCY*
- ❖ *MATERIAL TESTING*
- ❖ *IN-PLANT TRAINING FOR STUDENTS*

Advanced CNC Machine



The advanced CNC machines are common in most of the present day production departments. For these companies the fabrication of metals is the core business and they must develop expertise in these processes and economize them as to stay in the market. The automation has become a norm in the production industry and almost all the +machine tools have been replaced by the CNC machine tools. The advantages offered by this machine are immense.

3-D Printing Machine



3D printing, or additive manufacturing, is the construction of a three-dimensional object from a CAD model or a digital 3D model. The term "3D printing" can refer to a variety of processes in which material is deposited, joined or solidified under computer control to create a three-dimensional object, with material being added together (such as liquid molecules or powder grains being fused together), typically layer by layer.

The 3D printer, which we have in M-CIP, is,

<u>Fused Deposition Modelling (FDM)</u>

Fused deposition modelling (FDM) is a common desktop 3D printing technology for plastic parts. An FDM printer functions by extruding a plastic filament layer-by-layer onto the build platform. It is a cost-effective and quick method for producing physical models.

Centre For Advanced Material Research and Technology (CAMRT)

Lab Scale Facilities

Rubber compounding Two-Roll Mill

Single Screw Extruder

Piloting/Commercial Facilities

Injection moulding Machine

Compression Moulding Machine

Rotational Moulding Machine

3-D Printing

Stretch Blow Moulding Machine

Training

Safety

Machine Handling

Refresher Course

Analytical Instrument

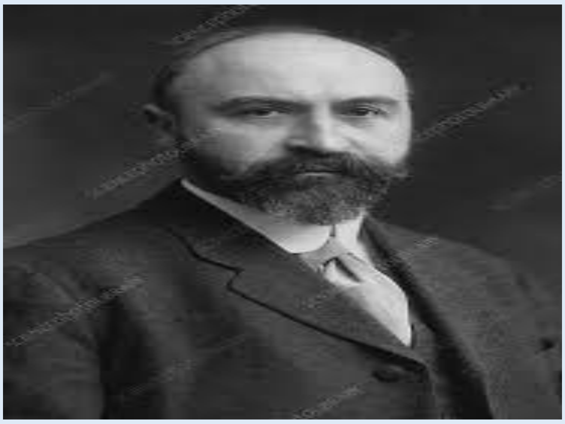
Custom

Performing Particle Size Analysis on Particle Size Analyzer

From the student corner

The renowned Polymer Scientist

by: Akash Malusare



Leo Hendrik Baekeland (November 14, 1863 – February 23, 1944.

He was a Belgian chemist. He is best known for the inventions of Velox photographic paper in 1893, and Bakelite in 1907.He has been called "The Father of the Plastics Industry for his invention of Bakelite, an inexpensive, non-flammable and versatile plastic, which marked the beginning of the modern plastics industry.

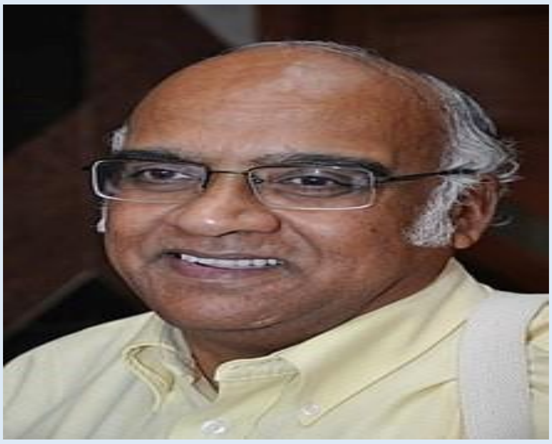
Early life

Leo Baekeland was born in Ghent, Belgium, on November 14, 1863. He spent much of his early life in Ghent, Belgium. Proudly, he graduated with honours from the Ghent Municipal Technical School and was awarded a scholarship by the City of Ghent to study chemistry at the Ghent University, which he entered in 1880. He acquired PhD maxima at the age of 21. After a brief appointment as Professor of Physics and Chemistry at the Government Higher Normal School in Bruges (1887–1889), he was appointed associate professor of chemistry at Ghent University in 1889.

Invention of Bakelite

Having been successful with Velox, Baekeland set out to find another promising area for chemical development. As he had done with Velox, he looked for a problem that offered "the best chance for the quickest possible results". By the 1900s, chemists had begun to recognize that many of the natural resins and fibres were polymeric, a term introduced in 1833 by Jon's Jacob Berzelius, Adolf von Baeyer had experimented with phenols and formaldehydes in 1872. He created a "black guck" which he considered useless and irrelevant to his search for synthetic dyes.

He familiarized himself with previous work and approached the field systematically, carefully controlling and examining the effects of temperature, pressure and the types and proportions of materials used. The first application that appeared promising was the development of a synthetic replacement for shellac (made from the secretion of lac beetles). Baekeland produced a soluble phenol-formaldehyde shellac called "Novolak" but concluded that its properties were inferior. Baekeland continued to explore possible combinations of phenol and formaldehyde, intrigued by the possibility that such materials could be used in moulding. By controlling the pressure and temperature applied to phenol and formaldehyde, he produced his dreamed-of hard mouldable plastic: Bakelite. Bakelite was made from phenol, and then known as carbolic acid, and formaldehyde. The chemical name of Bakelite is polyoxybenzylmethylenglycolanhydride. The invention of Bakelite marks the beginning of the age of plastics. Bakelite was the first plastic invented that retained its shape after being heated. Radios, telephones and electrical insulators were made of Bakelite because of its excellent electrical insulation and heat-resistance. Soon, its applications spread to most branches of industry. Baekeland received many awards and honours, including the Perkin Medal in 1916 and the Franklin Medal in 1940. In 1978, he was posthumously inducted into the National Inventors Hall of Fame at Akron, Ohio.



Swaminathan Sivaram (born 4 November 1946)

He is an Indian polymer chemist, inventor, institution builder and a former director of the National Chemical Laboratory, Pune. He is known for his pioneering work on alkylation of tertiary alkyl halides with trialkylaluminum and olefin polymerization and holds the highest number of US patents by an Indian working outside the US. He is a fellow of several significant professional organizations. The Government of India awarded him the fourth highest civilian honour of the Padma Shri, in 2006, for his contributions to Indian science.

Sivaram was born in the south Indian state of Tamil Nadu on 4 November 1946. His early college studies were at Madras Christian College from where he passed the graduate degree (BSc) in chemistry in 1965 after which he secured his master's degree (MSc) from the Indian Institute of Technology, Kanpur in 1967. Moving to the US, he did his doctoral research under Herbert C. Brown at Purdue University and secured his doctorate (PhD) in 1972. He continued in the US for two more years and worked as a research associate at the Institute of Polymer Science of the University of Akron, Ohio. He returned to India in 1973 and joined the Indian Petrochemicals Corporation Limited (IPCL). When he moved to the National Chemical Laboratory (NCL) as the Head of the Department of Polymer Chemistry. In 2002, he was promoted as the director of the institution and worked there until his superannuation in 2010.

During his US days, Sivaram was associated with Herbert C. Brown and J. P. Kennedy and worked on alkylation of tertiary alkyl halides with trialkylaluminum. His researches along with Kennedy is reported to have assisted in widening the knowledge base on the mechanism of carbocation polymerization and led to the latter-day techniques of controlled and living carbocation polymerization. His researches have also helped in creating new properties in polymers and threw more light on the synthesis, structure and properties of polymeric materials. He has also worked on polymer-layered clay nanocomposites and has been successful in synthesizing several organic modifiers for clay for the preparation of exfoliated nanocomposite of clay.

He is the holder of approximately 100 patents of which 50 are approved in the US. He is known to be the holder of the highest number of US patents by an Indian-based outside the US and many of his inventions have been put to commercial use in India and abroad.

Siva ram's efforts are known in the establishment of the first R&D centre on petrochemical research in India at NCL and transforming the organization into a centre for interdisciplinary research. He is the founder of the NCL Innovation Park and the Technology-Business Incubator under the aegis of the Council of Scientific and Industrial Research (CSIR), a first time in India. . He is the founder chairperson Venture Centre (Entrepreneurship Development Centre), a not-for-profit initiative by the National Chemical Laboratory for promoting technology and knowledge-based enterprises for India, and sits on its Board of Directors.

The Government of India included him in the 2006 Republic Day Honours list for the civilian award of the Padma Shri[4] and in 2010, Kurukshetra University awarded him the Royal Prize for Applied Sciences for the year 2007. The same year, he received the Material Scientist of the Year Award of the Materials Research Society of India...

Ethanol (Alternate fuel of Future)

Atharva V. Maggirwar

Crude oil is a non-renewable resource having limited deposits and can be extinct in future.

As we know that rate of petrol is increasing day by day because of the high cost of import of crude oil, which is affecting Indian economy.

Thus, to overcome such a burning issue we can have a solution of ethanol.

Ethanol can be blend in maximum percent with petrol, along with those engines can be developed working fully on ethanol. Eventually the need to import of the crude oil will decrease considerably and the Indian economy will be saved. On the other hand, farmers will also earn some extra money from waste.

Cost of ethanol is less compared to the petrol and hence it will be proved more pocket friendly.

In addition, it adds an advantage of controlling an air pollution, as it does not release carbon dioxide and any other pollutants into an environment.

It has medical applications as an antiseptic and disinfectant. It is used as a chemical solvent and in the synthesis of organic compounds. Ethanol is a fuel source.

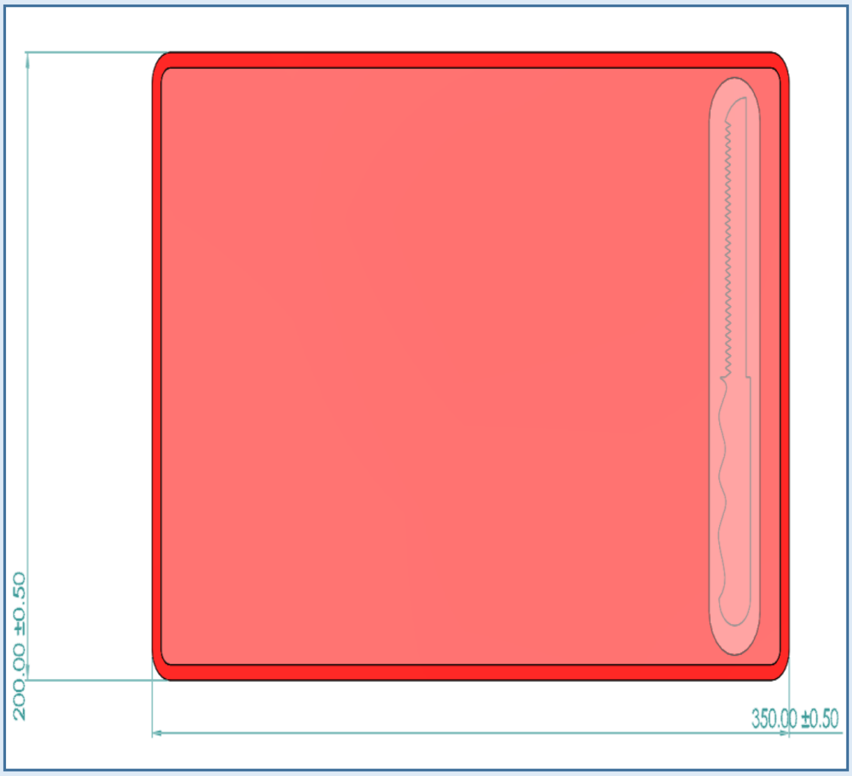
Ethanol is a renewable fuel made from corn and other plant materials. Ethanol use is widespread, and more than 98% of gasoline in the U.S. contains some ethanol. The most common blend of ethanol is E10 (10% ethanol, 90% gasoline). Ethanol is also available as E85 (or flex fuel)—a high-level ethanol blend containing 51% to 83% ethanol, depending on geography and season—for use in flexible fuel vehicles. E15, another blend, is increasing its market presence.

Ethanol blending in India has reached more than 7.2%.In states such as Goa, Karnataka, Maharashtra, Gujarat, Uttar Pradesh, Haryana, Punjab, Delhi, Uttarakhand and Himachal Pradesh 9.5-10% of ethanol are blend with petrol.

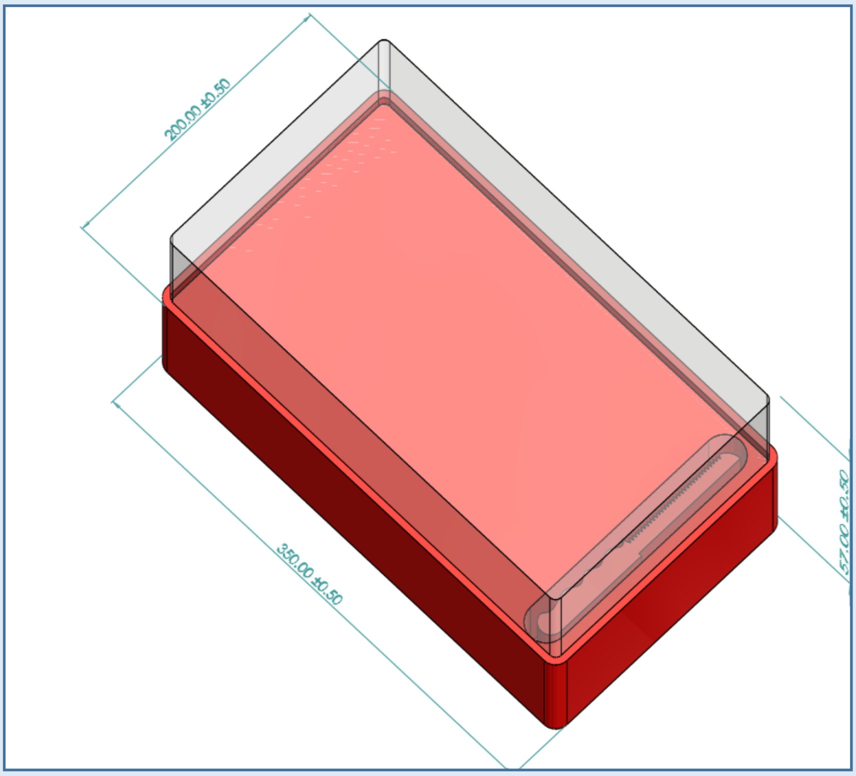
In addition, putting the country on course to meet the target of 10% blending by 2022.

Vegetable cutting board 3D Design

Vaibhav Patil



In this board, the length is 35 cm, breadth is 20 cm and the height near about is 2.5 cm. There is slot of 2 cm provided for holding the knife. The upper case provide that have almost same dimensions for covering chopped vegies and fruits. The baseboard is made up of polycarbonate (PC) and the case made up of polyethylene terephthalate (PET).



FEATURES: -

The designed slot inside the baseboard would help for holding the knife when your cutting is completed.

The transparent case would help to hold the chopped substances for at least one day.

This board would definitely have some limitations but the concept is just to introducing its new feature.

Importance of 3D Printing in medical Field

Bhargav.A.Patel

Advances in 3D printing, also called additive manufacturing, are capturing attention in the health care field because of their potential to improve treatment for certain medical conditions. A radiologist, for instance, might create an exact replica of a patient's spine to help plan a surgery; a dentist could scan a broken tooth to make a crown that fits precisely into the patient's mouth. In both instances, the doctors can use 3D printing to make products that specifically match a patient's anatomy.

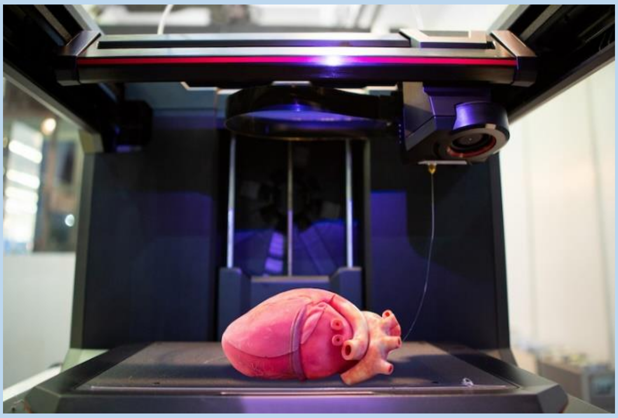
3D printing has enabled the production of customized prosthetic limbs, cranial implants, or orthopaedic implants such as hips and knees. At the same time, it is potential to change the manufacturing of medical products—particularly high-risk devices such as implants—could affect patient safety, creating new challenges for Food and Drug Administration (FDA) oversight.

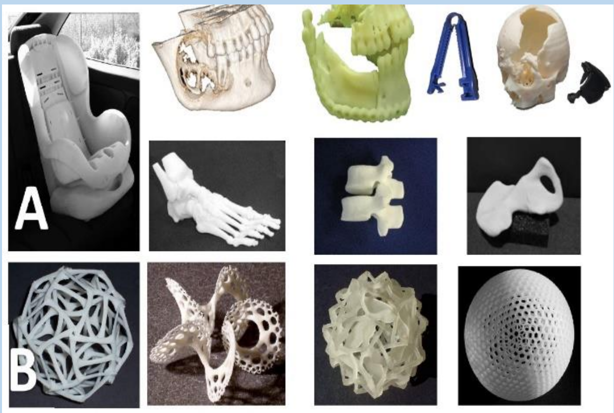
Unlike traditional methods, in which products are created by shaping raw material into a final form through carving, grinding, or moulding, 3D printing is an additive manufacturing technique that creates three-dimensional objects by building successive layers of raw material such as metals, plastics, and ceramics. The objects are produced from a digital file, rendered from a magnetic resonance image (MRI) or a computer-aided design (CAD) drawing, which allows the manufacturer to easily make changes or adapt the product as desired. 3D printing approaches can differ in terms of how the layers are deposited and in the type of materials used.

This type of procedure has been performed successfully in surgeries ranging from a full-face transplant to spinal procedures and is beginning to become routine practice.

In Dubai, where hospitals have a mandate to use 3D printing liberally, doctors successfully operated on a patient who had suffered a cerebral aneurysm in four veins, using a 3D printed model of her arteries to map out how to safely navigate the blood vessels.

In January 2018, surgeons in Belfast successfully practiced for a kidney transplant for a 22-year-old woman using a 3D printed model of her donor's kidney. The transplant was fraught with complications as her father, who was her donor, had an incompatible blood group and his kidney was discovered to have a potentially cancerous cyst. Using the 3D printed replica of his kidney, surgeons were able to assess the size and placement of the tumour and cyst.





Need of plastic recycling

Mayur Parmar

Plastics are durable, lightweight and inexpensive materials. They can readily be moulded into various products, which find uses in a plethora of applications. Every year, more than 420 million tons of plastics are manufactured across the globe. Consequently, the reuse, recovery and the recycling of plastics are extremely important. Plastic recycling refers to the process of recovering waste or scrap plastic and reprocessing the materials into functional and useful products. This activity is known as the plastic recycling process. The goal of recycling plastic is to reduce high rates of plastic pollution while putting less pressure on virgin materials to produce brand new plastic products. This approach helps to conserve resources and diverts plastics from landfills or unintended destinations such as oceans.

Ongoing innovations in recycling technologies have made the plastic recycling process easier and more cost-effective. Such technologies include reliable detectors and sophisticated decision and recognition software that collectively enhance the productivity and accuracy of automatic sorting of plastics.

Another notable innovation in plastic recycling has been in finding higher value applications for recycled polymers in closed-loop recycling processes. Since 2005, for example, PET sheets for thermoforming in the UK can contain 50 percent to 70 percent recycled PET through the use of A/B/A layer sheets.

Recently, some European countries including Germany, Spain, Italy, Norway, and Austria have begun collecting rigid packaging such as pots, tubs, and trays as well as a limited amount of post-consumer flexible packaging. Due to recent improvements in washing and sorting technologies, the recycling of non-bottle plastic packaging has become feasible.

The Association of Plastic Recyclers (APR): APR represents the international plastic recycling industry. It represents its members which include plastic recycling companies of all sizes, consumer plastic product companies, plastic recycling equipment manufacturers, testing laboratories and organizations that are committed to the advancement and success of plastic recycling. APR has multiple education programs to update its members about the latest plastic recycling technologies and developments.

Plastic in electric vehicle soaring

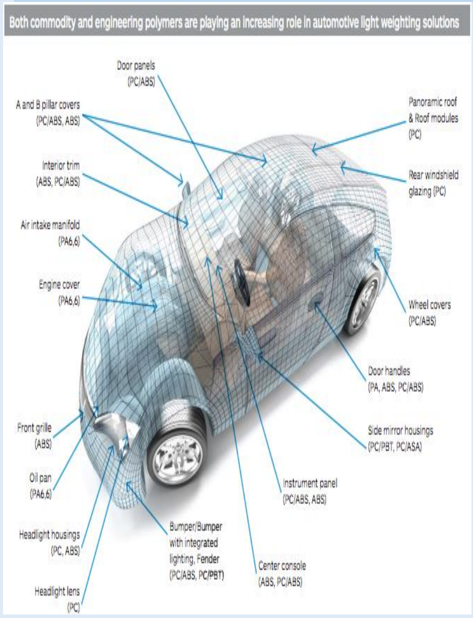
Atharva Kurd

The automotive industry is the third most important consuming sector of polymers after packaging and building & construction. Therefore, changes in the material usage can have major implications on polymer demand and the financial performance of polymer producers. In this article, we explain what impact electric vehicles will have on polymer consumption.

Thermoplastics polymer can be produced in various shapes and designs as per the requirement of electric vehicles due to the high versatility and easy moldability of plastics. The use of plastics for electric vehicles reduces the weight of these vehicles. Plastics offer excellent heat resistance that enables the construction of battery compartments and cooling systems and do not hamper the durability and safety provided by electric vehicles. The injection-moulded plastics are less costly than metal components, which attracts the attention of the manufactures of electric vehicle. According to type, the global plastic in electric vehicles market has been categorized into polypropylene, polystyrene, polycarbonates, ABS, and many more. Polypropylene accounted the highest shipment and is the most dominant type of plastic used in electric vehicles. Moreover, these synthetic polymers are used as metal substitute for various engineering as well as automotive applications due to their weight saving property which consequently increases fuel efficiency. Need for new solutions and alternative drive systems in order to compensate for the scarcity of fossil fuels coupled with reduced negative environmental impact of their emission is one of the major factor driving the plastic in electric vehicles market.

Currently, there are about 30,000 parts in a vehicle, out of which 1/3 are made of plastic. In total, about 39 different types of basic plastics and polymers are used to make an automobile.

The global plastic in electric vehicles market is estimated to grow with a CAGR of 37.3% during the forecast period and will reach $943.01m by 2021. The market was valued at US$ 966.09 million in 2019 and is projected to reach US$ 4,021.72 million by 2027; it is expected to grow at a CAGR of 19.7% during 2020-2027.



D30 Protection Rubber

Yash Ghodke

D3Ois an intellgent brand having speciality in advance protection fields, materials and products. It comprises a portfolio of more than 30 technologies and materials including set foams, formable foams, set elastomers and formable elastomers.

D3O is use in more than 50 counries. It is used in sports and motorcycle gear; protective cases for consumer electronics including phones; industrial workwear; and military protection including helmet pads and limb protectors.

In 1999, materials scientists Richard Palmer and Philip Green experimented with a dilatant liquid with non-Newtonian properties. Unlike water, it was free flowing when stationary but became instantly rigid upon impact.

When incorporated into clothing, the material moved with the wearer while providing comprehensive protection.

Application of D3o

1. Electronics
2. Motorcycle apparel
3. Military Defence
4. Sports

Graphene (A wonder material used to detect Covid-19 quickly and accurately)

By

Harshal Patil

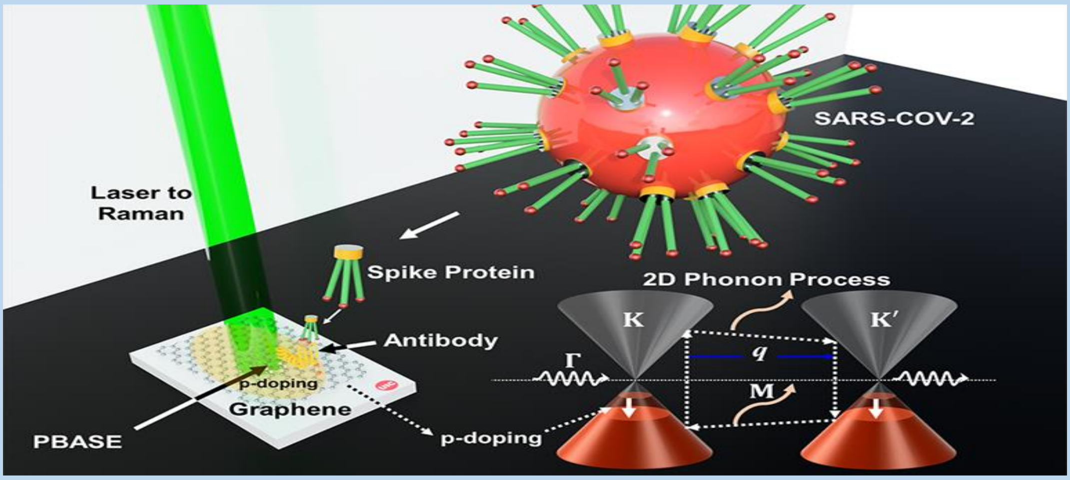
Tushar Patil

Adesh Siddhamsittiwar

Graphene, which has been called a "wonder material", has unique properties that make it highly versatile, making a type of sensor which has the ability to detect the covid-19 in minutes.

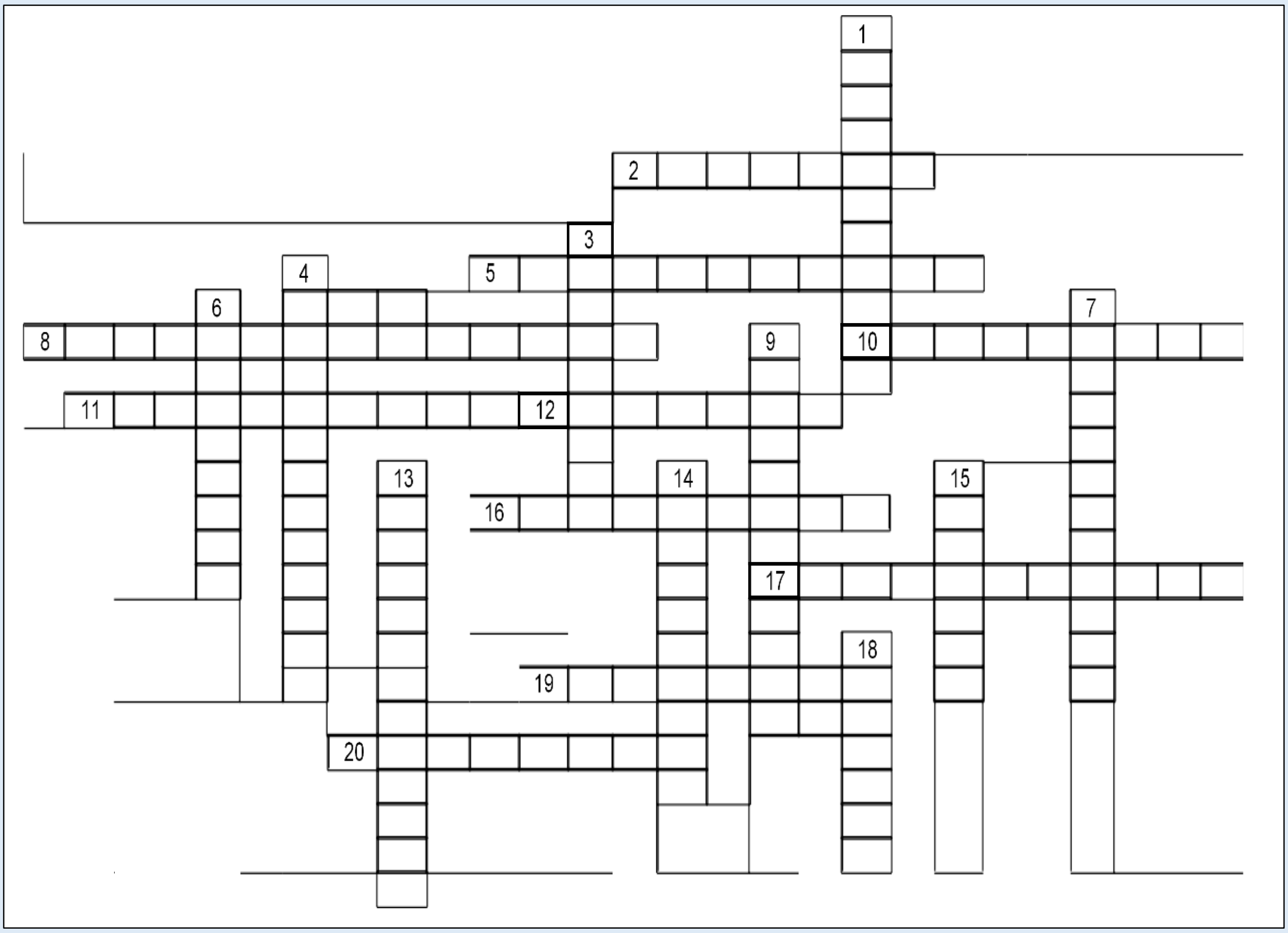
In experiments, researchers combined sheets of graphene, which are more than 1,000 times thinner than a postage stamp, with an antibody designed to target the infamous spike protein on the coronavirus. They then measured the atomic-level vibrations of these graphene sheets when exposed to COVID-positive and COVID-negative samples in artificial saliva. These sheets were also tested in the presence of other coronaviruses, like Middle East respiratory syndrome, or MERS-CoV. The vibrations of the antibody-coupled graphene sheet changed when treated with a COVID-positive sample, but not when treated with a COVID-negative sample or with other coronaviruses. Vibrational changes, measured with a device called a Raman spectrometer, were evident in under five minutes. When a molecule like a SARS-CoV-2 molecule interacts with graphene, it changes these resonant vibrations in a very specific and quantifiable way.

There is a clear need in society for better ways to quickly, accurately and inexpensively detect COVID and its variant to, Potential to make a real difference.



Crossword Puzzle

Abhijit Mohite



Across

2. Component of Safety Celluloid

5. The process of growing a polymer chain

8. The process of forming a large molecule by linking together smaller subunits

10. A polymer that springs back after being twisted or pulled

11. Type of polymer that cannot be reformed or remoulded after initial heat forming

12. A six carbon aromatic compound with alternating C=C double bonds

16. Natural component of first synthesized plastics

17. Type of polymer formed from two or more repeating monomers

19. The combination of molecules by sharing electrons with an adjacent molecule

20. First plastic made from synthetic materials

Down

1. Additive that gives plastics flexibility and durability

3. One of the small repeating units of a polymer

4. Type of natural thermoplastic

6. without a clearly defined form or shape.

7. The combination of two molecules through the loss of smaller molecule such as H_2o

9. Polystyrene produced when the phenol groups alternate on its backbone chain

13. Type of polymer that is remould able when heated

14. Type of rubber formed by heating with sulphur

15. Component of first the synthesized plastic

18. The disorder of molecules

Gate Syllabus

GATE Syllabus for Polymer Science and Engineering

Section 1: Chemistry of High Polymers:

Monomers, classification of polymers, melting transition, functionality, glass transition, degree of polymerizations, criteria for rubberiness, kinetics, different copolymers, polymerization methods: addition and condensation; their kinetics, copolymerization, monomer reactivity ratios and its significance, random, block and graft copolymers, metallocene polymers and other newer techniques of polymerization, techniques for copolymerization bulk, solution, suspension, emulsion.

Section 2: Polymer Characterization:

Solubility and swelling, determination of number average, the concept of average molecular weight, weight average, polymer crystallinity, microscopic (optical and electronic) techniques, viscosity average and Z-average molecular weights, analysis of polymers using IR, XRD, thermal (DSC, DMTA, TGA).

Section 3: Synthesis and Properties:

Commodity and general purpose thermoplastics: Acrylic, PE, PP, PS, PVC, Polyesters, PU polymers. Engineering Plastics: Nylon, PC, PBT, PSU, PPO, ABS, Fluoropolymers Thermosetting polymers: Unsaturated polyester, PF, MF, UF, Epoxy, Alkyds, Natural and synthetic rubbers: Recovery of NR hydrocarbon from latex, , EPDM, IIR, BR, SBR, Nitrile, CR, CSM, Silicone, TPE

Section 4: Polymer blends and Composites:

Difference between blends and composites, their significance, choice of polymers for blending, thermodynamics, phase morphology, blend miscibility-miscible and immiscible blends, polymer alloys, polymer eutectics, plastic-plastic, FRP, particulate, rubber-plastic and rubber-rubber blends, long and short fibre reinforced composites.

Section 5: Polymer Technology:

Polymer compounding-need and significance, crosslinking and vulcanization, vulcanization kinetics, different compounding ingredients for rubber and plastics.

Section 6: Polymer Rheology:

Molecular/segmental deformations at different zones and transitions, Flow of Newtonian and non-Newtonian fluids, different flow equations, the dependence of shear modulus on temperature, m. Measurements of rheological parameters by capillary rotating, parallel plate, cone-plate rheometer. Viscoelasticity-creep and stress relaxations, mechanical models, rubber curing in parallel plate viscometer, control of rheological characteristics through compounding, ODR and MDR.

Section 7: Polymer processing:

Compression moulding, calendaring, rotational moulding, rubber processing in the two-roll mill, internal mixer, blow moulding, reaction injection moulding, extrusion, transfer moulding, injection moulding, pultrusion, thermoforming.

Section 8: Polymer Testing:

Mechanical-static and dynamic tensile, fatigue, swelling, aging resistance, hardness, tear, resilience, impact, toughness, flexural, compressive, abrasion, endurance. Conductivity-thermal and electrical, dissipation factor, power factor, electric resistance, dielectric constant, surface resistivity, volume resistivity, and environmental stress cracking resistance.

MCQ of GATE

1) Styrene butadiene rubber (SBR) is.

(A) A natural rubber

(B) Another name of silicone rubber

(C) A synthetic polymer

(D) A synthetic monomer

2) Bakelite is

(A) Same as Polytetrafluoroethylene (PTFE)

(B) An inorganic polymer

(C) Same as thermoset phenol formaldehyde

(D) Not a polymer

3) __________ resins are produced by the condensation polymerisation of formaldehyde with urea or melamine.

(A) Epoxy

(B) Amino

(C) Alkyd

(D) Phenolic

4) Which of the following is an inorganic polymer?

(A) Teflon

(B) Perspex

(C) Silicones

(D) Bakelite

5) Buna-S is a __________ material.

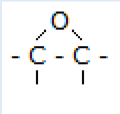
(A) Fibrous

(B) Plastic

(C) Resinous

(D) Rubbery

6) Epoxy resin is a polymer containing two or more groups of the bellow fig. is called epoxide group or ethoxyline group. It is a



(A) Polyamide & an elastomer

(B) Good adhesive

(C) Surface coating agent

(D) Both (b) and (c)

7) Which of the following has the weakest intermolecular forces?

(A) Polyisoprene

(B) Nylon-66

(C) Polystyrene

(D) Bakelite

8) Polystyrene is a __________ plastic at room temperature.

(A) Ductile

(B) Brittle

(C) Malleable

(D) None of these

9) Condensation polymerisation of __________ produces Bakelite.

(A) Propylene

(B) Phenol & formaldehyde

(C) Phenol & acetaldehyde

(D) Urea & formaldehyde

10) Thermosetting resins/polymers as compared to thermoplastic are

(A) Soluble in all organic solvents

(B) More brittle

(C) Formed by addition polymerization only

(D) Easily reshaped & reused

11) Branched chain polymers compared to linear polymers have higher.

(A) Density

(B) Tensile strength

(C) Melting point

(D) Degree of irregularity in atomic packing

12) Polyvinyl chloride (PVC)

(A) Is produced by Polycondensation reaction

(B) Uses either emulsion or suspension polymerization methods

(C) Can be made thermosetting by adding a plasticizer

(D) Softening temperature is 200°C

13) Condensation polymerization of caprolactam is carried out in the reactor maintained at a temperature of __________ °C for producing nylon-6.

(A) -20 to 25

(B) 50 to 75

(C) 100 to 150

(D) 250 to 280

14) In case of dry spinning of polymers, the polymer solution in a volatile solvent is forced through the spinnerates into a warm air chamber, where the solvent evaporates leaving behind the polymer in the filament form. Dry spinning is used for __________ fibres.

(A) Polythene

(B) PVC

(C) Rayon

(D) Polyvinyl acetate

Answers:

01. Answer: Option C 02. Answer: Option C 03. Answer: Option B 04. Answer: Option C 05. Answer: Option D 06. Answer: Option D 07. Answer: Option A 08. Answer: Option B 09. Answer: Option B 10. Answer: Option B 11. Answer: Option D 12. Answer: Option B 13. Answer: Option D 14. Answer: Option B.

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