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5. Composition, Application and The Impact of Additional Plastics or Polymers

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ABSTRACT

Plastic pollution is prevalent in both terrestrial and aquatic ecosystems. Plastic waste in the environment causes problems and is a major concern for all life forms. Plastic production and accumulation in the natural environment are at an all-time high due to indiscriminate use, insufficient recycling, and landfill deposits. Plastics, also known as addition polymers, are one of the most widely used materials in modern society. They are adaptable, long-lasting, and can be shaped into any shape or form. Polymerization of monomer molecules results in the formation of addition polymers. The composition, use, and effects of addition polymers or plastics will be discussed in this article.

KEYWORDS:

Plastics, Additional Plastics, Polymers, Polystyrene, Ecosystem Service.

Introduction:

Monomer molecules are joined together to form addition polymers through a process known as addition polymerization. The double bond in the monomer molecule is broken during this process, and the resulting free radicals react with other monomers to form a long chain of polymer molecules.

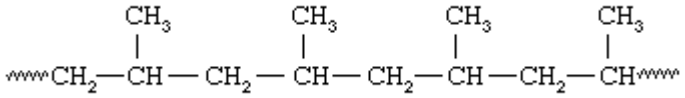
The end result is a solid material that is heat, water, and chemical resistant. There are various types of addition polymers, each with its own distinct composition. Polyethylene, polypropylene, polystyrene, and PVC are some of the most common addition polymers [1-5].

Polyethylene is a type of addition polymer that is commonly used in the manufacture of plastic bags, bottles, and containers. It is a lightweight material that is resistant to moisture, chemicals, and UV radiation. It is also recyclable and can be used to make a wide range of products. Polypropylene is another type of addition polymer that is used to make a wide range of products, including packaging materials, automotive parts, and textiles. It is a strong, lightweight material that is resistant to moisture, chemicals, and heat [6].

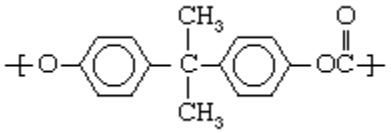
Polystyrene is an addition polymer commonly used in the manufacture of disposable cups, plates, and cutlery. It is a lightweight material that is simple to shape and mould. It is also an excellent insulator and is frequently used in the manufacture of packaging materials. PVC, or polyvinyl chloride, is an addition polymer that is widely used in the manufacture of pipes, window frames, and flooring. It's a tough, long-lasting material that's resistant to moisture, chemicals, and heat [7-8].

Plastics are commonly categorised as "commodity" or "specialty" resins by industrial fabricators. (The term resin was coined in the early days of the plastics industry to describe naturally occurring amorphous solids such as shellac and rosin.) Commodity resins are low-cost plastics produced in large quantities for the most common disposable items and durable goods. Polyethylene, polypropylene, polyvinyl chloride, and polystyrene are the most common. Speciality resins are plastics with properties tailored to specific applications that are produced in small quantities at a higher cost. Engineering plastics, also known as engineering resins, are plastics that can compete with die-cast metals in plumbing, hardware, and automotive applications. Polyacetal, polyamide (particularly those known by the trade name nylon), polytetrafluoroethylene (trademark Teflon), polycarbonate, polyphenylene sulphide, epoxy, and polyetheretherketone are important engineering plastics that are less familiar to consumers than the commodity plastics listed above. Another type of specialty resin is thermoplastic elastomers, which are polymers with the elastic properties of rubber but can be moulded repeatedly when heated. The article elastomer describes thermoplastic elastomers.

Plastics can also be classified into two types based on their chemical composition. Plastics in one category are polymers with only aliphatic (linear) carbon atoms in their backbone chains. This category includes all of the commodity plastics listed above. As an example, consider the structure of polypropylene, which has a pendant methyl group (CH_3) attached to every other carbon atom:



The other type of plastic is composed of heterochain polymers. In addition to carbon, the backbone chains of these compounds contain atoms such as oxygen, nitrogen, or sulphur. The majority of the above-mentioned engineering plastics are made up of heterochain polymers. Polycarbonate, for example, has two aromatic (benzene) rings in its molecules:



The table reflects the distinction between carbon-chain and heterochain polymers by displaying selected properties and applications of the most important carbon-chain and heterochain plastics and providing direct links to entries that describe these materials in greater detail.

It is important to note that for each polymer type listed in the table, there may be several subtypes, as any of a dozen industrial polymer producers may offer 20 or 30 different variations for use in specific applications.

Use Of Addition Polymers:

Addition polymers are used in a wide range of applications, including packaging, automotive parts, building materials, and textiles. They're also used in the manufacturing of consumer goods like toys, electronics, and appliances. The versatility of addition polymers is one of their primary advantages. Because they can be moulded into any shape or form, they are ideal for a wide range of applications.

They are also lightweight, making them simple to transport and handle. Additionally, addition polymers are resistant to heat, water, and chemicals. As a result, they are well suited for use in harsh environments such as construction sites, factories, and chemical plants [9,10].

Effects Of Addition Polymers:

While addition polymers have many advantages, they also have some negative environmental consequences. One of the main concerns is the amount of waste produced by the production and use of plastics. Plastic waste is a major environmental concern because it can take hundreds of years in landfills to decompose.

This can lead to soil and water pollution, as well as harm to wildlife that ingests or becomes entangled in plastic waste. Plastic production necessitates a significant amount of energy and resources. Both raw material extraction and the manufacturing process contribute to greenhouse gas emissions, which can contribute to climate change.

Impact Of Additional Plastics Or Polymers:

A million plastic bottles are purchased every minute around the world, and this number is expected to rise further in the coming years, resulting in an environmental crisis that may contribute to global climate change. MPs in sea ice were found to be positively associated with chlorophyll, indicating that living biomass can contribute to MP and NP deposition in sea ice. Significantly, sea ice in the Southern Ocean has the potential to serve as an MP depository. As a result, rather than being transported to deep oceans, MPs and NPs are likely to be trapped in and released from sea ice on a seasonal basis, in accordance with sea ice development and melting.

As a result, these MPs and NPs particles are more readily available to aquatic biota and are being consumed. Plastics are assimilated via physical or biological mechanisms, or a combination of both, depending on time and region [11-12]. As a result, MPs affecting ecosystem services primarily spread through three channels: terrestrial, aquatic, and atmospheric ecosystems. Figure 1. The impact of MPs and NPs pollution on ecosystem services, which are directly concerned with ecosystems and their functionality, has highlighted current knowledge gaps.

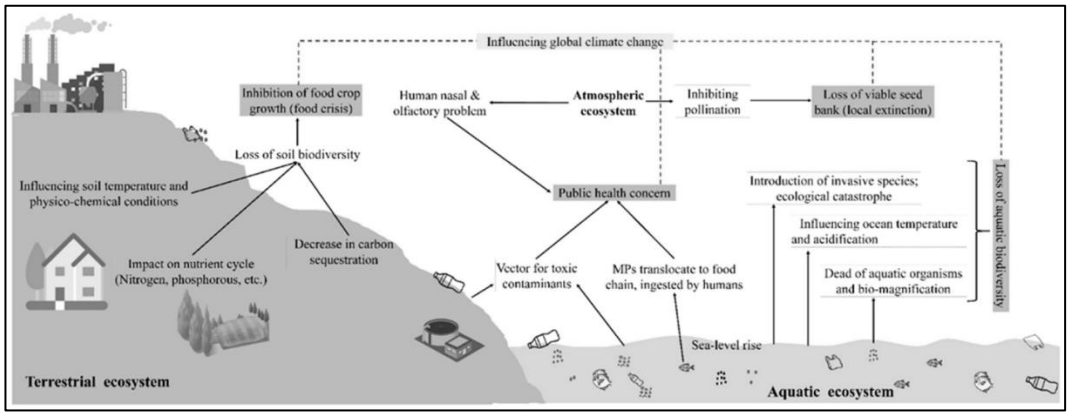


Figure 1: depicts the effects of MPs and NPs on various ecosystem services as well as climate change on terrestrial, aquatic, and atmospheric ecosystems.

A comprehensive approach necessitates balancing human well-being with nature's services; despite being emphasised in the late 1990s, this is one of the fundamental tenets underlying the development of ecosystem services that has yet to be investigated.

Conclusion:

Plastics, or addition polymers, are a versatile and long-lasting material that is widely used in modern society. They are used in a wide range of applications, including packaging and construction materials. However, the production and use of plastics have negative environmental consequences, such as waste generation and greenhouse gas emissions. There is a growing movement to use biodegradable and compostable plastics. These materials are intended to degrade more quickly in the environment, reducing the amount of waste generated by the production and use of plastics.

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