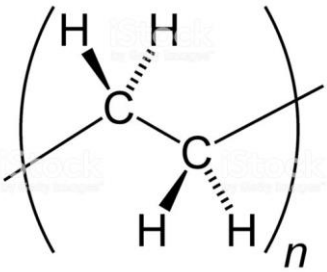

Polyethylene

CHEMISTRY PROJECT

PLASTICS HAVE CHANGED THE WORLD BOTH SOCIALLY AND ECONOMICALLY

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1 INTRODUCTION

Plastic is material consisting of any of a wide range of synthetic or semi-synthetic organic compounds that are malleable and so can be molded into solid objects. Plastics are typically organic polymers of high molecular mass and often contain other substances. They are usually synthetic, most commonly derived from petrochemicals.

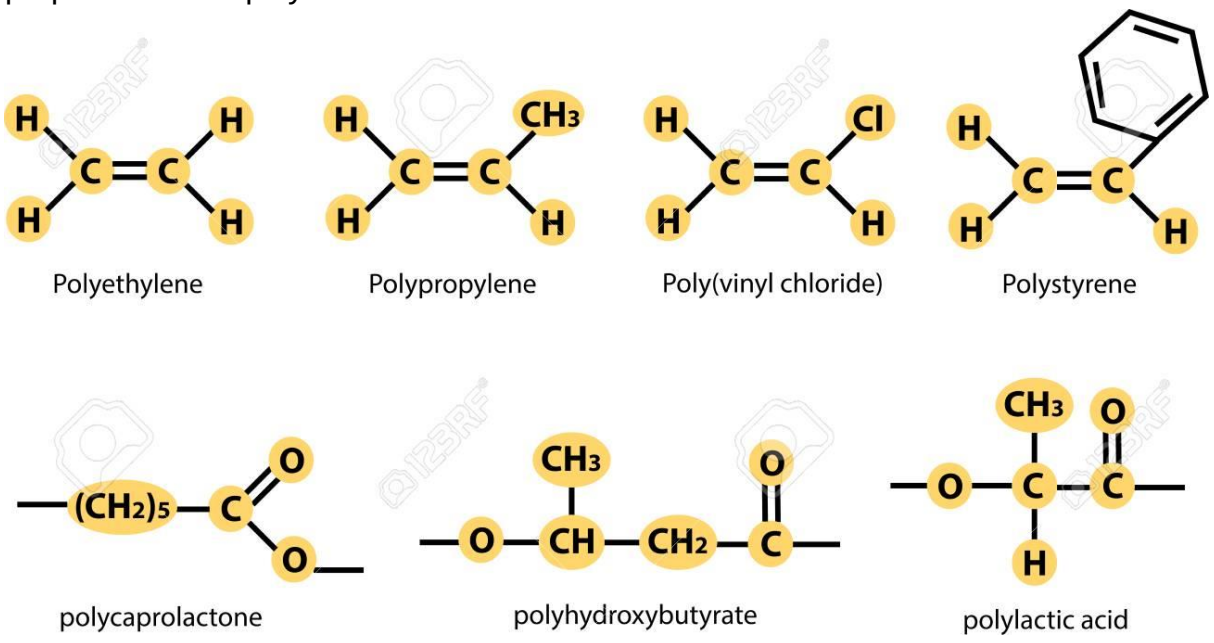
Due to their low cost, ease of manufacture, versatility, and imperviousness to water, plastics are used in a multitude of products of different scale, including paper clips and spacecraft. They have prevailed over traditional materials, such as wood, stone, horn and bone, leather, metal, glass, and ceramic, in some products previously left to natural materials.

Most plastics contain organic polymers. The vast majority of these polymers are formed from chains of carbon atoms, 'pure' or with the addition of: oxygen, nitrogen, or sulphur. The chains comprise many repeat units, formed from monomers. Each polymer chain will have several thousand repeating units.

The backbone is the part of the chain that is on the "main path", linking together a large number of repeat units.

To customize the properties of a plastic, different molecular groups "hang" from this backbone. These pendant units are usually "hung" on the monomers, before the monomers themselves are linked together to form the polymer chain. It is the structure of these side chains that influences the properties of the polymer.

The molecular structure of the repeating unit can be fine-tuned to influence specific properties of the polymer.



2 HISTORY AND FUTURE OF PLASTICS

2.1 THE FIRST SYNTHETIC PLASTIC

The first synthetic polymer was invented in 1869 by John Wesley Hyatt, who was inspired by a New York firm's offer of $10,000 for anyone who could provide a substitute for ivory. The growing popularity of billiards had put a strain on the supply of natural ivory, obtained through the slaughter of wild elephants. By treating cellulose, derived from cotton fiber, with camphor, Hyatt discovered a plastic that could be crafted into a variety of shapes and made to imitate natural substances like tortoiseshell, horn, linen, and ivory.

This discovery was revolutionary. For the first time human manufacturing was not constrained by the limits of nature. Nature only supplied so much wood, metal, stone, bone, tusk, and horn. But now humans could create new materials. This development helped not only people but also the environment. Advertisements praised celluloid as the savior of the elephant and the tortoise. Plastics could protect the natural world from the destructive forces of human need.

The creation of new materials also helped free people from the social and economic constraints imposed by the scarcity of natural resources. Inexpensive celluloid made material wealth more widespread and obtainable. And the plastics revolution was only getting started.

2.2 THE DEVELOPMENT OF NEW PLASTICS

In 1907 Leo Baekeland invented Bakelite, the first fully synthetic plastic, meaning it contained no molecules found in nature. Baekeland had been searching for a synthetic substitute for shellac, a natural electrical insulator, to meet the needs of the rapidly electrifying United States. Bakelite was not only a good insulator; it was also durable, heat resistant, and, unlike celluloid, ideally suited for mechanical mass production. Marketed as "the material of a thousand uses," Bakelite could be shaped or molded into almost anything, providing endless possibilities.

Hyatt's and Baekeland's successes led major chemical companies to invest in the research and development of new polymers, and new plastics soon joined celluloid and Bakelite. While Hyatt and Baekeland had been searching for materials with specific properties, the new research programs sought new plastics for their own sake and worried about finding uses for them later.

2.3 Plastics Come of Age

World War II necessitated a great expansion of the plastics industry in the United States, as industrial might prove as important to victory as military success. The need to preserve scarce natural resources made the production of synthetic alternatives a priority. Plastics provided those substitutes. Nylon, invented by Wallace Carothers in 1935 as a synthetic silk, was used during the war for parachutes, ropes, body armor, helmet liners, and more. Plexiglas provided an alternative to glass for aircraft windows. A Time magazine article noted that because of the war, "plastics have been turned to new uses and the adaptability of plastics demonstrated all over again." During World War II plastic production in the United States increased by 300%.

The surge in plastic production continued after the war ended. After experiencing the Great Depression and then World War II, Americans were ready to spend again, and much of what they bought was made of plastic. According to author Susan Freinkel, "In product after product, market after market, plastics challenged traditional materials and won, taking the place of steel in cars, paper and glass in packaging, and wood in furniture." The possibilities of plastics gave some observers an almost utopian vision of a future with abundant material wealth thanks to an inexpensive, safe, sanitary substance that could be shaped by humans to their every whim.

2.4 Growing Concerns about Plastics

The unblemished optimism about plastics didn't last. In the postwar years there was a shift in American perceptions as plastics were no longer seen as unambiguously positive. Plastic debris in the oceans was first observed in the 1960s, a decade in which Americans became increasingly aware of environmental problems. Rachel Carson's 1962 book, Silent Spring, exposed the dangers of chemical pesticides. In 1969 a major oil spill occurred off the California coast and the polluted Cuyahoga River in Ohio caught fire, raising concerns about pollution. As awareness about environmental issues spread, the persistence of plastic waste began to trouble observers.

Plastic also gradually became a word used to describe that which was cheap, flimsy, or fake. In The Graduate, one of the top movies of 1968, Dustin Hoffman's character was urged by an older acquaintance to make a career in plastics. Audiences cringed along with Hoffman at what they saw as misplaced enthusiasm for an industry that, rather than being full of possibilities, was a symbol of cheap conformity and superficiality.

2.5 Plastic Problems: Waste and Health

Plastic's reputation fell further in the 1970s and 1980s as anxiety about waste increased. Plastic became a special target because, while so many plastic products are disposable, plastic lasts forever in the environment. It was the plastics industry that offered recycling as a solution. In the 1980s the plastics industry led an influential drive encouraging municipalities to collect and process recyclable materials as part of their waste-management systems. However, recycling is far from perfect, and most plastics still end up in landfills or in the environment. Grocery-store plastic bags have become a target for activists looking to ban one-use, disposable plastics, and several American cities have already passed bag bans. The ultimate symbol of the problem of plastic waste is the Great Pacific Garbage Patch, which has often been described as a swirl of plastic garbage the size of Texas floating in the Pacific Ocean.

The reputation of plastics has suffered further thanks to a growing concern about the potential threat they pose to human health. These concerns focus on the additives (such as the much-discussed bisphenol A [BPA] and a class of chemicals called phthalates) that go into plastics during the manufacturing process, making them more flexible, durable, and transparent. Some scientists and members of the public are concerned about evidence that these chemicals leach out of plastics and into our food, water, and bodies. In very high doses these chemicals can disrupt the endocrine (or hormonal) system. Researchers worry particularly about the effects of these chemicals on children and what continued accumulation means for future generations.

2.6 The Future of Plastics

Despite growing mistrust, plastics are critical to modern life. Plastics made possible the development of computers, cell phones, and most of the lifesaving advances of modern medicine. Lightweight and good for insulation, plastics help save fossil fuels used in heating and in transportation. Perhaps most important, inexpensive plastics raised the standard of living and made material abundance more readily available. Without plastics many possessions that we take for granted might be out of reach for all but the richest Americans. Replacing natural materials with plastic has made many of our possessions cheaper, lighter, safer, and stronger.

Since it's clear that plastics have a valuable place in our lives, some scientists are attempting to make plastics safer and more sustainable. Some innovators are developing bioplastics, which are made from plant crops instead of fossil fuels, to create substances that are more environmentally friendly than conventional plastics. Others are working to make plastics that are truly biodegradable. Some innovators are searching for ways to make recycling more efficient, and they even hope to perfect a process that converts plastics back into the fossil fuels from which they were derived. All of these innovators recognize that plastics are not perfect but that they are an important and necessary part of our future.

3 HOW PLASTICS HAVE CHANGED THE WORLD

There are many modern items that would not have been possible without plastics. The vinyl record, CD, DVD, ball point pen, artificial Christmas tree, many toys, eyeglasses and many beverages and food containers and even plumbing pipes, vinyl siding, floor tiles, shower curtains, window frames, and furniture. Although these things could be made of something else, plastics made them affordable.

The reason that plastics have taken the place of metal and wood these days is that they are inexpensive to make and are easy to form into useful shapes.

Unfortunately, plastics have also changed humans in a negative way. The reason for this are toxicity and environmental impact. Biphenol-A is used to make polycarbonate, a very durable and useful plastic used in electronic applications. Biphenol-A is an endocrine disruptor that can get into food supplies and cause all sorts of health problems including inflammation and heart disease.

The other main problem with plastics is that they persist in the environment. In other words, they don't decompose, at least not for thousands of years.

4 THE BENEFITS OF PLASTIC IN SOCIETY, THE ECONOMY, & TO THE ENVIRONMENT

Plastic benefits society in many ways by being a highly versatile material that comes in different types, and can be molded into different shapes and sizes.

Environmentally, plastic is actually a more eco option than other packaging material options in several ways. By being so light – it also helps by reducing the amount of vehicles that need to help with transporting goods, and also helps increase fuel efficiency and decrease emissions in vehicles. Reducing food waste (and the environmental impact associated with food waste) is another way plastic helps save the environment.

Economically, plastic is so cheap to produce compared to other alternatives, and it also helps reduce the cost for food producers, transport companies and manufacturers and other parties.

Socially, plastic is key when it comes to safety and hygiene of food, but also in the health field with sterilization, and also protecting us from hazardous materials. Even with the above benefits in mind – the way in which we use plastic needs to be continually improved, as well as the way we reduce, re-use, recycling, dispose of and burn it for energy.

- Plastic can be an environmentally friendly, low-cost alternative to other products. Think for a moment of plastic grocery bags. They take up one-seventh of the space paper bags do in landfills and don't produce toxic fumes when incinerated, says the SPI, who also note that incinerated plastic helps the waste mix burn more efficiently.
- Only 9 percent of waste in landfills is plastic
- Plastic automobile parts have made lighter cars that consume less fossil fuel
- We aren't doing enough when it comes to plastic recycling though
- We need to keep more reusable plastic out of landfills.

- If there was no plastics packaging available and other materials were used, the overall packaging consumption of packaging mass, energy and greenhouse gas (GHG) emissions would increase
- Plastic is light and strong – this means we use fewer vehicles and less fuel to transport it (means less usage of fossil fuels and less vehicle emissions). Plastic packaging makes a positive contribution to saving resources and reducing emissions.
- Plastic keeps food fresh, and also helps prevent a lot of food waste (food waste has its own environmental footprint).
- So, plastic has safety, hygiene and protection benefits
  [there is actually a higher environmental cost in using plastic alternatives for consumer products and packaging – the more sustainable use of plastics is the answer to reducing plastic packaging waste]
- Plastic packaging production uses about half as much energy as alternative materials.
- Plastic helps us do more with less
- We can deliver more beverage with less resources than other materials
- Plastic is continuously re-engineered to become lighter and more efficient – so it's likely plastic in the future will help us save more resources
- Plastic helps us minimize packaging, and decrease waste
- Plastic decreases transport energy
- Plastic is highly reusable
- The ways in which we can recycle plastic are always improving.

5 BAN OF PLASTIC AND ITS IMPACT

Plastic bags are not safe for the ecosystem, since they are not easy to recycle. They cause severe health hazard for human, animals and the environment. Though there is plastic ban in several states including Maharashtra, which has become the 17 other states and Union Territories so far, in order to prevent litter and help the environment.

5.1 NEGATIVE IMPACT ON ENVIRONMENT

One of the biggest threats about plastic bags is that they threaten the environment. Plastic bags pollute the land and water, since they are lightweight, plastic materials can travel long distances by wind and water. Besides, these material bags are made from non-renewable resources. The majority of plastic bags is made of polypropylene, a material derived from petroleum and natural gas. Both of them are non-renewable fossil fuel-based resources, which contribute to global climate change.

5.2 HIGH COST OF PRODUCTION

It is said that the production of plastic material is very energy intensive. In order to produce nine plastic bags, it takes the equivalent energy to drive a car one kilometer (more than 0.5 miles). Using these resources to make plastic bags is not advisable since the life of plastic bag is just about 12 minutes. Plastic bags are not easy to recycle

Most of the plastics are not recyclable. Though some kinds of plastic bags can be recyclable, many done possess the technology or the plants to recycle them. According to various estimates, the actual recycling rate for plastic bags is about 5- 6 percent.

5.3 THREAT TO MARINE LIFE

Since plastic bags are not recyclable, they end up in the oceans. While they reach, they break up into tiny little pieces and are consumed by wildlife. It is estimated that 46,000-1,000,000 plastic fragments floating within every square mile of the world's oceans. Due to their size, they are often mistaken for food by animals, birds, and marine life like fish, whales and sea turtles. Thereby congesting their digestive system lead to health issues such as infections or even death by suffocation. Many animals also get entangled or trapped.

5.4 HARMFUL TO HUMAN HEALTH

Toxic chemicals from plastic bags can damage the blood and tissues. Frequent exposures can lead to cancers, birth defects, impaired immunity, hormone changes, endocrine disruption and other serious ailments.

6 PLASTIC BAN CAN HURT THE ECONOMY

Many economic experts point out the negative economic impact on ban of plastic.

6.1 IMPACT ON TRADE

The Plastic industry in the country employs about 40 lakh people which include more than 30,000 processing units. Around 85-90 percent of which are small and medium – sized enterprises. A ban on the plastics could easy affect industry, posing question on the trade and employment.

6.2 BEST FOR BRANDING

Plastic bags offer the easiest way for printing the business logo, company name and other relevant information. Printing cost is very low compared to paper and cloth bags.

6.3 CHEAPER THAN PAPER CLOTH PACKAGING

A piece of plastic bag will cost you no more than 10-15 paisa which is much cheaper than a paper bag costing 20-25 paisa per piece. This means that purchasing plastic bags in large quantities will be beneficial for small business and improves profit margins.

6.4 SIZE AND COMPACT

Plastic bags are easy to open, pack and transport. That is the reason why they are used widely in logistic and retail industry. In contrast, reusable cloth bags consume more space and are quite heavy.

7 CONCLUSION

Plastics also play a major role in the debate surrounding finite resources. It is undeniable that plastics use finite resources. However, this is where our thinking about plastics needs to change. We must stop thinking of plastics as throwaway products but as a renewable resource. This is only possible if there is more research into waste sorting and recycling technologies and more is done to educate globally about plastics and possibilities to recycle and reduce plastic waste. Ultimately, it comes down to each of us looking at ourselves and our habits, as manufacturers, as suppliers, as consumers, as individuals, and thinking about what we can do to reduce plastic waste and littering in a world where plastics is only going to become more important in the future.

Though recycling is the best option for plastic, methodology and systemization for recycling is slow. While the production model of plastic is very huge and uncontrollable, the numbers of recycling plants are very less. This vast gap must be closed. According to an international survey, around 600 billion plastic bags are used every year and, because of their in disposable quality, many are swept into rivers or drains not just clogging but eventually ending up in the ocean. This makes plastic bags among the top 10 items of debris found in oceans and coastlines. So increasing the number of recycling plants in the only option for renewed used on plastic. Besides, plastic ban forces the customer to buy the recyclable plastic bags and reuse of disposable bags. This can also encourage reuse of the bags. Moreover, such a ban could be complemented by ensuring that retail shop keeper and big shopping complexes to team up with plastic recycling firms and set up even collection points for the bags which no longer be reused. Finally, government should educate the public and trade bodies to achieve the benefits of the ban. Since long term benefits of plastic bag ban use will benefit the economy and also save taxpayer money can lead to plastic bag cleanup.

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