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Research Article

FORMULATION DEVELOPMENT OF A NEW BITUMINOUS BUILDING COMPOUND

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ABSTRACT

The paper presents the results of comparative tests of physical and mechanical properties of experimental samples of construction bitumen composition in laboratory conditions. It is concluded that the experimental sample №11, obtained according to the formulation developed by the author, in comparison with other samples, allows to obtain a high-quality construction bitumen composition. The developed construction bitumen composition is recommended to be used as a waterproofing material as a coating of foundations and building structures.

KEYWORDS

Component, mixture, oil sludge, gossypol resin, technical sulfur, temperature, lime, bituminous composition, formulation, waterproofing, coating.

INTRODUCTION

In the world the role of waterproofing materials is unparalleled in preventing the reduction of strength properties of all building structures and materials, the development of corrosion processes in metal and concrete, wood rotting, the appearance of cracks, mold and moisture, the collapse of protective layers of structures. In this regard, methods that contribute to the protection of building structures from moisture penetration, such as leveling the surface of building structures, applying coatings, polishing, creating a protective layer, acquire special importance in increasing the durability of buildings and structures.

Materials and methods. In this work, as a result of experimental studies, a construction bituminous composition with high performance properties of a new composition using oil sludge, gossypol resin, technical sulfur and quicklime was obtained [1].

Figure 1 shows the structural scheme of obtaining a new construction bitumen composition used in the preparation of waterproofing material "Polyisol - M". 1.

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PB 90/10 - petroleum bitumen; 2. Oil sludge - wastes of oil industry; 3. GR - gossypol resin, obtained by distillation of cotton soapstock fatty acids; 4. Sulfur and slaked lime, residues of the S-gas processing industry; 5. Reactor - oxidation unit with stirrer; 6. PB 90/10+4K - four-component construction bitumen.

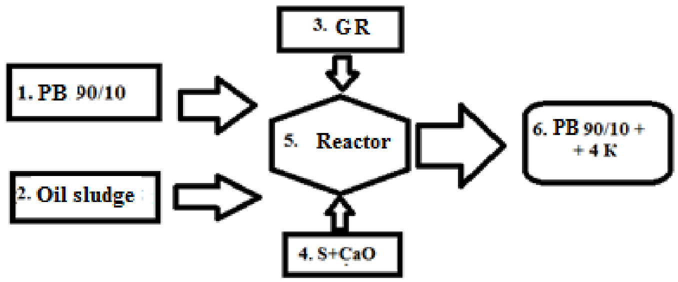

Figure 1: Block diagram of obtaining a new construction bitumen composition by adding to the construction bitumen BN 90/10 components of oil sludge, gossypol resin, sulfur and quicklime.

1-PB 90/10 construction bitumen is poured into the reactor in a certain amount and heated to 77 ° C, then a mixture of the following components is added to the bitumen: 2-oil sludge; 3-gossypol resin; In a certain amount add 4-technical sulfur and slaked lime. Then bitumen construction PB 90/10 and 4 components are mixed and heated to a certain temperature, after a certain time get the finished product of bituminous composition of construction bitumen for the bases of building structures.

Experimental samples of construction bitumen compositions used for waterproofing coatings were tested according to the following parameters: needle penetration depth 0.1 mm at 25 ° C, softening temperature of the ring and sphere, elongation at 25 ° C, solubility, mass change after heating, flash point, mass fraction of water [2].

GOST 6617-2021[3] in the laboratory of Fergana oil refinery. The results of comparative tests of physical and mechanical properties of experimental samples of construction bituminous composition in accordance with the requirements are presented in Figures 2-4.

As can be seen in the figures, samples selected according to the formulation, experimental sample № 11, allows to obtain a high-quality construction bitumen composition, which allows us to recommend it for use as a coating of waterproofing material "Polyisol". on foundations and foundations of buildings.

Experimental samples № 3 and № 7 allow obtaining high-quality construction bitumen composition, and from Fergana oil refinery received a recommendation for further use as a roofing coating.

In fact, the results of the experiments showed the obtaining of high-quality construction bituminous composition that meets the requirements of standards.

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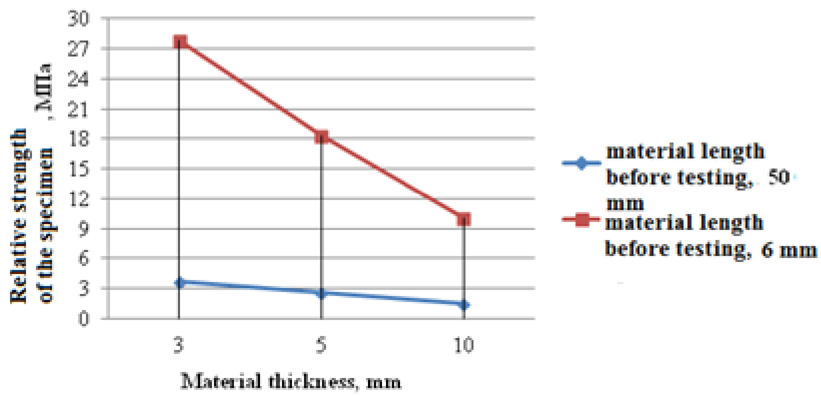

Figure 2: Dependence of the conditional strength of the sample on the thickness and width of the material

As shown in Figure 2, as the thickness of the material "Polyisol" increases, its conditional strength decreases. However, as the width of the material increased, a decrease in the conditional strength of the specimen was observed.

Figure 3 shows the graph of relative elongation (e) of the waterproofing material "Polyisol - M" depending on the length of the specimen before the test and the thickness of the material.

Depending on the thickness of samples of material "Polyisol" I-type its length and relative elasticity varies as follows:

When a 3 mm thick specimen was tested, it was observed that its length at break varied from 100 mm to 115 mm and the relative elongation was 6%.

When a 5 mm thick specimen was tested, it was observed that its length at break varied from 100 mm to 125 mm and the relative elongation was 10%.

When the 10 mm thick specimen was tested, it was observed that its length at break varied from 100 mm to 135 mm and the value of relative elongation was 14%.

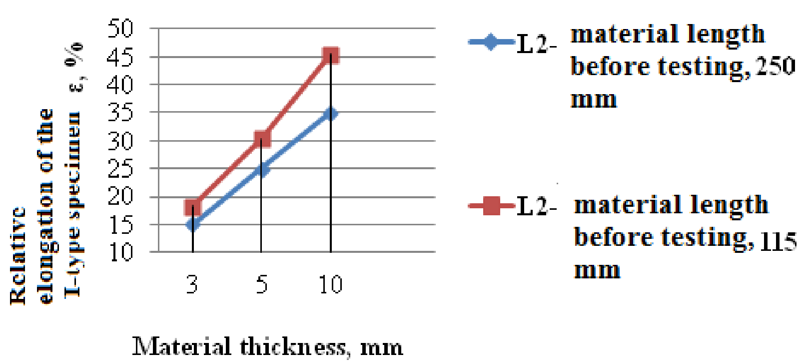

Figure 3: Plot of relative elongation of type I specimen as a function of its length and thickness before testing

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Depending on the thickness of specimens of type II "Polyisol-M" material, its length and relative elasticity varies as follows (Fig. 3):

When a 3 mm thick specimen was tested, it was observed that its length at break varied from 33 mm to 39 mm and the value of relative elongation was 5.2%.

When a 5 mm thick specimen was tested, it was observed that its length at break varied from 33 mm to 43 mm and the value of relative elongation was 8.7%.

When a 10 mm thick specimen was tested, it was observed that its length at break varied from 33 mm to 48 mm and the value of relative elongation was 13%.

From the graph, the following conclusion can be drawn that as the thickness of Polyisol material increases, its relative elasticity in percentage calculations also increases and it is shown to be positive (Fig. 3).

Fig. 4 shows the graph of residual relative elongation (e) of the material "Polyisol" as a function of the length of the specimen before the test and the thickness of the material [4].

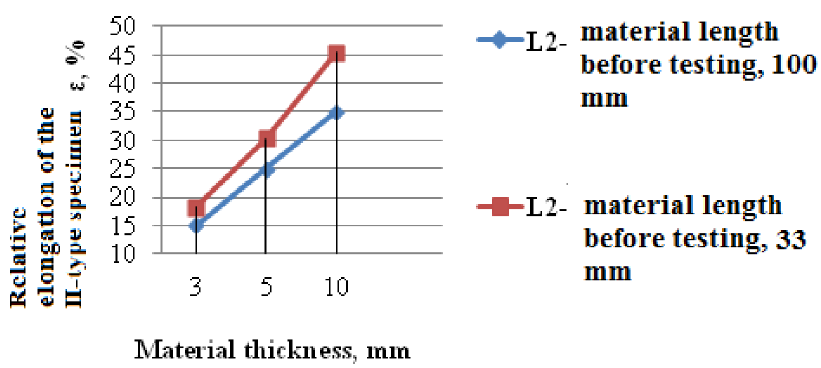

Figure 4: Graph of residual relative elongation of type II specimen as a function of specimen length and thickness before the test

Depending on the thickness of samples of type I material "Polyisol - M", the change in its residual relative elasticity occurs as follows (Fig. 4):

RESULTS AND DISCUSSION

On the basis of the above analysis can be made the following conclusion, one of the main characteristics of waterproofing material is the amount of length increase when heating the sample "Polyisol-M", and experimental analyses obtained in our laboratory showed: that the length increase of the waterproofing material "Polyisol-M" thickness of 5 mm is the greatest, as it increases to a minimum of 19.4%, ie, at a temperature of 90-105 ° C elongation of the waterproofing material "Polyisol - M" is recommended for its production at the temperature of 90-105 °C.

The results can be analyzed as follows: 3 samples taken in the laboratory "Chemistry of oil" of the Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan were carried out in the appropriate experimental facilities and compared with the materials Gidrostekloizol and Filizol, which meet the requirements of the standard

[6]. When calculating the value of mass loss, the sample "Polyisol - M" with a thickness of 3 mm has a good index in comparison with the materials "Hydrostekloizol" and "Filizol", that is, the value of mass loss of the sample material in the process of heating decreased by 3.85%.

Similarly, when calculating the value of mass loss during heating, the sample "Polyisol - M" with thickness of 5 mm has a good index in comparison with the materials "Hydrostekloizol" and "Filizol", that is, the value of mass loss of the material sample during heating decreased by 2.42%.

When calculating the value of mass loss during heating, the sample "Polyisol - M" 10 mm thick has a good index in comparison with the material "Hydrostekloizol", that is, the value of mass loss of the material sample decreased by 5.04% during the heating process.

When analyzing the value of mass loss of Hidrostekloizol, Filizol and 3 samples of waterproofing material "Polyisol-M" the second sample, i.e. "Polyisol-M", with a thickness of 5 mm material, the value of mass loss is much better than that of 3 mm. and 10 mm samples, and it is proved that it is better than the standard requirements for materials Hidrostekloizol and Filizol. As the mass loss value of 5mm thick sample of Polyisol-M was 1.43% less than 3mm thick sample of Polyisol-M, and the mass loss value of 10mm thick sample of Polyisol-M was 5mm. The "Polyisol-M" sample lost 2.62% more mass than the sample.

CONCLUSIONS

Based on the above analysis, we can draw the following conclusion, one of the main requirements for waterproofing material is the value of mass loss, and the experimental analysis obtained in our laboratory showed that the value of mass loss of waterproofing "Polyisol-M" material thickness of 5 mm is 2.42%, so its development was considered necessary to issue a recommendation.

The obtained bituminous composition with a new composition allowed to recommend it for use as a coating of waterproofing material "Polyisol" on foundations and foundations of buildings.

The obtained bituminous composition with a new composition allowed to recommend it for use as a coating of waterproofing material "Polyisol" on foundations and foundations of buildings. As the thickness of the material "Polyisol - M" increases, its relative elasticity in percentage calculations also increases, and it is shown to have a positive index.

It is proved that the obtained sample of "Polyisol-M" had a thickness of 3 mm and a bending temperature of -10.5 °C, and it differed by -5.5 °C from hydrostekloizol, which meets the requirements of the standard, but had a negative index from the Waterproofing material "Filizol". "It is confirmed that the thicker the sample "Polyisol-M", the better its temperature performance in bending. But as the thickness of "Polyisol-M" sample increases, its flow rate becomes proportional to it.

Thus, the obtained experimental analyses showed that the water absorption capacity of waterproofing material "Polyisol-M" thickness of 5 mm was 0.59%, and the value of mass loss was 2.42%, it was found necessary to recommend its production.

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