Universe Scientific Publishing

10.18686/ahe.v6i19.6288

Analysis of Flame Retardant Technology for Polymer Materials

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Abstract: In recent years, national machinery and agricultural production have played an increasingly important role due to the emergence and application of polymer materials. With their excellent performance and low cost, polymer materials are widely used in various fields of national economy and people's life. However, most polymer materials are flammable. The combustion process is characterized by high heat dissipation rate, high heat dissipation rate and high flame dissipation rate, which makes it difficult to extinguish the fire. They also produce tobacco and toxic gases, which pose a serious threat to human life and the environment. Improving the efficiency of the actual use of fireproof materials not only reduces the negative impact on the environment, but also eliminates possible fire hazards.

Keywords: Polymer materials; Flame retardant technology; Application and development

1. Introduction

Most polymers are flammable. When heated by air, it decomposes into volatile fuels. Combustion occurs at high system temperatures and fuel concentrations. Although polymers make people's lives easier, their flammability poses a threat to their lives and property. Therefore, there is an urgent need for research to optimize and improve the flame retardancy of polymeric materials and to minimize toxic emissions from combustion.

2. Analysis of the principle of flame retardant polymer materials

Flame retardant technology is an application technology developed primarily to address the combustion mechanisms of polymeric materials. If polymeric materials are to burn stably, they must be thermally stable and flammable, and be able to isolate heavy gases or substances. Flame retardant technology is achieved by cooling and diluting the material. Chemically speaking, the combustion process of flame retardant polymeric materials is very complex and their flame retardant systems measure the chemical properties of different materials. Studying the combustion mechanism of polymeric materials provides further insight into their flame retardant properties.

3. Flame retardant technology in polymer materials

3.1 Analysis of chemical reaction technology in polymeric flame retardant materials

The application of chemical reaction technology in polymeric flame retardants is mainly achieved through copolymerization, bonding and branching of substances in polymeric materials. Through chemical reaction techniques, polymers release flame retardant elements or flame retardant compositions in the molecular chains of polymeric materials through appropriate chemical reactions of internal substances. Flame retardant materials can replace traditional flammable polymer materials. The application of chemical reaction technology in polymeric materials expands the range of polymeric materials and thus supports the promotion of polymeric materials in various industries.

3.2 The use of nano flame retardant technology in polymer materials

The introduction of nanotechnology has changed the models and research directions related to flame retardant methods for polymeric materials. Due to nanotechnology of polymeric combustible materials, microstructures are changed to form inorganic composite nanocomposites, flame retardant materials and organic polymeric nanomaterials. This new microstructure contains nano

additives (such as carbon nanotubes, silica, low concentration of semisilicone polyethers and graphite) in combustible polymer materials. The application of nanotechnology in the production of polymeric refractory materials is one of the leading scientific and technological achievements in China.

4. Types of flame retardants for polymer materials

4.1 Phosphorus-based flame retardants

Organophosphorus flame retardants include phosphate esters, phosphate esters, organic salts, phosphorus oxides, phosphorus-containing polyols, and phosphorus-nitrogen compounds, but halogenated phosphate esters are widely used. The organophosphate-repellent flame retardant mainly functions in the decomposition phase of the polymeric material at the beginning of a fire. It promotes dehydration and carbon content of the polymer material so that the polymer material does not produce flammable gases, and because the non-volatile phosphorus compounds act as coagulants, the carbon forms a protective carbon film that isolates external air and heat.

4.2 Inorganic flame retardants

The flame retardancy of inorganic flame retardants is achieved mainly through the regeneration and thermal management of high performance fillers. Through thermal decomposition and absorption of the flame retardant, the material is unable to reach the decomposition temperature or slow or stop the temperature increase of the material. This reaction absorbs a large amount of heat of combustion, reduces the surface temperature of the material, and significantly reduces the rate of thermal decomposition and combustion of the polymeric material. During the decomposition process, a large amount of water vapor is formed and diluted with a certain concentration of combustible gas to provide flame retardant and cooling effect. In the combustion process, magnesium oxide, aluminum and other products together with carbon products to form a protective film on the surface of the plastic, can cut off the inflow of heat and oxygen, to prevent the release of small molecules of flammable gases, to achieve the effect of fire.

5. Conclusion

At present, with the development of flame retardant technology of polymer materials, a new method of flame retardant has been created. In practical application, we can combine flame retardancy, processing ability, mechanical properties, appearance and other factors, and fully consider environmental factors to produce combustible materials scientifically and efficiently. In general, in our in-depth research on polymer materials, many new polymer materials have appeared in front of people, and the locking technology has been optimized and improved, forming a certain technical basis. In recent years, the extensive development of fire extinguishing measures and related requirements in China have led to the emergence of a large number of fire extinguishing products, and some positive results have been achieved. However, there are still deficiencies or lack of practical applications in various production processes, which need further development and research.

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