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To improve the technology of obtaining polymer composite materials on the basis of fillers that provide special properties.

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Annotation. This article is written about the fact that by adding special property fillers to the polymer composition materials, which are obtained on the basis of thermoplastic polymers, they change their properties, obtain such important properties as liquefaction, melting and thermal conductivity.

Keywords. Polymer, polymer composite, filler, combustion, flammability, burning speed, oxygen index, friction, antifriction properties in polymers, talc, asbestos.

Introduction

Polymer composite materials (PCM) are becoming increasingly common and developing, in which the polymer performs the function of a pure form or polymer-bonding Matrix. The polymer-based composition is understood by the addition of various additives, such as plasticizers, stabilizers, solvents, etc. Such a structure of PKM is explained by the characteristics of different types of polymers and the supply of composite materials obtained from them, as well as the relatively simple processing technology and good bonding ability.[i][1]

Flammability is characterized by a number of properties, such as the ability to burn, the speed of combustion, the composition of combustion products, the heat intensity and, finally, the composition of the atmosphere in which combustion is possible. It is customary to divide polymer materials into non-combustible, hard-combustible, hard-liquid and easily combustible components. The coefficient of flammability (K) in such materials is appropriate <0,1; 0,1-0,5; 0,5-2,1; >2,1. The higher the flammability coefficient, the more flammable and dangerous the polymer substance will be. The coefficient of flammability is determined by the amount of heat delivered to it from the source of combustion by the amount of heat released during the combustion of a given mass sample.

Material and Materials

The composition of the atmosphere in which the combustion occurs is assessed by a minimum molar concentration of oxygen, which, on the one hand, is sufficient to activate the combustion sample. This indicator is called the oxygen index (ki) and has values from 15 to 95 for various polymers. With an increase in the oxygen index, the flammability of the material decreases.

On the other hand, the composition of the combustion atmosphere is assessed by the products released during combustion: smoke and gases, because the combustion products are usually toxic, the smoke changes the transparency of the atmosphere, which makes it difficult to control the flame and evacuate people from the polymer fire zone. The optical density of smoke varies from 0 to 535, and with its increase, the density of smoke increases (Table 1).

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Table 1

Foaming technology	Name of the substance	Scope of application
Mechanical separation of gas by liquid polymer composition, then processing it during heating	Weather	Production of foam latex, reagoplasts and thermoplastics from oligomers
Melting gas in a liquid polymer composition under pressure, and then processing with a pressure reduction	Carbon dioxide	Production of molded products from plasticized polyvinyl chloride
Simultaneous vaporization with polymer-containing liquid separation and polymer processing	Easy boiled liquids	Production of foam plastic acetyl cellulose
Separation of two or more components, then obtaining a foaming system	Gases formed as a result of the chemical reaction of polycondensation	Polyurethane foam production
Separation of the foam part by polymer composition, heating with the decomposition of the foam element that emits gases	Gases released during the decomposition of special substances	Manufacture of foam plastic and air rubber
Spacing the liquid composition with hollow microspheres, then improving it.	Hollow microspheres	Syntactic foam production

In particular, the indicators of collars for polymer materials used in aviation, shipbuilding, automotive, railway transporti, construction and other objects are associated with a large influx of people or the high speed of an object in space, which contributes to the rapid spread of fire and makes it difficult to eliminate the fire.

Reducing the flammability of polymer materials can be carried out in two ways. The first is the chemical modification of the polymer molecule, for example, with the inclusion in the polymer chain of certain chemical elements, such as chlorine, bromine, phosphorus, nitrogen, etc. PVC oxygen index 49. Another example can be polytetrafluoroethylene (fluoroplast-4), which has an 95 oxygen index. For comparison: the oxygen index of polyethylene is only 17,4.

Results

Another way to create low-flammable polymer materials is to create a polymer composition that has antipyrenes in its composition-to add various additives that reduce flammability. The mechanism of action of antipyrenes consists in the separation of the structure of products that inhibit flammability when destroyed by heat or contribute to the formation of coks of polymers.

The use of non-combustible mineral additives that maintain their stability in temperatures up to 1000°C is common. Among them are oxides, for example, surma oxide (Sb2O3), as well as silicates, graphite and other additives. In addition, as a mineral additive, which reduces the flammability of polymers, substances with a relatively low decomposition temperature are used. Thus, when heated to 40°C, carbonates, bicarbonate, metal hydroxides, a large amount of non-combustible gases are released, resulting in a decrease in the flammability of the polymer composition.

As antipyrenes, chlorine-, bromine -, phosphorus-containing substances, for example, chlorparaffin, geksabrombenzen, tricrezilphosphate, etc., are used. The use of antipyrenes is an effective way to reduce the burning of polymers — based materials and products, which in itself allows the creation of dry materials, the use of which can also be used in construction and transport.

Friction plays a huge role both in everyday life and in the work of various machines and machines. If there is no friction, it would be impossible to shake the car wheel or turn a person to the ground, at the same time there are many devices that can reduce the friction force and at the same time improve the performance of the machines. Therefore, it is very important that the creators of technology always have the

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functions of regulating the force of friction, including the use of special materials that have the properties of friction or antifreeze. In the process of friction, two materials are involved: body and body resistance.

Discussion

From the molecular point of view, during friction, adhesive bonding, which is always present between two contact materials, is overcome. The external friction force is determined by the resistance of the two bodies to move relative to each other. it is directed towards the opposite side, not looking at the vektori direction of action of the force.

Polymers are widely used as friction and antifriction materials, for this purpose their properties are regulated by introducing special additives into the composition.

Polymer materials differ from other materials in that the surface layer is relatively quickly eaten during friction, and the higher the temperature of the eaten material, the stronger.

Polymers with high antifriction properties, such as polytetrafluoroethylene, polyamide, polyethylene, polyphormaldehyde and others, can be used in friction nodes at low mechanical loads.

Most often, for the production of working parts in friction nodes, polymer compositing materials are used, which include special fillers with the ability to reduce the coefficient of friction. As a rule, these fillers have a layered structure. These include graphite, molybdenum disulfide, tungsten disulfide and others.

The composition of the antifreeze filler in the polymer matrix is 2-10% of the composition of the material, this amount has little effect on other properties of the polymer. Sometimes in combination with the above filler, metal salts are added to increase the thermal conductivity of materials and improve the removal of heat from the friction area, creating polymer composites with antifriction properties in them.

Conclusion

In technology, in addition to antifreeze materials, materials with a high coefficient of friction are widely used. They have a coefficient of friction within 0.2-0.5 and are used in various machines and shears friction devices.

Friction materials are used in the brake system and in vehicles: they produce brake pads and compression disc coatings. Due to friction materials, the kinetic energy of the vehicle during braking is converted into heat. The released heat energy is absorbed by the metal parts, and then released into the atmosphere.

For most polymer materials, it is easy to achieve the required coefficient of friction. Most often, thermoplastic polymers - rubber and phenol-formaldehyde plastics are used to create friction materials. These polymers have relatively high thermal resistance ,the necessary flexibility (for increasing the actual contact area and the adhesion of the two communication bodies), the stability of the friction coefficient in different operating temperatures, high tensile resistance. To obtain materials with high friction properties, metal oxides, metal powders and talc, asbestos, uglerod and Basalt fibers are added to the polymer composition. Designed to increase the heat resistance and strength of the composition of the fibers, the polymer composition of the metal filler improves heat dissipation.

Acknowledgement

PCMs are widely used in Electrical Engineering and electronic devices. Such properties, the value of which must be regulated, include electrical conductivity, electrical strength, dielectric conductivity, etc. Electrical conductivity is the inverse value of electrical resistance, which depends on the size and surface of the polymer sample. The electrical conductivity of polymers is closely related to their chemical purity. Tiradi significantly change this indicator in mixtures. For example, in terms of mass, polyamide humidity in the amount of 0,1-1,0% increases electrical conductivity in 1000 times. Similarly, plasticizers with high mobility of ions are also affected.

Fillers can affect electrical conductivity in different ways, depending on their nature. The high content of electrical conductive fillers (metal powders, graphite) significantly increases the electrical conductivity of the polymer material. Based on such compositions, for example, electric heaters of a complex geometrical shape are obtained.

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When creating electroplating polymer materials, there are no restrictions on the use of polymers as binders. These solid thermos and reagoplasts can be rubber-like materials, which have a constant shape of the product or a variable shape in loading, that is, materials with high return deformation.

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