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Research on the New Technology of Surface Modification in Polymer Materials

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Abstract

value.Polymer surface modification technology is widely used in industrial production, combined with the current production reality and research status, first introduces the polymer surface modification technology, then discusses the technical principle of polymer surface modification technology, and finally analyzed the trend, the prospect of market application, hope to create good conditions for the sustainable and healthy development of the industry.

Keywords

Polymer Materials; Surface Modification; Technology.

1. Introduction

Since the 20th century, polymer materials have made great progress along with the development of the petrochemical industry.In recent years, the new development direction of polymer materials has gradually expanded to medical use, communication, photoelectric and other aspects.At the same time, the rapid development and wide application of polymer materials also put higher requirements for polymer materials themselves.Healommer materials are required to be better in basic performance and function, and to make greater progress in green synthetic chemistry and environment-friendly processing to adapt to and improve problems due to industry, energy shortage and reduction of human living space.

With the rapid development of science and technology, the current market puts forward higher requirements for the material production level and process stability. At present, as a key component of new materials, polymer materials have gradually been widely used in cutting-edge science and technology fields such as agricultural production, industrial production and aerospace. The surface modification technology of polymer materials is a surface modification technology developed based on the traditional polymer technology, which helps to give full play to the excellent performance of polymer materials and improve the use effect of materials. In order to further explore the application and development trend of the polymer material surface modification technology, the definition and characteristics of the polymer material surface modification technology are now described as follows.

2. Current Status and Progress of Polymer Materials

Polyolefin material research boom is based on the general application and performance improvement of thermoplastics and the demand for environmental recovery; polymer-based nanocomposites are one of the most useful applications in the future; energy-saving and environmentally friendly materials meet the requirements of world energy shortage and sustainable development; biomedical materials are making great contributions to the improvement of human life and quality of life.

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2.1 New Progress in the Study of Thermal Conductive Polymer Thermal Materials

With the development of industrial production and science and technology, traditional thermal conductivity materials and one gold fund has been limited in certain fields due to their poor corrosion resistance and electrical conductivity.If the heat exchanger is used in chemical production and wastewater treatment, the material is required to have high heat conductivity, chemical corrosion resistance and high temperature resistance. In the field of sub-electrical technology, electronic components and electronic equipment develop due to the development of integrated technology and micropackaging technology, which leads to more heat generated by limited volume, and high heat conductivity insulation materials are required to quickly lose the heat produced.At present, the field of thermal conductivity polymer materials has formed a relatively complete classification, thermal conductive rubber, thermal conductive plastic, thermal conductive adhesive have had great development.In the plastic industry, heat conductive plastic can be used for metal materials in environments requiring good heat transfer performance and corrosion resistance in heat transfer and heating engineering.Such as heat exchanger, heat conduction pipe, solar water heater, etc.In addition, in the field of electronic and electrical engineering, it can also make high-performance heat conductive circuit boards.In the rubber industry, the research of thermal conductive rubber mainly focuses on the field of silicone rubber and nitrile rubber as the matrix, and the thermal conductive rubber with butadiene rubber, natural rubber, butyl rubber, SBs and other bases have also been reported.At present, thermal conductive rubber is mainly used in the field of electronic and electrical, for manufacturing rubber products in contact with electronic components (thermal conductive rubber can provide good heat dissipation for electronic components, and can play insulation and shock absorption function).In the compound industry, thermal conductive adhesive is mainly used as adhesive and packaging materials in the electronic and electrical field.The polymer matrix material has basically no uniform single-dense ordered crystal structure or loader required for heat transfer, and the thermal conductivity is relatively poor.In order to improve its thermal conductivity, it can be solved in two ways: one is to prepare structural thermal conductivity polymer material, and the other is to prepare added thermal conductivity polymer material by adding thermal conductivity packing to the matrix material.Since the polymer materials are mostly thermal and electrical bad conductors, it is not easy to prepare structural thermal conductive polymer materials; on the contrary, the added thermal conductive polymer materials are compared to the structural thermal conductive polymer materials, so the research of thermal conductive polymer materials is mainly focused on the study of added thermal conductive polymer materials.

2.2 New Progress in Studying Bionic Polymer Materials

Animals and plants in nature have undergone millions of years of evolution, and their structure and function have been nearly perfect.In just a hundred years, synthetic materials have far exceeded the evolutionary pace of nature.Teacher nature greatly enriches our ability to understand and transform the world.In this process came a new science-bionics.The first Bionics Symposium was held in the United States on September 13,1960, and Dr. Steele (D r.Jack Ellwood Steele) The first concept of bionics (Bionics) was proposed at the meeting, and bionics was defined as follows: Bionics is the science of building technology systems imitating biological systems, or that makes the artificial technology systems have or are similar to the characteristics of biological systems.In short, bionics is "the science of mimicking biology".synthetic polymer materials is coordinated with wood, cotton, wool, silk, natural or green materials, with the progress of scientific means, modern biomimics has entered the molecular level, from a more micro level of nature, through the original "familiar" natural materials, learn from "bionic" to develop nutrition, will find new properties and new applications, get high efficiency, low energy consumption, intelligent response and environment friendly bionic polymer materials.In the next 20 years, people are expected to produce high-performance, low-cost biomimetic materials, and the bionic technology will be widely used in the preparation of various materials.In the field of biomimetic materials research, polymer biomimetic materials will be one of

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the most important research and development directions, mainly including the structural bionic polymer and functional bionic polymers.

For example, the composite structures of bone and animal teeth, Preparation of superstrength materials; The molding process of imitation spider and silk spinning, Preparation of high-strength artificial fibers; Two-dimensional network structures imitating plant leaf stems and animal muscle fibers in nature, Prepare a trapezoidal structural polymer with extremely high thermal stability; Structure structure of spherical cell membranes in nature, Polypolymer hollow vesicle membrane, For the study and development of highly efficient biological microreactors; A "spring" -like cross-section morphology in the imitation animal mantis muscles, Preparation of high molecular elastic materials with super-long tensile / high return elastic energy; A longitudinal gradient of animal tendons and plant stems, An n-gradient gradient structure is formed in the optical transparent polymer fiber along the fiber direction, Get the ultra-wide frequency band characteristics; Hyperhydrophobic properties of plants with surface micron-nanosized secondary surface structures, The corresponding polymer biomimetic surfaces were prepared, Get superhydrophobic properties comparable to lotus leaves and oil, It is expected to be used to prepare self-cleaning coating materials; The efficient preparation of natural products and properties of natural degradation, Through the genetic modification, To study the preparation of environmentally friendly and biodegradable new polymer materials or efficient synthesis of chiral molecules in biological systems; Imthe strain properties of organisms in the environment, Priority supported directions for the preparation of high molecular and gel smart materials with rapid response function under the external field include, Bionic polymer surface study with the surface structure of biological materials as the template, Study on bionic polymer bulk materials and their properties of simulated biological materials, To simulate the structure-efficiency relationship and the strain behavior of the bionic polymer materials in biological systems, Scientific exploration of efficient preparation of high molecules with similar preparation reaction to biological systems.

3. Overview of New Techniques for Surface Modification of Polymer Materials

3.1 Surface Modification Method

Different types of modification of polymer materials are required. First of all, the most common is the direct coating technology, the technology through the polymer material surface directly coated with organic matter to achieve the effect of substrate mutual fusion, not only has the material basic performance, but also has the function of functional group, so it can meet the special needs of surface material transformation, such as hydrophilic material treatment. However, the technique is insufficient durability and short service life; surface oxidation is a polymer surface aggregation by surface oxidation. Among them, the flame treatment method is to achieve the surface treatment through the high temperature instantaneous oxidation, the more representative is the ink printing technology. Halo discharge technology achieves the plasma effect through the electric field on the film surface, and then meets the improvement effect of free radicals. The introduction of oxygen atoms is easily achieved. Acid treatment technology is to improve the functional group of the surface by means of hot chromium acid solution treatment, mainly through the overall group substitution into the substrate; Finally, plasma treatment and ultraviolet radiation technology. Plasma treatment is also conducted through plasma discharge to achieve the treatment effect of hydrogen bonding elimination of organic compounds combined with other types of organic bonds. UV radiation is the technology that achieves the surface treatment effect by using the surface modification of the substrate under ultraviolet radiation. Due to the low cost, it can not affect the performance of the material itself, so the development speed of the technology is very fast and has a broad market prospect.

3.2 Surface Modification Process

The application of surface modification technology of polymer materials needs the development based on basic theory.From the perspective of process realization, by placing the polymer base in a closed reaction container, adding the grafting monomer, polymerization reaction through the initiator,

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and adding the grafted monomer, the reaction temperature is generally lower than the overall boiling point of the solvent, when the inert gas is needed to add protection, the main reaction will be completed within 5min.The production process mainly adopts the indirect production process mode, which can be used in the production activities of different types of polymer materials, such as polystyrene, high-density polyethylene and low-density polyethylene.The grafted monomer is mainly acrylic acid, acrylic glycidate acrylate and other substances.The biggest characteristic of this mode is adapted to the polymerization of various hydrocarbon bonds, and the disadvantage is also very obvious, that is, the radiation time required is relatively long, and the speed of the reaction is mainly related to the rate of initiator and liquid phase transition.Although the problem of evaporation rate can be solved by raising the temperature in the cavity, once the temperature exceeds a certain boiling point, a solid-state layer will be left on the surface of the substrate. At this time, the rate of the reaction will be affected to a certain extent, which is equivalent to reducing the effect of the reaction in a disguised way.

Continuous method is a technique of reacts polymer fiber with flexible film using a polymer matrix as a reaction medium.In the reaction step of the technology, most of the air is removed by the nitrogen replacement, then solve the reservation problem of light initiator and monomer by the substrate motor traction, then ray through the quartz window, move the front and negative irradiation, then install the mirror on the lamp chamber to achieve the effect of foaming, then the monomer temperature of the container is controlled by electric heating to ensure the tightness through the pipeline, the motor time changes with the motor speed, and the process operation can be dry after cleaning the acetone material.

4. New Technical Principles of Surface Modification of Polymer Materials

Photoinitiators generally choose dibenzoketone or the corresponding derivative material to achieve the effect of quickly restoring the three-line state by absorbing the UV light excitation by the initiator.The capture of the H atoms through the surface of the polymer enables the mixing of the polymer surface radicals, and the branch chain is formed by the monomer addition, thus realizing the processing of the polymer surface.From the perspective of technical type, polymer material surface modification technology technology principle has unique performance, and optical medium modification technology first appeared in the last century 50s, in recent years through technical research, maturity, has can through mature process production mode to adapt to each link of social production, to promote the application and development of polymer material surface modification technology has laid a solid foundation.

5. Market Application of New Technologies of Surface Modification Technology of Polymer Materials

5.1 Improve the Stability of Organic Materials

The application of surface modification technology of polymer materials can well solve the problem of insufficient photostability of organic materials.Objectively speaking, the important factor leading to the life shortening of organic materials is the influence of ultraviolet light, so in recent years, the surface modification technology of polymer materials is gradually inclined to the application of photostability agents.Although conventional stabilizers can be added to the material, the method also has obvious defects.When acrylate is used, the layer of the surface is connected to the epoxy group, allowing the group into the second reaction part.For example, amine compounds can improve the overall photostability. The commonly used stabilizer has obvious advantages in resisting the photooxidation effect. Figure 1 below is the molecular formula structure of the amine stabilizer.

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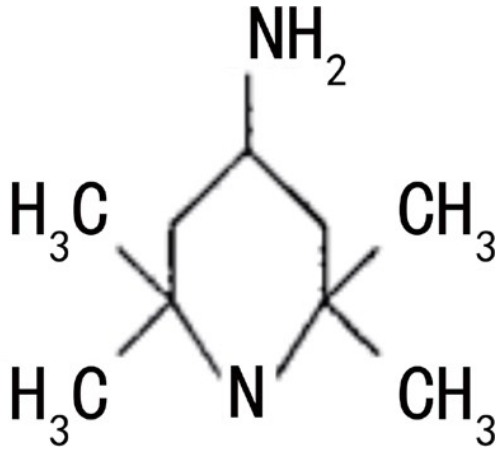

Figure 1. Amide stabilizer molecular formula

The photostabilizer under the above molecular formula conditions can effectively improve the antioxidant performance, and can well meet the actual needs of mixing production.

5.2 Application in the Printing and Biology Field

Surface modification technology of polymer materials is widely used in the printing field.The corona discharge method can solve the problem of insufficient polyolefin thin film printing performance, which not only has simple operation and low technical cost, but also can meet most production requirements.However, the technology also has some drawbacks, such as insufficient durability, and it is easy to fall off after a long time of use.The mode of surface photografting can introduce the polar monomer of the polyolefin well, and thus solve this problem objectively.The application of the surface modification technology of polymer materials in the biological field mainly focuses on two aspects, one is the biocompatibility problem, and the other is the anticoagulation problem of blood contact.In fact, most of the polymer materials on the market cannot meet the above requirements, so only through the surface modification of the polymer materials can improve the overall use performance.For example, heparin membrane modification can meet the treatment requirements of the material surface, so as to reduce the occurrence rate of thrombosis during the use process, and contribute to the improvement of patient prognosis.

5.3 Application in Agriculture

The surface modification technology of polymer materials has long been used in the field of agricultural production.In recent years, through the polymer surface modification, it not only improves the effect of membrane waterproof and antifog, but also can meet the use requirements of light transmittance, so as to avoid the poor plant photosynthesis caused by insufficient light transmittance, and promote the growth of plants to a certain extent.In addition, the current domestic agricultural production is still more commonly used in polymer surfactant, the surface of the material dissolved in water after 3 months will fail.After the adjustment of the surface modification technology of polymer materials, the surface activity level is improved and effectively reduces the impact of water. The blowing validity period of the material is low, there is no replacement products and materials, and the market is relatively good.

5.4 Clothing Industry Application

The application of polymer material surface modification technology in the clothing industry is mainly reflected in fiber products and other fields.Generally speaking, conventional cloth often has the problem of poor dyeing performance, so the cloth will inevitably suffer some risks and resistance in the promotion process, leading to commercialization cannot be realized.Compared with the surface modification method, the price control can also avoid the problem of staining.For example, after MGA grafting processing, the application to high-intensity PE can not only achieve the staining

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performance, but also solve the problem of insufficient uniformity, laying a foundation for the development of the garment industry.

5.5 Composite Material Application

One of the key applications of the surface modification technology of the polymer materials is the high strength fiber, which has the characteristics of matrix compatibility. Through the surface modification of the polymer materials, it can improve the compatibility of the fiber and the collective, and achieve the ideal material additional level, so as to solve the problem of group compatibility.

6. Summary

In conclusion, the surface modification technology of polymer materials is widely used in the treatment and application of polymer materials and industrial modernization. Through polymer material surface modification technology processing, can make polymer materials better meet printing, biology, clothing industry, through the application of composite materials, help to reduce production costs, improve economic benefits and the overall social benefit, promote industry sustainable development and reduce the waste of natural resources, so has a broad market prospect, hope to provide for the development of chemical industry and related industries new ideas and insights.

Looking ahead, with the development of polymer materials, the boundary between nanotechnology and biotechnology becomes smaller and smaller, and is combined with more traditional molecular science and technology. In addition to the important directions mentioned above, the delivery technology of energy and water purification technology is perhaps the most important new issue in the next decade. In terms of energy supply, the application of polymer materials in energy generation materials, such as thin-film conversion materials, catalysts for fuel cells, solar cells, etc., and energy-saving materials, such as insulation materials and energy storage materials, will be even more important. In terms of water purification supply technology, applied polymers including filtration membrane, reverse osmosis membrane, polymer materials of floc(clean) will also become increasingly important.

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