Multifunctional single-layer coating on a base of silicon Sylgard-184 elastomer

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Silicone elastomer coatings are widely used to protect substrates from the negative effects of the atmosphere, especially fabrics, among which particularly stringent requirements are placed on the woven frame of a fire hose. In the last decade, there has been great interest in the development of polymer coatings that can simultaneously perform several functions, such as heat and fire protection, waterproofing, luminescent film, *etc*. The decorative function is also important, it is highly desirable that fire hoses have a bright color and were clearly visible under artificial lighting. As a rule, the protective coating is multilayer, each sublayer performs a specific function [1]. Such a coating structure leads to an increase in film thickness and product weight. Development of multifunctional protective coatings of minimum thickness is an urgent problem of modern technology [2].

It has been shown that number of sublayers in protective film can be reduced to one by combining several functions. It means that under certain conditions the thickness and weight of coating can be minimized. On a base of Sylgard-184 silicon elastomer a composition for single-layer protective coating is proposed for fire hoses. This composition contains Coumarin-7 as a luminescence dopant and a filler in form of halloysite nanotubes as an adhesion promoter.

It has been shown that proposed coating successfully protect the substrate against negative effects of UV-light and atmosphere oxygen and ozone. In addition to the protective function, such a coating successfully performs the function of a fire-retardant layer, a bright yellow decor, an adhesion promoter that prevents the coating from peeling off the lining, as well as a fluorescent film of green emission.

It is shown that the mechanical characteristics of the obtained samples do not change after climatic tests.This result, together with the improvement of the adhesion, as well as high weather and fire resistance of the samples, allows us to predict an increase in the service life of the fire hoses.

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2. M.M. Goroneskul, L.A. Andryushchenko, A.M. Kudin, *et al*. Method of application of luminescence coating. Patent 147605 UA. Bul. No **21** (26.05.2021).

Possible mechanism for increasing the fire resistance of a polymer coating filled with diatomaceous biosilica

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Polymer coatings are widely used in various fields of technology to protect the substrate from the negative effects of the atmosphere. Usually, coatings perform several functions, in particular thermal and fire protection. It was recently shown [1] that introduction of diatomaceous biosilica to the silicone polymer significantly improves the heat resistance of the protective film. According to our data, it also increases the fire resistance of the coating.

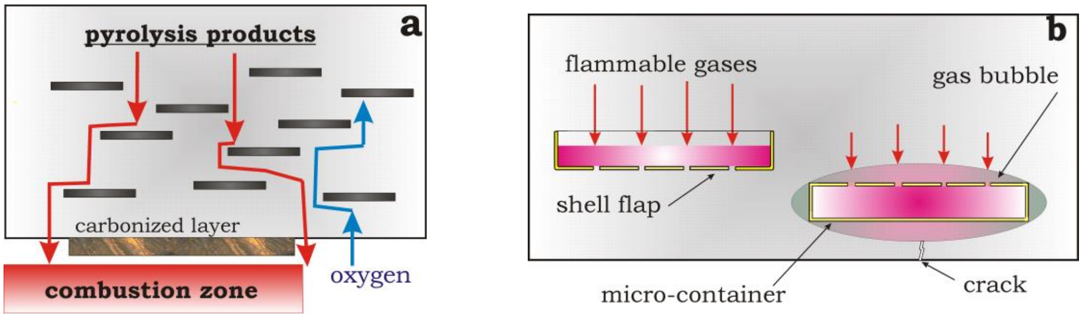

Fig. Scheme of the barrier (*a*) and the proposed mechanism (*b*) of flame retardation

A known barrier mechanism for increasing the fire resistance of polymers is characteristic of fillers in the form of plates or scales. Flakes of the filler prevent the oxygen diffusion into polymer and hinder the transport of gaseous products of pyrolysis, see scheme in Fig. *a*. Particles of diatomic biosilica (shells of algae) are micro-containers with a diameter of ~ 4 μm. Individual shell flaps, which are similar in shape to a Petri dish, are perforated with an ordered system of pores 150-200 nm in diameter. The filler serves as a natural sink for combustible decomposition products, as shown in Fig. *b*. If the average distance between the particles is less than the thickness of the sample, then the primary sink for combustible gases will be not the film surface, but the filler particles, which play the role of a flame retardant.

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