мікросфер як компонента шихти при виготовленні виробів грубої та тонкої кераміки.

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CLAY-BASED FILLERS AS HEAT-RESISTANT ORGANOSILICON COATINGS PROPERTIES MODIFIERS

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Abstract. One of the aspects of creating resource- and energysaving technologies in one of the most energy-intensive industries – cement is being solved. The effect of energy saving was studied by increasing the corrosion resistance of the operation of units, in particular, dedusting units. The effect of fillers on the performance properties of organosilicon coatings, which are used to protect the inner surface of electrostatic precipitators, has been determined.

Key words: organosilicon varnish, clay minerals, corrosion resistance, electrostatic precipitator.

The need to take into account environmental problems has increased the requirements for environmental protection and tightened the standards for emissions of gases and dusty air into the atmosphere. Electrostatic precipitators are the most adapted devices for cleaning large volumes of gases [1].

At present, attempts are being made to improve dedusting devices and make them more reliable in operation. At the same time, there is a desire to more fully use the exhaust gases in the technology.

Since the largest amount of dust is emitted from the zones of drying, decarbonization and exothermic reactions, it mainly consists of a mixture of fired clay and undecomposed limestone. The dust may contain 10–25% clinker minerals: β- and γ-C_2S (8–10%); C_2F and C_4AF (10–12%). With an increase in the content of clinker minerals in the dust, the content of free lime also increases from 2 to 14%. Compared to sludge, dust contains alkalis and sulfates in an increased amount [2].

Alkaline compounds are represented by sulfates, carbonates and bicarbonates of sodium and potassium, as well as alkaline silicates of variable composition. The amount of K_2O and Na_2O in the dust caught by electrostatic precipitators varies from 0.9 to 45% with the predominance of K_2O. At the same time, fine dust fractions (field III of the electrostatic precipitator) contain 3–4 times more alkalis than in bunkers I and II fields. The content of calcium sulfate in the dust is 0.8–7%.

Gradually, during the operation of electrostatic precipitators, the destruction of the metal of the structure occurs as a result of chemical or electrochemical interaction with a corrosive environment. The problem of protecting the internal working space of the electrostatic precipitator to increase the service life of the unit often arose before many cement plants, both in Ukraine and abroad [3]. Analyzing the experimental material on the creation of polyfunctional coatings based on organosilicon compounds for the protection of various materials, we proposed an organosilicon polymethylphenylsiloxane (PMPS) varnish, filled with oxides and dispersed clay minerals as a protective coating for steel structures [4; 5]. The main criterion for selecting the composition for filling on the test sample was the maximum adhesion of the film to the metal substrate, taking into account the optimal content of the filler. Structural-mechanical and technological parameters of the proposed compositions showed a good correlation.

The oxides $A1_2O_3$, TiO_2, SiO_2 (amorphous and crystalline), Fe_2O_3 and some clay minerals, montmorillonite, kaolinite, and palygorskite, were used as fillers. The proposed compositions were applied to samples of steel ST. 3, a group of building steels. A total of 40 samples were prepared, which, after curing the film, were transferred to the cement plant and installed in the second field of the UG type electrostatic precipitator. The installed samples were periodically visually assessed and a conclusion was made about their safety. It turned out to be ineffective to assess the state of the surface in other ways.

After 6 months of testing, the coatings made with the introduction of $A1_2O_3$ fillers and kaolinite underwent changes – cracks appeared, peeling of the protective film was outlined. The rest of the samples were preserved in their original state, the continuity of the coating was not disturbed, but sticking of dust was indicated. After 12 months of testing, the surface of the films with the introduction of the filler changed more significantly: the coating with the $A1_2O_3$ filler by about 50% peeled off; the coating based on crystalline SiO_2 and kaolinite peeled off by 60%.

At the same time, films containing TiO_2, the amorphous form of SiO_2, Fe_2O_3, and palygorskite remain unchanged.

The final check of the samples after 4 years of testing showed the following results. Films filled with $A1_2O_3$, SiO_2 (crystalline) and kaolinite almost completely exfoliated. Films containing Fe_2O_3 and montmorillonite exfoliated by about 40%. Films containing SiO_2 (amorphous) and were preserved almost completely, but cracks appeared along the edges of the samples. The films containing TiO_2 and palygorskite remained unchanged under the experimental conditions; showed the highest stability. We propose, taking into account the cost of fillers, compositions of PMPS varnish – palygorskite as protective coatings for metal structures under the influence of dust entrainment products from a rotary kiln.

КОМПОЗИЦІЙНІ МАТЕРІАЛИ
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