Degradation of plastic pdf

The word plastic comes from the Greek word plastikos, which means capable of being molded into various shapes. Plastics consists of a combination of monomers together by chemical bonds. Polyethylene consists of 64% of all plastic, which is a linear hydrocarbon polymer consisting of long chains of ethylene monomers. The common formula for polyethylene is CnH2n, where 'n' is the number of carbon atoms. The plastics we use today are made from inorganic and organic raw materials such as carbon, silicon, hydrogen, nitrogen, oxygen and chloride. The main materials used to make plastics are extracted from oil, coal and natural gas. Plastics include polyethylene, propylene, polystyrene, polyurethane, nylon, etc. Polyethylene or LDPE (low density polyethylene) or HDPE (high-density polyethylene) is a thermoplastic polymer made by ethylene monomers, used mainly as thin films and packaging sheets. Over the past three decades, the uncontrolled use of plastics for packaging (e.g. fast food), transport, industry and agriculture in rural and urban areas has raised the serious problem of plastic waste disposal and pollution. Light weight, inertia, durability, durability and low cost are the main advantages of plastic, while it has drawbacks such as having this unspoded biodegradation and difficult to degrade naturally. Global plastic use is growing at a rate of 12% per year and about 0.15 billion tons of synthetic polymers are produced worldwide each year. The level of plastic waste accumulation in the environment is 25 million tons per year and is therefore considered a serious environmental hazard. Plastic is estimated to have 20% of solid household waste (MSW) in the United States and Germany, 7.5% of MSW in Western Europe and 25% in Australia. Turkey disposes of 11 million tons of plastic every year. In 1999-2000, India imported more than 120,000 tons of plastic. India produces 5.6 million metric tons of plastic waste each year, with Delhi accounting for a shocking 689.5 metric tons per day. According to the Central Council for Pollution Control (CPCB) of India, the total amount of plastic waste collected and recycled in the country is likely to be 9,205 tons per day (approximately 60% of the total plastic waste) and 6,137 tons remain untreated and littered. The main disruptor in generating such waste are four metro stations, followed by Delhi contributing 689.5 tons per day, followed by Chennai (429.4 tons), Kolkata (425.7 tons) and Mumbai (408.3 tons). The figures are only to confirm the total areas of plastic mass in industrial, residential and slum areas of Indian towns and cities. PLASTIC RECYCLING and degradation: Recycling plastics too serious problem, because hardly 50% of the total amount of plastic produced is recycled. The production rate is enormous compared to its degradability. Pollution caused by recycling, recycling, however, this can be compensated for the reuse of such materials. Plastics these days are being reused by changing their application. Bottles, canisters, containers can be used for storage. Drums, tubes, sheets, etc. are all reused in many ways. Reusing plastics has a lot of creativity involved. There are many artists who have developed new recycling techniques that can be replicated by anyone. Schools and colleges could teach the recycling of plastics as an art, which further raise awareness in the community. Below is a list of plastic recycling symbols: Source: there are quite a few physical and chemical ways polymers and plastics can be degraded. They're not biological at all. They are illustrated below: Thermo-oxidative processes: Here the polymer is heated to extremely high temperatures and is oxidized in the primary polymer chain. Basically, here, the spine of the polymer gets chemically altered. Mechanical processes: Here the polymer is subject to mechanical stress or change, which in turn leads to a change in the properties of the polymer. Ultrasonic techniques: When a polymer passes through an ultrasonic environment, the polymer chain can vibrate at the frequency of the environment and can break down and dislodge. Hydrolytic environments: When plastic is stored in wet or acidic conditions, a chain split can occur through the hydrolysis of the main chain. This hydrolysis occurs in polymers with functional groups that are sensitive to water exposure. Other chemical methods: Corrosive chemicals, gases or liquids are used to decompose the polymer. Ozone, atmospheric pollutants and acids such as nitrogen, sulphur and hydrochlorin substances will attack and degrade most polymers through chain oxidation and oxidation. This is very similar to oxidative or hydrolytic processes. Photo-oxidative methods: the absorption of radiation by polymers, or their impurities, due to exposure to sunlight or high radiation energy can lead to the rupture of chemical bonds in polymers as a result of photo-degradation. This is even more possible if polymers have some semiconductor properties in the visible or solar light area. Other methods are landfills, burning and disposal in the oceans, which have deadly consequences for life on Earth. These methods are not feasible for a long time. Among all these methods, the most significant ways of decomposing plastic are thermooxidative, biological and photooxidative routes. Biological processes will always be a very important method of decomposition of plastic because of their effectiveness, ability to attach specific polymer areas and reduce environmental problems! BIOLOGICAL PROCESS OF PLASTIC The safest method that can be implied on a large scale is the biological process. Biological processes do not harm the environment and by-products be great apps. Below is an overview of the biological approach: microorganisms such as bacteria, fungi and actiomyects are involved in the degradation of both natural and synthetic plastic. Plastics are usually biodegradable aerobicly in nature, anaerobic in sediments and landfills and partly aerobic in compost and soil. Carbon dioxide and water are produced during aerobic biodegradation, while anaerobic biodegradation produces carbon dioxide, water and methane. READ ALSO - Plastic Degradation: Dream or Reality? Biodegradation of polymers includes the following steps: attaching the microorganism to the surface of the polymer. The growth of microorganisms using polymer as a carbon source. The final degradation of the polymer. Microorganisms are able to attach to the surface of the polymer, if the latter is hydrophilic. Once the body is attached to the surface, it can grow using the polymer as a carbon source. In the primary stage of degradation, extracellular enzymes, secreted by the body, cause the main chain to break down, leading to the formation of low molecular mass fragments such as oligomeers, dimers or monomers. These low molecular weight compounds are then used by microbes as carbon and energy sources. Small oligomes can also spread in the body and assimilate in the internal environment. A list of different microorganisms reported to degrade different types of plastics: STORY of A PLASTIC DEGRADING WORM: Federica Bertocchini - an amateur beekeeper as well as a researcher - made a curious discovery. Galleria mellonella larvae are known not only for their use as fishing bait, but also for the problems they cause in beekeepers (creatures live on beeswax). Bertocchini, placing the larvae in a plastic bag so they wouldn't swarm in her hives, found that the larvae were able to chew their way out. I went back to the room where I left the worms and I found that they were everywhere, the bag was full of holes, said Bertocchini. This discovery prompted Bertockini and other Cambridge University scientists to begin studying patterns of waxworm nutrition. After placing the larvae on plastic, they found that each worm can create almost two holes per hour. To put this in context - in less than a month, 100 worms can degrade (on average) 5.5 grams of plastic! To prove that the worms did not just release small pieces of plastic (due to the mechanical movement of the mastic system), Bertochcini and his colleagues smeared mixed larvae on plastic, and then... Waited. Surprisingly, they found that even waxworms of liquid can create holes in the plastic. This result convinced the team that it was either an enzyme (in their saliva, or their intestines) or bacteria in degrading plastic. ... This discovery may simply turn the tables on how the control of plastic waste is carried out by spectroscopy analysis - measuring light absorbed, emitted or dissipated by the material - has been used to confirm the degradation of plastic after contact with homogenate larvae. Scientists have concluded that waxworms can break down plastic using the same enzymes they use to eat beeswax; By attacking chemical bonds in polyethylene, the worms turn it into an optional material called ethylene glycol (a chemical regularly used in antifreeze). The type of very high-resolution probe microscopy only provided more evidence to support the idea that larvae are capable of altering the unity of polyethylene. Commenting on these findings, Paolo Bombelli (biochemist of the University of Cambridge) said: ... if one enzyme is responsible for this chemical process, its reproduction on a large scale using biotechnology methods should be achievable. Bombelli seems to believe that the results of this study are promising, and have the potential to lead to a solution to the problem of plastic waste. Hence the next step is to find an enzyme specifically involved in degeneration. And... After that? The range of possibilities is wide. The compound can be inserted into bacteria or phytoplankton in order to reduce the amount of plastic waste in uninhabited regions. In addition, the results could potentially be adapted to industrial scale (given the ability of larvae to degrade even the hardest plastics). Finally, enzymes can be sprayed directly on places such as landfills. This discovery may just turn the tables on a path in which the fight against plastic waste is underway. I hope this provides an opportunity to move away from the endless accumulation of plastic in landfills and seas, and to the biodegradation of plastics. For now, however - let's keep trying to reuse more, and produce less. READ ALSO - How a plastic ban in Mumbai will protect you from diarrhea Read also - Plastic Recycling: Why and How to Also Read - Fighting Ocean Pollution and Why Plastic Isn't the Only Issue to Solve REFERENCES: WEBLIOGRAPHY: degradation of plastic waste. degradation of plastic is accelerated by. degradation of plastic by microbes. degradation of plastic in soil. degradation of plastic bags. degradation of plastic by bacteria. degradation of plastic bottles. degradation of plastics in the environment