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Natural Rubber and Polyethylene-based Biodegradable Polymer Materials

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Editorial

The ever-growing volume of synthetic polymeric material trash on land and at water is currently a significant environmental issue. The prevalence of plastic pollution is correlated with plastics' low cost, durability and current unavoidability in some regions, which determines its extensive usage by humans. Packaging materials, casings for household and other equipment, containers, disposable medical supplies and utensils are examples of products composed of polymer materials that swiftly decompose into polymer trash and pollute the environment. However, it is important to keep in mind that up to 90% of all plastic that has ever been created in the world is still in existence and that 60-70 percent of this waste is municipal solid waste in the form of plastic packaging.

All types of plastic trash are bad for the environment and other living things. Polymers have the potential to produce toxic compounds that can kill plants and animals on land and in the water as well as infect people with diseases. Plastic waste poses a threat to entire ecosystems when it accumulates in huge numbers, particularly close to rivers and water sources as well as in the waters of the seas and oceans. The economy is also harmed by plastic pollution. The fishing business has considerable losses and it costs a lot of money to build treatment facilities and create new techniques for recycling plastic. Additionally, the tourism sector is struggling since plastic household garbage dumps close to recreational areas are not only unsightly but can also be a source of harmful gases and offensive odours [1].

It takes a lot of time and energy to separate polymeric compounds from dirt or other contaminants. Utilizing these resources for recycling is not always possible. A lot of experts believe that the development of polymers with the ability to undergo biodegradation after operation under suitable conditions with the formation of carbon dioxide and water, which are safe to plants, is a radical solution to this issue. Materials with a variable service life include biodegradable polymers [2].

Polymer biodegradation typically begins not only through biological processes but also by mechanical harm, chemical interactions, or penetration of ambient elements into the material, among other things. This might ultimately result in material degradation and increased attack by microbes. Numerous properties of polymers influence how they degrade during composting and how appealing they are to microbes. The polymer's chemical makeup, molecular weight, molecule structure, branching of the macrochain (side group presence and nature) and supramolecular structure are the factors that matter most.

The inclusion of plasticizers, fillers, stabilisers and other technological additives in polymeric materials affects how resistant they are to the action of microorganisms as well as how much of these materials can serve as a source of carbon, nitrogen and other biogenic elements for microorganisms. The growth of microorganisms is not supported by inorganic components (silicates, sulphates, phosphates and carbonates), as is well known [3].

Although biodegradable polymers have been around for a while, it has taken a very long time for them to become widely used in commerce. As compared to conventional plastics, they were typically more expensive and had less stable physical characteristics. Advanced polymerization and mixing technologies increase the strength and durability of these materials while cutting-edge large-scale manufacturing techniques lower the cost of generating biodegradable polymers.

The main purpose of biodegradable polymers is to give large-capacity industrial polymers, like polyolefins, biodegradability features (polyethylene, polypropylene, etc.). By polymerizing olefins, a low-molecular material, high-molecular polyolefins are created from oil and natural gas. The size of a polymer's molecules is a crucial component, as was mentioned above, in determining how resistant it is to biodegradation. Microorganisms use the monomers they impact as a source of carbon [4].

Natural polysaccharides are biodegradable but have low mechanical properties, whereas synthetic polymers have great mechanical and thermal properties but are resistant to the activity of microorganisms and cannot be degraded. Natural components (starch, chitin, cellulose, amylose, amylopectin, dextrin, etc.), which are a nutrient medium for microorganisms, are employed as additives to synthetic polymers in order to maximise the utilisation of the features of each component. Given that the synthetic polymer matrix in this scenario breaks down into bioassimilable pieces, the polymer composite material made from such a mixture might be referred to as biodegradable [5].

Conclusion

Polymeric materials are currently utilised in practically every branch of science and technology, including construction, agriculture and industry. The significance of creating novel materials based on polyolefins is determined by their enormous industrial production scale and diverse variety of uses, including polyethylene. Combining polymers with other substances and with one another to create materials with the new, necessary qualities is the primary and long-term direction in the development of new polymeric materials. The qualities of two materials do not, however, simply add up when they are combined. Based on the composition and circumstances of their creation, the properties of multicomponent materials are typically exceedingly challenging to predict.

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Conflict of Interest

No potential conflict of interest was reported by the authors.

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