**Nanocomposites and nanomaterials**

**Effect of TiO2-based nano-liquids on the photocatalytic activity and mechanical properties of plasters**

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Modern realities require the creation of new approaches in the development of building materials - nanomodified coatings with photocatalytic, biocidal and hydrophobic properties. To give the surfaces complex properties, there is a need to create special composite nanoliquids that can be widely used in various types of plasters.

The aim of this study is to evaluate effects of TiO2-based nano-liquid on the photocatalytic activity and mechanical properties of plasters. Composite nanoliquid based on a dispersion of a colloidal nano-silica particles with a size of 2 to 150 nm, which was mixed with nano-TiO2, co-doped with sulfur (S) and carbon (C), obtained. The ability of silica nanoparticles to form an electric double layer causes a significant electrokinetic potential on the surface of nano-SiO2, which improves the dispersion of particles.

The study showed that addition TiO2 S,C improve the photocatalytic properties of plasters, as this material exhibits photocatalytic properties not only in the UV spectrum but also in visible light, which makes it possible to use it indoors. Colloidal nano-silica, despite its ability to increase the hydrophobicity of the surface and the strength of the plasters, performs the function of uniform distribution of nano-TiO2 in the volume of the plasters. It was shown that the volumetric application of this modifier increases the strength of gypsum plaster by 54%. The effect of nanoliquid when applied to the surface of the finished plaster was also investigated. Such plasters increase their hydrophobic characteristics and gain the ability to self-clean due to photocatalytic reactions on the surface. The free surface energy of cement plasters becomes lower than the control sample from 64.5 to 40.4 mJ/m2, which indicates increased hydrophobicity of the surface, and accordingly better vapor permeability and performance characteristics. Nanoliquids based on SiO2 and TiO2 S,C nanoparticles exhibits biocidal properties, which is relevant for spaces with high humidity and insufficient insolation (hospital corridors, water reservoirs, tunnels). Thus, the synergistic combination of silica and titanium dioxide nanoparticles gives the plasters a number of important properties, such as self-cleaning, photocatalytic, biocidal and hydrophobic, while improving standard physico-mechanical properties.