

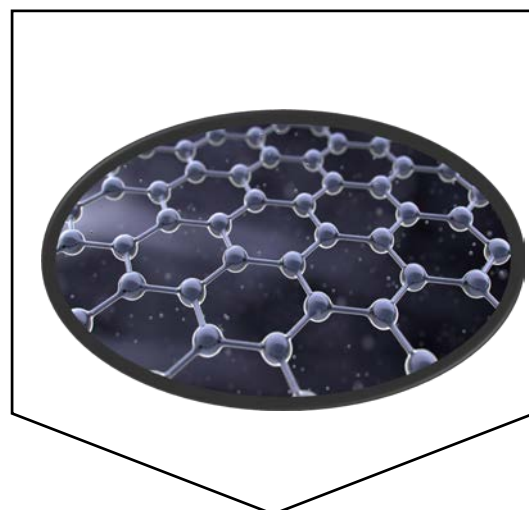
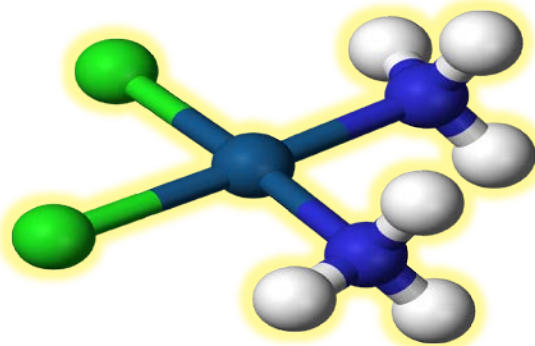
*G. S. Mandal's  
Maharashtra institute of technology, Aurangabad  
Department of plastic and polymer engineering*

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**PLAST**



**MEDIA**



**PLASTIC IS  
PART OF  
THE FUTURE.**

*by*

*Association of Plastic and Polymer Engineering Students (APPES)*

*From the desk of HOD..*

*Dr. Aniruddha chatterjee...*



The E-magazine of plastic and polymer engineering is an endeavour of our student which has paved a long way from 2016 with the previous name “**Plastmedia**”. I hope this edition would grow interest among the readers about the application of polymer

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From the desk of the Editor...

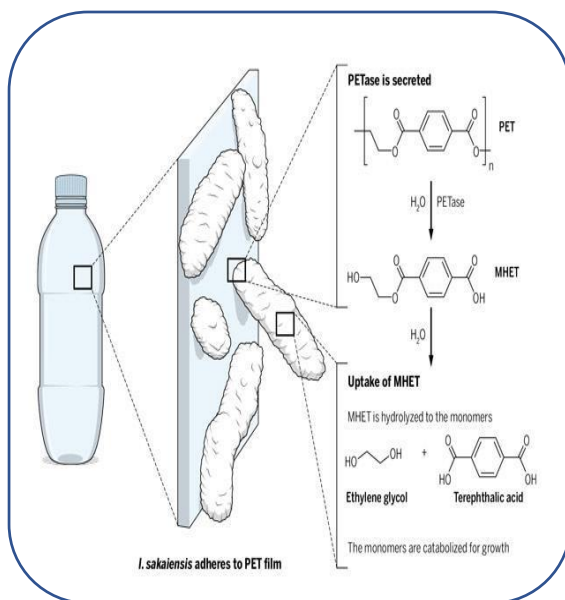
## PLASTIC EATING BACTERIA



....*Mr. Vishal A. Avhad (final yr)*

A team of Japanese scientists has found a species of bacteria that eats the type of plastic found in most disposable water bottles

The plastic found in water bottles is known as polyethylene terephthalate, or PET. It is also found in polyester clothing, frozen-dinner trays and blister packaging.



**First real recycling:** This opens a whole new approach to plastic recycling and decontamination. At present, most plastic bottles are not truly recycled. Instead they are melted and reformed into other hard plastic products. Packaging companies typically prefer freshly made 'virgin' plastics that are created from chemical starting materials that are usually derived from oil.

the real innovation - is that the team has identified the enzymes that *Ideonella sakaiensis* uses to breakdown the PET.

The PET-digesting enzymes offer a way to truly recycle plastic. They could be added to vats of waste, breaking all the bottles or other plastic items down into easy-to-handle chemicals. These could then be used to make fresh plastics, producing a true recycling system.

# Goodyear Eagle-360 Tyre



...Mr. Vedant gupta (3<sup>rd</sup> year)



After 117 years of making tyres, Goodyear has unveiled its latest concept tyre, Eagle-360, at the Geneva International Motor Show. The spherical, 3-D printed tire highlights an inspiring solution for this long-term future when autonomous driving is expected to be more mainstream. Eagle 360 can become hard in dry condition and soft in wet condition giving stability and control in any climate condition.

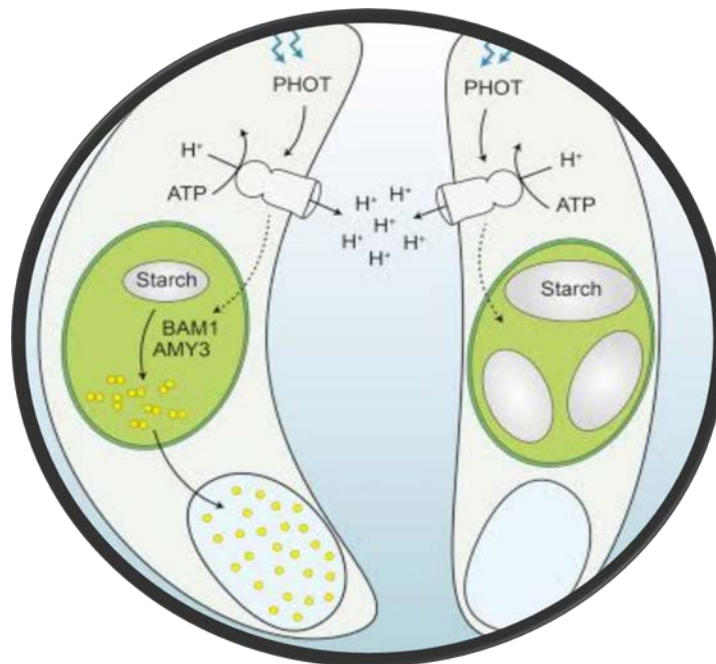
It can even shorten the stopping distance. In addition, these tyres can communicate with other systems like collision prevention system and electronic stability program, thereby making every drive safe and reliable. The intelligent morphing tread prepares the vehicle for the unexpected by proactively providing safety under all conditions. Depending on the road and weather conditions, the most appropriate tread pattern appears autonomously with the help of the bionic skin of the tire.

The bionic skin allows self-healing repair. And, in combination with the Artificial Intelligence unit, it measures current and predicts future tire wear to allow automated tire management, enabling predictive and proactive maintenance. This maximizes uptime and safety, offering an improved mobility user experience at all times for *Mobility as a Service (MaaS)* providers.

# Biodegradation of Low Density Polyethylene in Aqueous Media



...Mr. Ganesh B. Gavhane (3<sup>rd</sup> year)



Low Density Polyethylene (LDPE) is the most common packaging material used for packaging a wide range of products. The efficient disposal of these plastic materials is a herculean task as they are not easily degradable and pose detrimental effects on the environment. An efficient approach is to degrade them into simpler compounds that can be disposed safely. Out of the various degradation techniques, biodegradation is vastly used as it is more economical method. Biodegradation may either be carried out in a specific aqueous medium so designed for the most efficient degradation For the blended starch plastics at each level the degradation increased with time. At the lowest levels the degradation was almost uniform in the early stages but at higher starch content LDPE the degradation increased with time.

# Replacement of E-plastic Waste as Coarse-Aggregate in Concrete



*...Mr. Digambar Rathod (3<sup>rd</sup> year)*

The management and recycling of E plastic waste is rapidly growing as it is a valuable resource of IT industries and it is very hazardous substances and with low recycling rate. The Utilization of e plastic waste materials is a partial solution to environmental and ecological problems. As the use of E plastic waste will reduces the Aggregate cost and provides a good strength for the structures and roads. It will reduces the landfill cost and it is energy saving. The e plastic waste consists of discarded plastic waste from the old computers, TVs, refrigerators, radios; these plastics are non-biodegradable components of E plastic waste as a partial replacement of the coarse or fine aggregates.

An experimental study is made on the utilization of E-waste particles as fine and coarse aggregates in concrete with a percentage replacement ranging from 0%, 20% to 30% i.e. (0%, 10%, 20% and 30%) on the strength criteria of M20 Concrete. Compressive strength, Tensile strength and Flexural strength Concrete with and without E-waste plastic as aggregates was observed which exhibits a good strength. The feasibility of utilizing E-waste plastic particles as partial replacement of coarse aggregate has been presented. In the present study, compressive strength was investigated for Optimum Cement Content and 10% E-plastic content in mix yielded stability and very good in compressive strength of 53 grade cement.

## As Usual !!



*..Mr. Girish musale and Dhiraj Kadam (3<sup>rd</sup> year)*

As usual I was passing by the road. It was a beautiful evening and little rainy outside so there were no one to be seen on the streets. As I walked a little further I saw a plastic bottle lying on the side of the road, and as I was about to kick it I heard a voice saying “NO!!NO!!”. I stumbled and looked around to search for the person whose voice had struck in my ears, but couldn't find anyone. I got terrified thinking about the voice and as I was wandering where it had come from, I again heard someone saying “look down!” and as I looked down I saw that the bottle had eyes and limbs. I was both surprised and terrified at the same time. The bottle said pick me up and with hesitation I picked her up in my hands. My hands were shivering.

She said “look what you humans have done to me” as she sobbed. I asked her “how are you able to talk, do you have some kind of super powers?” to which she replied “you think only you can talk, huh! Don't we have feelings? Just like I can store water for your sake, I can very well hide my tears for you and what do I get from you, I get thrown away besides the road as soon as your need is fulfilled”.

I couldn't think for a minute about what to say and what not to. Then I asked her if she has a problem why don't she talk to the government about it herself. She said “what difference will it make, after all you humans are all the same. Let me tell you something about myself. I was born on 1973 in Dupont engineering. Nathaniel Wyeth was the one who created me. My birth brought a revolution in this world. High Density Polyethylene, Low Density Polyethylene, Polycarbonate, Polypropylene, Polystyrene, Polyvinyl Chloride these are some of the members of our vast family and you might know them very well as they are present everywhere these days making your lives easy”.

“We are the ones responsible for the convenience in storage of your food and other supplies like oil, water, refreshments, medicines and many more things that you won't be able to store without our help”. I said “so where do you think is the mistake being made by us”. She replied “Do you know that 15,342 tons of plastic waste is produced per day in our India, If this keeps on going then in no time a day will come when more bottles can be seen than human beings and even then we will be the only ones who will be blamed for it all. There is still time you can save your world, make it safer for the generations to come”; saying this the bottle slipped through my hands.

Suddenly I woke up and I found myself lying in my bed. I got up and looked outside the window then I realized it was just a dream. But it forced me to think that really the circumstances need to be changed. We humans need to think for ourselves. If every individual do their part right then the world would be a better place. Be the change you want to see in the world.

## Spider Silk



*...Mr. Deepak Prajapati (passout 2017)*

Spider silk has been considered the strongest biological material in the world and has inspired generations of materials scientists to understand and mimic its properties. However, new findings knock spider silk off its pedestal, reporting that engineered cellulose fibers, derived from plant cell walls, are the strongest bio-based material. The material is more than 20% stronger and eight times as stiff as spider silk. The inspiration can be taken from trees as outer cell walls of woody trees provide strength and stiffness, which aids trees to stand tall. Those cell walls contain cellulose nanofibers, which are aligned and embedded in a matrix of lignin and hemicellulose. That alignment transmits the exceptional strength and stiffness of individual nanofibers to the macroscale properties associated with wood. Even so, wood is not as strong as the nanofibers themselves because defects in alignment occur, which weaken the material. As a result, a material that mimics this structure using commercially available cellulose nanofibers from spruce and pine trees, which is 2 to 5 nm in diameter and up to 700 nm long is being developed. Using a process called hydrodynamic focusing, they squeeze the nanofibers together using streams of water into larger fibers of 6 to 8  $\mu\text{m}$  in diameter and up to a meter long. The material has a tensile strength of 1.57 GPa, stronger than natural dragline spider silk fibers, whose strength ranges from 0.6 to 1.3 GPa. The strongest cellulose fibers were also 1.2 to 1.5 times as strong as wet-spun carbon nanotubes and graphene fibers. The cellulose fibers' tensile stiffness was 86 GPa, eight times as stiff as silk, allowing it to be used in artificial joints or surgical sutures that require a stretchy but strong material. In the future, materials like these could form parts in load-bearing applications like cars and bikes, where most materials come from unsustainable sources or processes that produce large carbon emissions. They could also be used for tissue engineering applications, and the material is strong enough to be used as for body parts like limbs.



# Contradictory properties of polymer



...*Mr. Rushikesh Ambekar (Passout 2017)*

The Per Capita plastic products consumption in USA (109 kg/person) and Europe (65 kg/person) is higher than China (38 kg/person), Brazil (32 kg/person) and India (11 kg/person) in 2017 still those countries are more greener and eco-friendly. In India, lack of awareness regarding plastic packaging products and poor waste management of waste plastic is responsible for ban; however this ban should be taken as an opportunity by researchers to develop greener polymers for society, such as biopolymers, as it is a whole new field that can be explored. Cellulose fibers derived from plant cells has 1.57 GPa tensile strength which is 1.2 to 1.5 times stronger than wet-spun carbon nanotube and graphene fiber.

The polymers are macromolecules which has contradictory properties in copious applications, for instance Poly-p-phenylene terephthalamide has high tensile strength (2757 MPa) whereas on the other hand, Silicone elastomer has ultra-high elongation (5000%), Poly(3,4-ethylenedioxythiophene) has ultrahigh-conductivity (3000 S/cm) contrarily, Cyanoethylated cellulose has insulating property (dielectric constant 21 at 1 kHz), Polyimides have high thermal stability (400-500°C) whereas Poly(N-isopropylacrylamide) is thermally unstable even at lower temperatures (32-34°C), Polycarbodiimide is highly transparent (Refractive index-1.757) although Fluoropolymers are opaque (Refractive index-1.29) in nature, Poly(butyl methacrylate-co-ethylene dimethacrylate) has superhydrophobicity (WCA-172°) whereas Poly(vinyl alcohol) is hydrophilic polymer(WCA-61°). Chitosan has intrinsic anti-bacterial property but polysaccharides are degrades in the presence of bacteria.



*...Mr. Pravin Waghmode ( 2019 Passout)*



## *Department Events:*

❖ National Conference on Material For Advanced Technology & Application (MATA 2019) **22-23 August**

- ❑ MATA 2019 was organised by Plastic and Polymer Engineering Department with the aim of gathering together scientist, researchers, academicians and student to generate discuss and promote scientific information in the field of material for advanced technology.

## *Student Achievements:*

- ❑ Congratulations to the class toppers of 2019 **Vikram Mane** (4<sup>th</sup> year), **Kiran Thakre** (3<sup>rd</sup> year), **Vedant Gupta** (2<sup>nd</sup> year) who were felicitated by teachers and students on the Teachers Day.
- ❑ From final year student **Vijay Adhali**, **Pallavi Pokale** and **Mamta Dhotre** presented poster( on project work) and won Second prize in National Conference MATA2019 at MIT, Aurangabad.
- ❑ From final year student **Matin Belgaonkar**, **Aishwary Koganole** and **Sayali Sawant** presented poster (on project work) and won a First prize in conference “Characterization of polymer and polymeric product- 2019” at ICT, Mumbai.

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