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DEVELOPMENT OF OLIGOMERIC ANTIPYREN FOR POLYMERIC BUILDING MATERIALS

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Annotation
The article considers the dependence of the oxygen index AJ-4, AJ-5, and AJ-6, and also studies the effect of the concentration of oligomeric flame retardants on the oxygen index. Oxygen index of the epoxy composition (ED-20) with the addition of 1.0-30 wt%. It is KI-63%, which allows it to be used in the polymer industry

Keywords: Oligomeric flame retardant, fire hazard properties, rheological properties, flame retardant composition, fire hazard effect, flammability, self-burning, smoldering

Most polymeric materials have low fire resistance and are combustible. Reducing the flammability of polymeric materials is achieved mainly by modifying them or introducing combustion retarders (fire retardants) into the material.

When performing the work, it is necessary to determine the standard characteristics of the flammability of polymers (for example, the oxygen index of the polymer). The data obtained are necessary to construct a model for the ignition of polymers and their combustion under conditions close to real ones. The relevance of this study is determined by the widespread use of polymers in human life and the danger of emergencies during their combustion.

Under real operating conditions of polymer products (in the presence of atmospheric oxygen), along with free-radical processes of destruction of macromolecules, oxidative processes are inevitable, which also proceed by a radical chain mechanism. Therefore, to slow down the aging of polymeric materials, compounds are required that can terminate oxidative chains by interacting with peroxide radicals, as well as destroy hydroperoxides by reactions that compete with processes of degenerate chain branching. Polyolefins are high molecular weight aliphatic hydrocarbons obtained by polymerization of the corresponding olefins. Of this class of compounds, the most widely used are polyethylene, polypropylene, and numerous copolymers of ethylene and polypropylene. Polyolefins have a valuable set of properties: high dielectric characteristics that remain in a wide temperature range, chemical resistance, low gas and moisture permeability, significant heat capacity and, in most cases, frost resistance, strength, etc.

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In construction, polyolefins are mainly used as waterproofing films, pressure and non-pressure pipes in water supply and sewerage systems, drainage pipes, molded and sanitary ware, fittings, ventilation ducts, and heating formwork.

The main disadvantages of polyolefins and building materials based on them are low heat resistance and increased fire hazard. They belong to flammable materials, the decomposition of which proceeds without the formation of a coke residue: Oxygen index, ignition and autoignition temperatures are equal, respectively: 17.4-18.2%; 325-345 ° C and 345-390 ° C.

The oxygen index of the composition of polyethylene grade F-0220 with oligomeric flame retardants in an amount of 10-60% is CI: 46-52%. The results of studying the compositions of AJ-4, AJ-5 and AJ-6 with polyethylene are shown in Table 1. Epoxy oligomers include compounds containing more than one epoxy (ethylene oxide, glycidyl) group, which are located at the ends or along the main chain of the molecule, or in the alicyclic ring.

Table 1-Dependence of the oxygen index on the content of fire retardant

Name of oligomeric flame retardant	Concentration of oligomeric fire retardant, mass,%	Oxygen index,%
-	0	18,0
АДж-4	10	28
	40	43
	60	48
АДж-5	10	22
	40	38
	60	46
АДж-6	10	27
	40	41
	60	48

Epoxy groups interact with many polyfunctional compounds to form three-dimensional polymers. Despite the variety of epoxy compounds and the constant expansion of their assortment, the products of interaction of various diols (diphenols, dioxybenzenes) and polyphenols with epichlorohydrin have received the greatest application for the preparation of binders.

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Table 2-Influence of the concentration of oligomeric fire retardants on the oxygen index. Thickness of ED-20 + PEPA samples with oligomeric flame retardant

№	Oligomeric flame retardant	Concentration of oligomeric fire retardant, mass%	Oxygen index,%
1	АДж-4	1.0	38
2	АДж-4	5,0	42
3	АДж-4	10,0	46,3
4	АДж-4	16,0	57,0
5	АДж-4	18,0	60,0
6	АДж-4	20,0	62,0
7	АДж-4	30,0	63,0
1	АДж-5	1.0	24
2	АДж-5	5,0	30
3	АДж-5	10,0	38,3
4	АДж-5	16,0	42,0
5	АДж-5	18,0	48,0
6	АДж-5	20,0	52,0
7	АДж-5	30,0	55,0
1	АДж-6	1.0	28
2	АДж-6	5,0	34
3	АДж-6	10,0	44,5
4	АДж-6	16,0	56,0
5	АДж-6	18,0	58,0
6	АДж-6	20,0	60,0
7	АДж-6	30,0	62,0

Epoxy polymers are widely used in construction due to their high strength characteristics, chemical and weather resistance, adhesion to many materials. At the same time, they have a number of disadvantages: relatively low thermal and light resistance, increased fire hazard. At temperatures above 150-170 ° C, their decomposition begins, at a temperature of 400 ° C, they ignite. The linear and mass combustion rates of polymers are 3.5-4 mm / min and 7.8 g / (s • m3), respectively. The surface temperature during the combustion of epoxy polymers reaches 500-530 ° C, the flame temperature is 950-970 ° C. Depending on the nature of the starting reagents used in the synthesis of oligomers, as well as the amount and nature of hardeners, the oxygen index of epoxy polymers ranges from 19.8 to 34.7%. They burn with the formation of sooty smoke.

The fire retardant properties of the oligomeric fire retardant were studied in accordance with GOST-12.1.044-84. The oxygen index of the epoxy composition (ED-20) with the addition of 1.0 - 30 wt.% Is KI-63%, which makes it possible to use it in the polymer industry (Table 2).

Thus, the analysis of the work performed shows that the development and use of phosphorus-containing oligomeric composite flame retardant materials as fire and bioprotective agents for wood

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and polymer materials is promising. It was found that as a result of the study, it was found that high fire resistance of wood and polymeric materials can be achieved by surface treatment with composite compositions AJ-4.

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