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Modern Trendin Development of Fire Protective Polymer Composition Based on Silicon Organic Materials

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Successful elimination of the consequences of man-made disasters is largely determined by the quality of life-saving ammunition. The firefighter's clothing, as a means of protection, is intended to compensate for the influence of dangerous and harmful factors, protecting the rescuer and thus stabilizing his working capacity. It has been shown in review [1] that possibility of increasing the level of protection of personnel from the effects of harmful factors in the elimination of the consequences of accidents due to the use of organosilicon materials to create protective coatings of clothing. However, some issues relating to the development of flame retardants remain unresolved. This is due to the fact that although silicone rubbers have a higher thermal resistance than other polymers, they have a low burning rate without the formation of burning droplets, a low level of toxic emissions [2], but the resistance to ignition of these materials is not sufficient.

This report discusses development trends in the field of flame retardant materials based on an organosilicon polymer base. Particular attention is paid to modern methods of creating fire-retardant coatings for cotton and synthetic fabrics with dirt, water, oil resistance, and self-cleaning ability. The analysis of scientific, technical and patent literature revealed the following:

1. The current trend in the further improvement of firefighters protective uniforms is the development of protective coatings for multifunctional purposes.

2. The thermal stability and fire resistance of organosilicon composition can be improved by introducing nanosized fillers into compound. A positive effect is achieved by reducing the rate of heat generation during combustion.

3. It is shown that a decrease in a large concentration of environmentally friendly aluminum hydroxide $\text{Al}(\text{OH})_3$ is possible due to the introduction of another flame retardant, a functionally modified aluminosilicate (OB, organobentonite), into the silicone rubber composition. Reducing the concentration of $\text{Al}(\text{OH})_3$ allows you to increase the whole range of physical and mechanical properties of products without loss of fire resistance.

4. It was found that the introduction of nanosized titanium dioxide into the composition of high molecular weight siloxane rubber SKTV allows you to get a photocatalytic coating with a self-cleaning effect, without compromising

other properties of the protective rubber-fabric material, such as fire resistance and resistance to aggressive environments.

5. The efficiency of introducing fluoroalkylsilane and hydrophobic nanosized SiO₂ into the composition of organosilicon compositions cured by the polyaddition reaction is shown to create superhydrophobic coatings with high resistance to boiling water, acids, and pollution.

6. A promising technique for producing fire retardant coatings on the surface of fabric materials is the method of molecular layered assembly, as well as the sol-gel technique. Both methods can increase the fire resistance of protective coatings with a slight increase in weight.

7. To slow down the processes of heat and mass transfer, it is advisable to use phospho-nitrogen-containing organosiloxane coatings. A positive effect is achieved due to the decomposition of the additive with an endothermic effect in a narrow temperature range.

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НОВІ ТЕХНІЧНІ ВИМОГИ ЩОДО ХАРАКТЕРИСТИК ЗНАКІВ ПОЖЕЖНОЇ БЕЗПЕКИ Й ЕВАКУАЦІЇ ТА ОСНАЩЕННЯ НИМИ БУДІВЕЛЬ І СПОРУД

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Актуальність зазначеної роботи пов'язана з вирішенням проблеми підвищення рівня безпеки життя та здоров'я людей, майна, охорони навколишнього природного середовища шляхом гармонізації національних стандартів з міжнародними і європейськими нормативними документами.

На сьогоднішній день в Україні діють національні стандарти на знаки пожежної безпеки та евакуації, які не відповідають міжнародним та європейським стандартам. У міжнародних та європейських нормативних документах використовуються знаки пожежної безпеки та евакуації, які