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Methods for Obtaining Modified Sulfur Bitumen

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Abstract: The properties of the serum composition are analyzed.The methods of adding the necessary components to the composition of serobitum and obtaining high-strength serobitum on their basis have been determined.The methods of analyzing the obtained components have been studied. Methods of obtaining serobitum have been studied. The physico-mechanical properties of serobitum were analyzed. The mechanism of action of additives added to the composition of serobitum has been studied.

Keywords: serobitum, bitumen, sulfur, urea, sulfur asphalt concrete, kinetics, catalyst, method, mineral, sulfur.

The aim of the work is to study methods for obtaining modified serobitum. The production of modified serobitum is growing on a large scale and constantly. A model of chemical processes occurring in a sulfur-asphalt concrete mixture has been developed, which makes it possible to establish the effects of prescription and technological factors on the emission of toxic gases;

The kinetics of sulfur crystallization in sulfur bitumen materials has been established, which affects the structure parameters and properties of sulfur asphalt concrete;

a method for designing compositions of sulfur asphalt concrete obtained by adding a sulfur modifier has been developed;

a method for estimating the emission of toxic gases from sulfur bitumen materials is proposed, which allows determining the concentrations of released toxic gases;

dependences of the temperature of preparation and compaction of sulfur-asphalt concrete mixtures on the amount of sulfur modifier and plasticizer (paraffin) are obtained;

the composition and mode of preparation of sulfur asphalt concrete, which has increased physical, mechanical and operational properties, have been optimized. Currently, there is a shortage and an increase in bitumen prices in the oil products market. The analysis of the bitumen market shows that the main market factors are: price and quality. The cost of sulfur bitumen is 35-40% lower than usual. The relevance of the work lies in the fact that for the production of this product we use chemical waste, sulfur, catalyst products of petrochemical waste processing. Several attempts were made to carry out this process, but it had a number of significant drawbacks, in particular: sulfur and bitumen were mixed only in a ratio of 20:80 - when this mixture was heated to more than 140 dB, hydrogen sulfide was rapidly released; at the same time, the bitumen mixture and sulfur did not ensure the quality of bitumen for road works. All this made it difficult to implement the process. We have proposed a unique technology for the formation of a chemical bond between sulfur and bitumen to form bitumen polymers, rather

than a physical mixture of sulfur and bitumen; thiokol has a roughly similar structure. This technology will be possible with the help of a unique catalyst that was developed by US and has no analogues in world practice. The technical solution is related to the production of road construction materials, in particular, the preparation of sulfur-bitumen mixtures used for road surfaces (in combination with mineral inert fillers), waterproof roofs, etc. The claimed line consists of a sulfur preparation plant, which includes: a sulfur smelting furnace equipped with an elevator for loading sulfur, an automatic oil station connected through a heated pipe for supplying dissolved sulfur with a sulfur bitumen preparation plant, which is an intensive mixing reactor. It is equipped with a dispenser for supplying molten sulfur, a catalyst, a hatch for supplying bitumen, a heating system consisting of two stainless steel pipes and two automatic liquid burners, an intensive mixing system, two gear pumps to ensure mixing of the mixture and a pipeline for supplying ready sulfur bitumen to the consumer. The design of the claimed technological line allows the production of high-quality sulfur bitumen with a sulfur content of up to 70%, which meets quality standards and exceeds them in some parameters. A method for producing sulfurous asphalt concrete, including the interaction of sulfur with dicyclopentadiene followed by mixing modified sulfur with bitumen and filler, characterized in that the interaction of sulfur with dicyclopentadiene is carried out by intensive mixing with an immersion sulfur pump for 45-60 minutes at a temperature of 140-145 ° C, then sulfur bitumen is mixed first obtained by mixing modified sulfur and bitumen in a reactor in for 25-35 minutes in a ratio of 1:1-1:1.5, followed by mixing the resulting sulfur bitumen with a mineral filler, moreover, sulfur bitumen is introduced in an amount at which its volume concentration corresponds to the volume concentration of ordinary bitumen for a given brand of concrete and type of filler [1].

The prospects for the production of modified serobite and its use in road construction depend on a number of circumstances. First of all, over the past 10 years, there has been a significant increase in the technical processing and purification of sulfur, oil, natural gas and flue gases in all developed countries. Giving recommendations on the technology of preparation of modified serobite, we will analyze the optimal result obtained mainly by modifying sulfur and bitumen. Certain scientific and practical research is underway in the republic on the manufacture of modified sulfur binders and modified sulfur asphalt concrete based on industrial waste, secondary products of the gas and oil refining industry [2]. Based on the dielectric properties, the possibility of using a basic method to determine the adhesive properties of bitumen is proposed. Based on the values of the dielectric constant of modifying additives, the possibility of their choice to increase the adhesive properties of road bitumen was established. Effective additives and their best concentration for bitumen have been proposed to reduce bitumen consumption in asphalt concrete and improve its quality indicators [3].

These data represent a monographic database of works, a scientific and technical conference dedicated to materials science, expertise and scientific publications. During the research, such methods as modern methods of chemical physics (spectroscopic analysis, X-ray diffraction) and modeling of asphalt concrete were studied [4].

The article presents an individual model of sulfur dispersion and a model of combining sulfur droplets in a sulfur-bitumen connector, as well as experimental data showing the effect of sulfur content on the basic properties of a sulfur-bitumen connector and the mechanical properties of sulfurous asphalt concrete. The model of sulfur distribution by type of state shows that with an increase in the sulfur content in the sulfur-bitumen connector, the proportion of sulfur in the physically free state increases, forming a dispersing phase that increases the viscosity of the connector. This increase leads to a natural increase in the astringent properties of sulfur-containing bitumen when sulfur is introduced. The melting model of sulfur droplets shows that this process is energetically beneficial. The driving force of melting is the Laplace pressure, which increases with an increase in the ratio of the values of the communicating sulfur droplets. Also, with an increase in sulfur content, the probability of overcoming the interfacial bitumen film between sulfur droplets increases, which naturally increases the frequency of occurrence of

spatial sulfur structures that negatively affect the crack resistance of sulfur-containing asphalt concrete [5].

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