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RECYCLING AND REUSING OF PLASTIC

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Abstract

Plastic of things deals with the ways of improving the reuse of plastic waste which harms the environment in many different ways. Plastic, sure is very useful substance and could be made cheaply but the problem in using it is that it cannot be disintegrated both naturally and artificially so, to overcome the problems through plastic wastes the only way possible is reusing it. Plastic when heated under certain pressures could mould into many useful substances. Some methods of changing plastic would be using a centrifuge and some methods include using only heat. In this paper we briefly discuss about methods of synthesizing plastic about the amount of plastic going waste and methods to reuse it and also we discuss about the reactions plastic undergoes with different types of chemicals

1. Introduction

Plastic is invented by using a famous scientist named **Alexander Parkes**. Plastic is a material along with any of a wide variety of synthetic or semi-synthetic natural compounds which are malleable and may be moulded into solid items. Plastics are typically natural polymers of high molecular mass, but they frequently include other substances. They are commonly synthetic, maximum commonly derived from petrochemicals, but many are partially natural. Plasticity is the overall belongings of all substances which are able to irreversibly deform without breaking, but this takes place to any such diploma with this magnificence of mouldable polymers that their call is an emphasis on this capability. Polymers are materials whose molecules have excessive molar masses and are composed of a massive range of repeating units. There are both clearly taking place and synthetic polymers. Among clearly occurring polymers are proteins, starches, cellulose, and latex. Synthetic polymers are produced commercially on a totally big scale and feature a huge range of residences and makes use of. The materials generally called plastics are all synthetic polymers.

Examples of such polymers are:

1. Polyethylene terephthalate-(PET) or Polyethylene terephthalic ester (PETE) Polyethylene- (only polymer with -CH₂- chains).
2. Poly Vinyl Chloride- commonly known as PVC. Etc.,

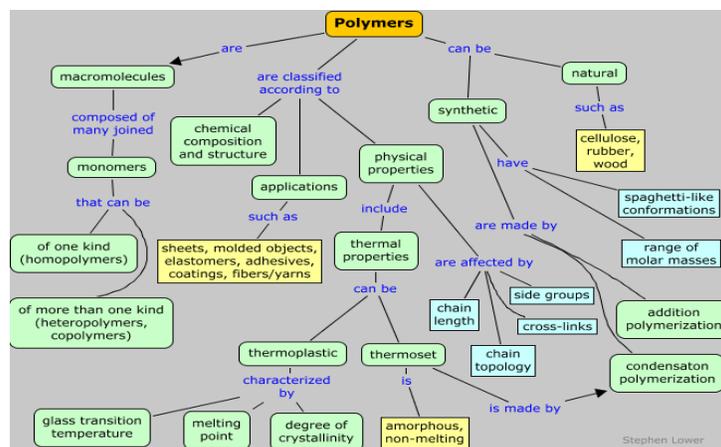


Fig.1 Polymers

The success and dominance of plastics beginning in the early 20th century led to environmental concerns regarding its **slow decomposition rate** after being discarded as trash due to its composition of very huge molecules. Towards the end of the century, one technique to this problem turned into met with huge efforts towards **RECYCLING**.

2. Classification of Plastics

Plastics are generally categorized by means of their chemical shape of the polymer's backbone and side chains. A few groups' agencies in these classifications are the acrylics, polyesters, silicones, polyurethanes, and halogenated plastics. Plastics also can be categorised by the chemical system used in their synthesis, consisting of condensation, polyaddition, and cross-linking.

There are types of plastics⁽²⁾

Thermoplastics and Thermosetting polymers. Thermoplastics are the plastics that do not go through chemical exchange of their composition whilst heated and may be molded over and over.

❖ Examples consist of polyethylene, polypropylene, polystyrene and polyvinyl chloride.

3. Production

Most plastics are produced from petrochemicals. Prompted by way of the finiteness of petrochemical reserves and danger of world warming. Bioplastics are being developed. Bioplastics are made significantly from renewable plant

materials consisting of cellulose and starch. In assessment to the worldwide consumption of all bendy packaging, expected at 12.3 million tonnes/yr, estimates placed global manufacturing potential at 327,000 tonnes/yr for associated bio-derived substances.

Manufacture of plastics has various types of methods which gives us various types of plastics⁽³⁾:

- Blow Moulding
- Casting
- Compression Moulding
- Extrusion
- Fabrication
- Foaming
- Injection moulding
- Rotation moulding
- Thermoforming

4. Properties of Plastic

- The properties of plastics are defined chiefly with the aid of the organic chemistry of the polymer which includes **hardness, density, and resistance to heat, natural solvents, oxidation, and ionizing radiation.** Specially, maximum plastics will melt upon heating to three hundred tiers Celsius. even as plastics may be made electrically conductive, with the conductivity of as much as **80 kS/cm** in stretch-oriented polyacetylene, they're still no match for most metals like copper which have conductivities of **several hundredskS/cm.**
- Pure plastics have low toxicity due to their insolubility in water.
- Pure plastics are chemically **Inert.**

5. Effects of Plastics⁽⁴⁾

Plastics take more time to degrade naturally and they can't be degraded artificially which means the production of plastics is more when compared to its degradation and use. Hence the wastage of plastics would be enormous and we have to pay severe consequences in return. The distribution of plastic particles is pretty variable due to positive factors consisting of wind and ocean currents, shoreline geography, urban areas, and trade routes. Human populace in sure areas

additionally performs a large function on this. Plastics are much more likely to be found in enclosed regions which include the Caribbean. Chlorinated plastic can release dangerous chemical substances into the encircling soil, which could then seep into groundwater or other surrounding water sources and also the ecosystem. this can cause serious damage to the species that drink the water. Plastics in oceans commonly degrade within a yr., but now not entirely. Within the technique, poisonous chemicals like includes bisphenol A and polystyrene can leach into waters from a few plastics. Polystyrene pieces and nurdles are the most commonplace styles of plastic pollutants in oceans, and mixed with plastic baggage and meals boxes make up most people of oceanic debris. One take a look at envisioned that there are extra than five trillion plastic portions (described into the 4 instructions of small micro plastics, large microplastics, meso- and macro plastics) afloat at sea. Plastic pollution inside the ocean is an ongoing global disaster. The plastic pollution problem is ongoing and should be stopped. Aesthetically viewing the plastic inside the ocean is not the most effective problem with the pollutant. The litter this is being added into the oceans is toxic to marine lifestyles, and human beings. The toxins Plastic pollution has the capacity to poison animals, which can then adversely affect human meals elements. Sea turtles are affected by plastic pollution. Some species are customers of jelly fish, however frequently mistake plastic bags for their natural prey. This plastic debris can kill the sea turtle by way of obstructing the esophagus. So too are whales; massive amounts of plastics were discovered in the stomachs of beached whales.

Therefore, the manufacturing of plastics has elevated markedly during the last 60 years. However, modern-day tiers of their utilization and disposal generate several environmental troubles. Around 4% of world oil and gas production, a non-renewable useful resource, is used as feedstock for plastics and a similarly 3–4% is expended to offer strength for their manufacture.

A prime portion of plastic produced each 12 months is used to make disposable items of packaging or other quick-lived products that are discarded within a yr. of manufacture. These observations alone suggest that our contemporary use of plastics isn't sustainable. Further, because of the sturdiness of the polymers concerned, big quantities of discarded end-of-existence plastics are collecting as debris in landfills and in natural habitats worldwide. The only way to overcome the problems of plastic wastage is **RECYCLING**.

✚ **Recycling** plastic is of many types ,they may be homemade or industrial.

✚ **Homemade recycling** is nothing but covering some waste plastic materials into some useful items such as decorative flower post etc.,

✚ **Industrial recycling** is much advanced stage through which a huge amounts of plastic wastes are converted into various plastic items and are marketed as new products.

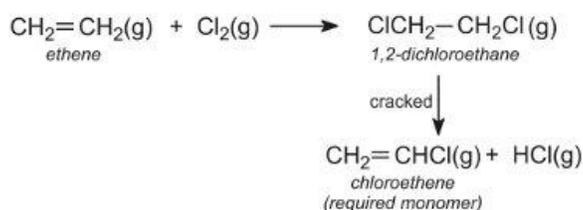
6. Industrial Recycling⁽⁵⁾

Recycling of materials has become common practice over the last ten years or so, with households in many countries encouraged to save used cans, glass, plastics, paper and garden rubbish for special collection. These are then recycled for two main reasons. One is local, to save land which would otherwise be used as dumps for the waste. The other main reason for recycling has global significance - to help conserve valuable resources, such as metals, wood and energy.

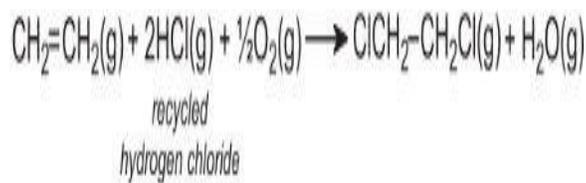
6.1. Recycling within Processes⁽⁵⁾

Many processes recycle reactants and products in order to conserve materials and make the processes as efficient as possible. An example is in the manufacture of chloroethene (vinyl chloride), the monomer for the manufacture of PVC.

Chloroethene is made from ethene via 1,2-dichloroethane, which is then cracked:



The hydrogen chloride is recycled and reacted with oxygen and more ethene. The overall reaction can be represented by



6.2. Recycling of Polymers⁽⁵⁾

The most written about aspect of polymers is not their enormous usefulness but the problems that they bring as waste. This is not surprising, as the world's annual production of plastics is nearly 300 million tonnes. China accounts for about 24%, and the rest of Asia another 16%, Europe 20% and NAFTA (North American Free Trade Agreement: US, Canada

and Mexico) another 20%. To put these numbers in perspective, 20 000 large bottles can be made from just one tonne of plastic.

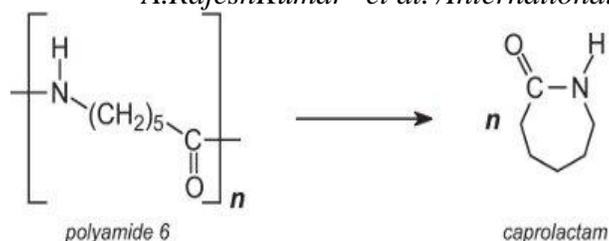
Further, the plastics industry uses nearly 5% of the world's oil supply. One of the great problems facing the industry is to ensure that the plastics can be recycled. This account is concerned with the recycling within the chemical industry, the issue of recycling all plastics produced is dealt with briefly in a later section.

6.3. Reusing Plastics ⁽⁵⁾

Reusing plastics would be ideal, and already happens for example, with bottle crates and increasingly with shopping bags. At first sight, collecting plastics which can be remoulded, for example the thermoplastics, such as poly(ethene) and poly(propene), would appear to be an attractive solution. However, collecting and sorting plastic articles into specific polymers is an expensive and difficult process. It is often done manually by trained staff who sort the plastics into polymer type and/or colour. Technology is being introduced to sort plastics automatically, using various spectroscopic techniques.



Fig.a: This machine sorts bottles and other containers made from different polymers prior to cleaning and shredding. It distinguishes between different polymers using a NIR (near infra-red) detector. This distinguishes between bonds in a molecule. There is also a separate detector which allows metals to be removed.



After purification, by distillation, the monomer is polymerized again to yield polyamide 6. In another process, it is not necessary to remove the backing (which is an added expense). Instead, the polyamide 6 fibres are heated in a stream of superheated steam and depolymerized. Polyamides from recycled carpet are being used to make new carpets and to make cushions and resilient flooring. Although many recycling programmes are restricted to collecting carpets used commercially (for example in large hotels and offices), this too is about to change and domestic carpets will be used more extensively.

6.5. Polymers as fuels ⁽⁵⁾: Polymers can be burnt to produce energy. The issues are that the incineration can produce noxious fumes which ought to be trapped and the carbon is not recycled although the electricity may be used.

Waste management ⁽⁵⁾: This unit has been concerned with the recycling of plastics within the chemical industry. However, the issue of recycling plastics in a wider context is extremely important. Within Europe, 26% of plastics are recycled and another 36% are used to produce energy. This still leaves 38% (*ca* 10 million tonnes) to go to landfill. This contrasts with a zero target for landfill by 2020, which is being promoted within the European Union. Packaging accounts for over 62% of the waste plastic, but over 69% of it is reused. This proportion varies very widely. Almost all is reused either by recycling or energy production in 9 European countries (Austria, Switzerland, Germany, Luxembourg, Denmark, Sweden, Belgium, Netherlands and Norway). In contrast, large countries such as Italy (72%), France (67%), Poland (64%), Spain (57%) and the UK (38%) lag behind.

7. Advantages of Recycling Plastic⁽⁶⁾

- ✓ Reduce global warming.
- ✓ Increase in energy sources based on plastic wastes.
- ✓ Protecting the environment by balancing the eco-system
- ✓ Reduces pollution.
- ✓ Conserves natural resources.

- ✓ Reduces amount of wastes to landfills.

8. Disadvantages of Recycling⁽⁶⁾

- ▲ Not always cost effective.
- ▲ Durability of the recycled products may be less as they are created from trashed waste which are overly used.
- ▲ It's unsafe and unhygienic around the recycling areas.
- ▲ Very less large scale industries.
- ▲ Initial cost of recycling is too high.

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