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FIRE RETARDANTS

Nazarov Feruz Farxodovich
Karshi Engineering and Economic Institute

Abstract
As is known, all resinous polymers are flammable. Therefore, in order for polymer materials to meet fire safety requirements, flame retardants (fire retardants) are added to their composition. Additives must also meet high fire safety requirements.

Keywords: Here are the main areas of application of fire retardants: electrical and electronic devices, for example, television components, fuses, switches, plugs, etc.

Introduction

- Devices installed in vehicle interiors (buses, trucks, airplanes) [3];
- Finishing of public buildings, for example, airports, train stations, their internal and external parts [4].

Initially, small amounts of chlorine and bromine derivatives were widely used as fire retardants. They were later found to have a number of disadvantages, including the fact that when exposed to flame they release hydrogen halide gases and become very corrosive when exposed to water [5]. Even in small fires, these flue gases have been found to disrupt the operation of highly sensitive electronic devices in the building. Such consequences cause more damage than damage caused by fire. Therefore, the use of chlorine and bromine derivatives as fire retardants in the future will be significantly reduced, and they will not be used at all [6]. Modern flame retardants do not contain halogen derivatives. Their disadvantage is that to meet the requirements of the industry standard UL 94 V-0 they must be added to the polymer in larger quantities (25-30% or more) [7].

Polymer manufacturers typically include flame retardants directly into their production processes for the following reasons:

- without halogen preservatives;
- when it can fully comply with the requirements of the standard when used in various fields.

Typically, fire-resistant polymer materials are painted with dyes. In addition, materials must be in special colors (for example, company colors). This in turn creates problems with color and flame retardants:

- it is not allowed to reduce the level of fire resistance during the painting process;
- some fire retardants are not painted, so the material must be painted at the beginning of the process;
- if, when dyeing a polymer material, the dye concentration is high, the amount of fire retardants will also increase;
- a negative interaction between the fire retardant and the dye cannot be ruled out.

Due to the presence of these problems, it is recommended to coordinate in advance with polymer manufacturers changes in the composition of concentrates for coloring fire-resistant

polymers [8]. In the electrical industry, fire-resistant polymer materials are produced according to the international standard UL 94 [9].

Here is an example of the application of this standard. Powdered pure titanium dioxide (pigment white 6) is an absolutely non-flammable substance used as a dye, intended for the production of fire-resistant polymer materials by injection molding. At first glance, this solution is sufficient, but upon closer examination, according to the international standard UL 94, not a drop should flow out of the burning polymer material. If a fall occurs without this requirement being met, the material is considered not to comply with UL 94 [10]. Titanium dioxide is considered a “heavy” substance and increases the weight of the polymer and droplets, so they do not splash. The following chemicals are used as fire retardants:

- aluminum hydroxide;
- roh borts;
- red phosphorus;
- melamine derivatives (ammonium polyphosphate, aryl phosphates);
- phosphoric acid esters (chlorinated and non-chlorinated);
- antimony pentoxide;
- chlorinated aliphatic hydrocarbons [11].

Concentrations of fire retardants depend on their chemical composition, type of polymer and classification group (international standards UL 94 V-0, V-1, etc.).

The results of a number of experiments carried out according to the international standard UL 94 V-0 for the production of refractory polymer composite materials based on recycled polyethylene are described in previously published scientific sources [12].

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