«Development of composites based on thermoplastic elastomers with improved performance properties»

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The relevance of the topic. At present, polymer composite materials (PCM) are widely used in various industries, including for building products. Such materials should have good strength properties, high elasticity and deformation capacity, weather and ozone resistance, impact resistance, durability and resistance to alternating temperatures. Such materials include compositions based on thermoplastic elastomers (TPE), especially mixtures of styrene thermoplastic elastomers or polyolefin elastomers with polypropylene (PP).

Due to the increasing requirements for the quality of products used in construction, composite materials require additional modification to increase the level of properties. This is achieved by introducing various modifiers into them and using special technological methods for obtaining composite materials.

The purpose and tasks of the dissertation are to develop recipes composite materials based on TPE with the use of modifying additives, the study of technological, strength and performance properties of materials for the manufacture of parts for construction purposes. In the dissertation work, research was carried out in the following areas: modification of a polymer composition based on a mixture styrene TPE and polypropylene to improve performance and deformation properties; reducing the flammability of the compositions; replacement of styrene TPE with polyolefin elastomers to improve manufacturability.

The scientific novelty of the dissertation work is as follows:

- for the first time, an increase in the resistance to thermal-oxidative degradation of PCM based on styrene TPEs modified with maleized PP (PP-g-MA) and organobentonite, which is associated with a change in their morphology;

- using scanning electron microscopy, it was shown that in the composition of mixtures of SEBS and PP containing microcalcite , PP-g-MA helps to reduce the size of filler agglomerates compared to the initial composition, which allows us to conclude that PP-g-MA has a compatibilizing effect;

- a model for obtaining a nanocomposite based on a styrene thermoplastic elastomer modified with organoclay was proposed ;

- it is shown that the introduction of 4% organobentonite into PP and styrene TPE leads to a decrease in the combustion rate and a decrease in the specific combustion area of materials due to the formation of a coke layer, which is a thermal and diffusion barrier to the propagation of the flame front;

- studies of the properties of flame retardant compositions based on polyolefin elastomers showed that they belong to the PV-0 class in terms of combustion resistance, in contrast to the sample of the flame retardant composition based on oil-filled SEBS, the samples of which burn out.

Theoretical and practical significance of the work. Based on the scientific results obtained in the framework of this study, the formulations of composite materials based on TPE for construction purposes have been developed:

- materials for the production of window seals with increased resistance to thermal-oxidative degradation based on SEBS modified with PP-g-MA;

- materials for cable and wire products and for roofing membranes made of polyolefin and styrene thermoplastic elastomers with reduced flammability.

An act on the implementation of the results of the dissertation was received from Polikom LLC dated April 19, 2023.

Defense provisions.

- development of modified composite materials based on TPE with improved operational and technological characteristics;

- nanofiller additives on the deformation-strength properties of composites based on styrene TPEs;

- study of the effect of flame retardant additives on the burning rate of compositions;

- studying processes of thermal oxidation of composites based on styrene TPE modified with maleized polypropylene, as well as composites modified with organobentonite ;

- study of the influence of the type of polyolefin elastomers on the properties of compositions.