

The Using Suspensions of Detonation Nanodiamond in Sol-gel Processing Formation of Biostable Protective Coatings

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New opportunities in preparing coatings with unique properties of soft biocides have appeared as a result of development of nanotechnologies. Advantages of such coatings are smaller loading on an environment, the prolonged biocide action, ability to inhibit development of aggressive microbial assemblages without change of properties of a protected material. Sol-gel processing is one of the most prospective synthesis ways of such coatings, as it allows distributing uniformly biological additives in silicate or hybrid matrixes at the nanolevel. However a problem of search of new substances which can be used as soft biocides remains pressing need.

The present paper is devoted to sol-gel synthesis and research of biological activity of epoxy-silicate coatings doped by detonation nanodiamonds (NDs) in relation to a number of mold fungi. NDs were used in the form of suspension in water and in isopropanol. ND concentration in sols was varied from 0.05 up to 0.25 wt.%. Coatings were brushed on glass plates (microscope slides) as well as on marble. Testing was carried out in laboratory and in city environment.

The technique of tests for bioactivity of the synthesized coatings has been developed on the basis of the standard recommendations described in GOST 9.048-89, GOST 9.052-88, GOST 9.049-91, GOST 9.048-89 and on the basis of author's experience. As mold fungi 7 kinds of micromycetos have been selected, which most often meet in the air environment of megacities: *Aspergillus niger*, *A. terreus*, *Cladosporium herbarum*, *Paecilomyces variotii*, *Penicillium chrysogenum*, *P. funiculosum*, *Scopulariopsis brevicaulis*.

Test data on biostability of non-doped epoxy-silicate coatings have shown that they possess weak biocide action. Micromycetes development on their surface is moderated. At the same time experiments have shown essential influence of the ND on the antimicrobial activity of the epoxy-silicate coatings. The inhibiting action of ND on micromycetes has been detected in all variants of coatings with ND. It was important the antimicrobial activity of coating prepared on a basis of ND's aqueous suspensions was higher, than when ND's suspensions in isopropanol were used.