SUSTAINABLE POLYMERS AND THEIR COMPOSITES AS A FUTURE CHALLENGE

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The demand for plastics has been increased remarkably in the last few decades and environmental pollution causing these materials has become one of the mostimportant concerns of the ecosystem. Most of the conventional polymers are highly persistent in the environment though they are obtained from fossil fuels and show, which is the main pollutant and there arise sustainability issues like petroleum depletion and waste management. Nowadays researchers are forced to manufacture environmentally friendly and recyclable plastic materials and their composites. By considering the applications of these materials in food packaging and other sectors such as agriculture, pharmaceutics, biomedicine, etc researchers are looking for fast-growing technologies in order to develop sustainable materials.

A sustainable polymer is a plastic material that addresses the needs of consumers without damaging our environment, health, and economy. To do this, researchers are working to develop polymers that, when compared with their non-sustainable counterparts:use renewable feedstocks, such as plants, for productionuse less net water and non-renewable energy in productionemit fewer greenhouse gases during productionproduce less waste in productionhas a smaller carbon-footprinthave a facile end life.

In the case of traditional polymers chemicals derived from petroleum or natural gases are taken as monomers, these monomers are used to produce plastic materials and these plastic products can be recycled, incinerated, or simply thrown away. While monomers in sustainable polymers are plant origin, these plant-originatedmonomers may be obtained by fermenting plants, simple extraction, bioengineering, microbial pathways, etc. thus obtained renewable chemicals are converted into plastic products. These sustainable plastics are easily compostable instead of recycle or incinerated. The most important commercially available sustainable polymer is PLA which cannot be recycled currently. But sustainable polymers are designed to use for a long time without any damage, i.e. they will never degrade if you use them properly or by putting themon your shelf. In order to degrade it properly so many

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conditions should be satisfied, they will not biodegrade in a landfill due to low temperature and lack of oxygen, etc. they will also not undergo degradation above the ground, so we have to provide sufficient conditions or should always dispose of it properly.

There is a question that whether sustainable polymers are compostable or not, the answer is of course “Yes”, while comparedto petroleum-based polymers sustainable polymers are more environmentally friendly. This means that they would produce less pollution, less non-renewable energy to make, etc. nowadays sustainable polymers are a growing segment in the industry, the main area of sustainable polymer industry includepolylactide which is derived from corn is made into plastic cutlery, cloth fibers, food containers, surprisingly in cell phone cases, etc. seating cushions and some foam pillows are manufactured using polyurethane which is modified soybean oil.Thus,the list of such innovative products will grow exponentially in the research field.There are many challenges to sustainable polymers such as elasticity, toughness, color, melting temperature, etc. so universities and companies are in extensive research on improving the physical properties discussed above.

Unfortunately, there is no easy way to identify the product whether it is made from conventional polymers or from sustainable polymers. This means there isn’t any universally accepted definition of sustainable with respect to the product. Butthere are some certifications for compostability and biological content which can help you to identify which products are truly more environmentally friendly. Commonly used sustainable polymers are obtained from plants like sugarcane, seed oils, vegetable oils, corn, etc, the scientists around the world-famous universities are in a search of finding or making non-food sources like trees, agricultural waste, grass, etc. these research studies in the present era can reveal the exact potential of sustainable polymers and their applications in the various fields. It is a big expectation for common people that the researchers will contribute innovative products like renewable and biodegradable food packaging materials in order to avoid conventional polymers and thus reduce environmental pollution.

Conclusion

Due to the biodegradability and enhanced mechanical properties, sustainable/biodegradable polymers have great potential in the industry. So instead of products manufactured from sustainable polymers, we have to use their composites. By

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mixing different fillers with these polymers. The composites may have vast advantages like processability, heat resistance, weather resistance, low cost, abrasion, and chemical resistance. New innovations led technology to enhance the above characteristics and production capacity of sustainable polymers. The sharp rise in global oil prices, growing concerns over the depletion of non-renewable raw materials, and global interest in sustainability, responsible packaging production, and efficient waste management have created a remarkable interest in the designing of crop-based packaging materials.

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