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Bio-based Polymers: Historical Events to Modern Medical Application Context

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INTRODUCTION

Is it possible to make long necklaces by tying the molecules together like pearls make a necklace of yarn? Not only is this possible, but these molecular chains have changed our physical world. The chemistry of long chains marked the beginning of an era in which materials that had only a short lifespan, which was easily subjected to the onslaught of sun, heat, and sunlight, were about to come to an end. There can be no other branch of science that has received so much blame with praise. Yes, it's about the big molecules called polymers. The name polymer is a combination of the Latin words poly, meaning many, and meros, meaning parts. As the name implies, large chains of polymers are formed by several small molecules' chemical reaction. Thousands of tiny molecules combine to form tens of thousands to millions of molecular weight substances. Their uses and possibilities range from the lightweight, comfortable clothing we wear to the artificial heart valves, from the seating chair to the parts of the spacecraft, to the sanitary napkins to the treatment of cancer. Natural materials such as natural rubber and cellulose obtained from biological sources and synthetic materials such as polythene and PVC are part of this field of science. Even, polymers are now being used to make small houses, including 3D printing.

History

Polymers are named after the scientist Jöns Jacob Berzelius. Although isolated studies date back to the nineteenth century, serious advances in the field have been made since the second decade of the twentieth century. In 1920, the study "On Polymerization" by German chemist Hermann Staudinger was published. It was followed by a period of heated debate and great controversy. The chemistry of the giant molecules and their chemical bonds' nature were unknown to the scientific community at the time. Schrodinger's article marked the beginning of a new field of study. He is therefore considered the father of polymer science. In that sense, the science of polymers is turning 100 this year. The

idea of how the advances made in this field have changed everyday life over the last hundred years is astonishing. As early as the nineteenth century, scientists observed that the molecular weight of materials such as rubber and cellulose was much higher than that of ordinary materials. Semi-synthetic plastics such as cellulose-based paroxysm and celluloid were the first to be manufactured. It is the first plastic bakelite to be produced commercially. It was built in 1907 by Leo Henrik Arthur Baekeland. Except rare polymers such as silicone rubber, the vast majority of commonly used ones are made of carbon chains. Hermann Schrodinger later described the chemical properties of the polymers.

During the First and Second World Wars, the search for new materials for warfare led to the discovery of many new polymers. Polythene, the most widely produced thermoplastic today, was accidentally discovered in 1939. Natural rubber was discovered as early as the 16th century but had little use. In 1839, Charles Goodyear discovered that heating with sulfur could greatly improve its properties and increase its strength. This process of vulcanization has led to great advances in transportation. The era of synthetic rubbers began in 1930 with the invention of the synthetic rubber SBR. Today, research is being carried out worldwide to develop polymers with strange thermal properties, such as natural decomposition and conductivity, which may seem strange.

Bio-based Polymers

Organic polymers were used long before synthetic polymers were invented. Starch and cellulose found in plants are organic polymers composed of glucose molecules. Biopolymers are proteins that are made up of amino acids in our body. Natural rubber is derived from the *Hevea brasiliensis* plant. Kite is also another biopolymer found in the shells of marine life. Their use is less widespread than that of synthetic polymers. However, their natural decomposition and safe use in the human body add to their importance. The bio-based polymer branch is a dynamic, adaptable area in which they reached development phases that

arises from the research level, via preliminary market adoption to long-term recognized presentations such as nylon or cellulosic. All of them show significant market growth. Bio-based polymer production continues to grow at about 4% per year, approximately the same as petrochemical polymer. Therefore, the market share of bio-based polymer in the polymer market remains around 2%. However, the individual development of different bio-based polymers varies. Some of the bio-based polymers actually live longer (such as bio-pet) compared to previous predictions, but many still show a slight increase, and some even show the ability to show significant growth trends (such as PLA). In addition,

there is optimism for future prospects for some bio-based polymers, such as PEF and bio-polypropylene. So, it is important that research cooperation could be in various fields, including natural polymers, bioplastics, bio-composites, nano-structural materials, and polymer nanocomposites. Studies are also underway to improve the potential of natural polymers such as cellulose, starch, and chitin.

REFERENCE

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