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Thermal and fire resistance of luminescent coating on a base of silicon elastomer with diatomaceous biosilica filler

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Protective luminescent coatings are widely used in various fields of technology, in particular, to create evacuation sign systems. The multifunctionality of coating (as luminescent film, fire protection, insulation against negative effects of the atmosphere, decor layer, *etc*.) is usually achieved by increasing the number of its layers. Ensuring thermal and fire resistance of sign systems in harsh operating conditions is an urgent problem of modern materials science. It is clear that the fire resistance of the protective coating should be no less than the stability of the polymer substrate, preferably without increasing the thickness and weight of the coating. The realization of this goal involves the use of fillers capable of performing several functions [1].

It has been shown [2] that Diatomaceous Biosilica is a promising filler. The introduction of such additive into the Sylgard-184 polymer slows down the process of polymer thermal decomposition, so the $T_{30\%}$ (temperature which corresponds to 30% of the mass loss) increases by more than 140°C. In addition, the additive has intensive green luminescence. The undoubted advantage of the filler is also that it significantly improves the elastic properties of the polymer base, primarily the tensile strength of the resulting protective film.

Based on the transparent in UV-range silicon SKTN-med elastomer with a noted filler (2 and 5 w.% of Diatomaceous Biosilica), heat- and fire-retardant protective coatings were obtained. Samples exhibit strong green fluorescence at λ_{em} = 530 nm, which is excited by UV-light at λ_{ex} = 265 nm. Standard fire tests showed ignition time of ~200 s *vs*. 120 s for unfilled samples. It should be noted that weight of composition with filler decrease compare to pure SKTN-med due to small density of Diatomaceous Biosilica powder. This circumstance favorably distinguishes a promising filler from traditional ones.

1. L. Andryushchenko, V. Borisenko, M. Goroneskul, A. Kudin. Emergency situations: Prevention and Elimination. **5** 2 (2021) 5.
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