CARBON FIBER PLASTICS BASED ON POLYAMIDES

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Annotation: The influence of dispersed and fibrous fillers on the main performance characteristics of polymer composites based on aliphatic and aromatic polyamides has been studied.

Keywords: polymer composites, polyamides, fillers, properties.

Introduction

One of the effective ways to improve the properties of PA is to reinforce them with chemical fibers (Vl). And although the use of overhead lines somewhat limits the choice of reinforcement methods, makes it difficult to manufacture products of complex shape, however, the complex of valuable properties set by the PC and the possibility of their variations, providing prospects for use, compensate for these disadvantages. One of the most promising chemical overhead lines are carbon fibers (HC). Carbon fibers are materials of the third millennium, and significant progress in various fields of technology is associated with them. Compared to St. The use of HC for polymer reinforcement makes it possible to increase the bending modulus by more than 5 times, the thermal conductivity coefficient by 2-3 times, reduce creep and increase the wear resistance of PC . Due to the fact that HC is characterized by inertia to most chemically active media, products made of UP are characterized by high chemical resistance in aggressive environments of various industries. Carbon fibers have a low thermal coefficient of linear expansion (TCLR) and coefficient of friction, good performance in vibration conditions, high fatigue strength and manufacturability. For reinforcing polymer binders, HC is used in the form of continuous threads, bundles, woven materials (staple, tapes), crushed or chopped. The most durable hydrocarbons, which are carbonation products of the initial carbon-containing fibers, are obtained from polyacrylonitrile (PAN), viscose and pitch raw materials.

In, the results of studies of the UP based on PA 6 obtained by injection molding from granules reinforced with hydrate cellulose hydrocarbons using a twin-screw extruder are presented. Information is provided on the influence of technological factors on the shrinkage of products: the influence of heat treatment in various media (air, water, oil) on the physical and mechanical properties of the packaging is studied. It is shown that the optimal set of properties (compressive strength – 128-166 MPa, heat resistance according to Vika – 497 K, dry friction coefficient – 0.16–0.3) is possessed by an UP reinforced with 30-40 wt. % UV. Carbon fiber plastics based on PA 6, which contain 10-30 masses. % of the brand Ural-24, manufactured by injection molding on the KiASU-100/25 machine, have high thermophysical and tribological properties. When reinforced with PA 6 HC, its wear resistance increases by 1-2 orders of magnitude, which is explained by a decrease in the coefficient of friction (by 1.2–3.7 times), an increase in thermal conductivity (by 25-62%) and, as a result, a better heat sink from the friction zone. Carbon fiber based on PA 6, containing 40 wt. % of the above–mentioned overhead line has the following characteristics: heat resistance according to VIKA - 483 K; destructive compression stress – 166 MPa; linear wear intensity – 0.66·10-8, coefficient of friction – 0.34).

The mechanical properties of HC significantly depend on the temperature of the heat treatment (TO). With an increase in TTO from 1473 to 3073 K, the modulus of elasticity of HC increases, and the maximum tensile strength has UV in THAT 1773 TO. Studies on the effect of CBT on the properties of UE based on phenylene C-2 have been devoted to. As the research results have shown, the best complex of thermophysical and strength properties is possessed by UE based on HC with TTO 1173 K, and the highest impact strength and strength indicators are UP with TTO 773 K.

As noted [30], the modulus of elasticity of HC affects the change in tribological properties of UE based on aromatic phenylone C-1 and C-2. An increase in the modulus of elasticity reinforcing the overhead line in the UP, providing increased wear resistance, leads to a decrease in the strength of the UP and their elasticity. It was found that the maximum reduction in wear is typical for C-2-based UE reinforced with a modulus of elasticity not exceeding 300·103 MPa. The properties of plastics, especially plastics, depend on the interlayer strength, which is determined by the adhesion of the fiber to the binders. Considering that they have Due to insufficient adhesion to the polymer matrix, intensive research has recently been conducted in the field of developing new types of hydrocarbons with special properties and modifying the surface of existing ones. The introduction of metals into their composition is one of the promising methods for modifying the surface of hydrocarbons. The use of element-containing hydrocarbons containing structurally active groups in the volume and on the surface of the fibers makes it possible to achieve a significant improvement in the properties of polymer binders.

Depending on the feedstock and the temperature of heat treatment , metals in the composition of metal-carbon fibers (Me-HC) are in the form of oxides, carbides, highly dispersed particles, which gives Me-HC special properties (magnetic, adsorption-catalytic, biocidal) and provide good wettability and adhesion to polymer and inorganic binders, affects the nature of the interaction of reacting components at the interface of the "fibrous Np polymer" phases.

Metal-containing hydrocarbons (Sn, Al, Fe, Pb, Zn, Cu) obtained by carbonation at 1173 K of cellulose fibers impregnated with the appropriate composition are used in for reinforcement of phenylene C-2. According to their effect on improving the physico-mechanical and tribological properties of plastics, Me-HC are arranged in the following row : Al-HC > Zn-HC > Sn-HC > Fe-HC > Cu-HC > Pb-UV.

When nickel-containing carbon fibers (Ni-HC) 3 mm long, obtained from a carbon bundle and tape, are introduced into phenylon C-2, the thermal and wear resistance of the binder increases by 15-20% and by 5.5-12.5 times, TCLR and coefficient of friction they decrease by 1.5–1.6 and 2.8–3 times, respectively. In, hydrate cellulose copper-containing carbon fiber (Cu-HC) of the Ural-20-Si brand was used to reinforce phenylene C-2 in the amount of 17 mass. % with an electrochemically applied copper coating. The resulting PC has the following properties: impact strength – 51.2 kJ/ m2, microhardness – 39MPa MPa, compressive stress – 260 MPa, coefficient of friction – 0.23. Carbon fiber is recommended to be used in friction units of machines and mechanisms operating in harsh operating conditions without lubricants at values of RV ≤ 10 MPa · m/s.

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