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# STUDY OF CONCRETE FILLERS TO IMPART SPECIAL QUALITIES TO THE ROAD SURFACE (ROAD SURFACE) TO ENSURE SAFE ROAD TRAFFIC

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**Abstract**
The article presents proposals for the introduction of polymer-based sulfur concrete using innovative approaches to ensure the construction of roads with high-quality road surface. In this way, a reduction in road accidents will be achieved.

**Keywords**: safety, sulfur concrete, road, road surface, concrete samples, treatment with chemical reagents.

**Introduction**

As a result of active human activity, enormous progress in the development of society has been achieved. At the same time, this also gives rise to some problems that require urgent solutions. These include unclaimed raw materials that clutter large areas, for example, the storage of sulfur at gas processing plants (GPPs), and waste vehicle tires. That is, there is a need to resolve this environmental problem [1].

Therefore, the goal was set to use these wastes in the production of the so-called "polymer-based sulfur-containing concrete" [2], i.e. design of road surfaces that have a great impact on the safety of road traffic.

During the research work, the following tasks were taken into account:

Select the necessary components for the road surface;

Select a recipe and prepare samples in the laboratory.

subject samples to chemical treatment;

Test samples for strength, frost resistance and water resistance.

After setting goals and objectives, the research work was completed.

Selection of necessary components for road surfaces.

The components used are products from local producers in Uzbekistan.

Selection of recipes and production of cement stone samples under laboratory conditions.

After varying the components and testing the recipes under laboratory conditions, the most promising samples were selected.

Table 1 shows samples of normal concrete, with sample No. 1 with the addition of gravel and samples No. 1 or No. 1 without the addition of gravel. As can be seen from Table 1, samples No. 1 and No. 1 are identical in composition, the only difference is in the form of casting: No. 1 was cast into a cylindrical mold, while No. 1 was cast into a square mold Prism shape was cast. The result showed that samples made in cylindrical shape eliminate the possibility of excessive crack formation, which often occurred in samples cast in a square prism shape.

Table 1

| Compound | **Sample№1** | **Sample №1** | **Sample №1"** |
|---|---|---|---|
| Cement | 14,6 | 26,5 | 26,5 |
| Sand | 31 | 56 | 56 |
| Water | 7,9 | 17,5 | 17,5 |
| Crushed stone | 46,5 | - | - |

Table 2 shows samples of sulfur concrete. In this case, samples No. 2 and No. 3 are also identical in composition, they only differ in the heat treatment of the sulfur binder [3]. Sample #2 was processed at room temperature (25 °C), while #3 was processed at a temperature of 150 °C. Sample No. 4 is sulfur concrete with the maximum content of sulfur binder.

Table 2

| Compound | SampleN2 | **Sample №3** | **Sample №4** |
|---|---|---|---|
| Cement | 25,5 | 25,5 | 14,6 |
| Sand | 54 | 54 | 31 |
| Water | 16 | 16 | 16 |
| Sernoye | 4,5 | 4,5 | 38,4 |

Table 3 already shows recipes for an example of complex processing of rubber and sulfur waste [4]. Rubber waste was added to reduce or completely eliminate the sulfur odor present in sulfur concrete samples [5] by cross-linking sulfur molecules with a polymer [6, 7].

Table 3

| Compound | Cement | Sand | Watet | Sernoye | Rubber fraction |
|---|---|---|---|---|---|
| Sample N 5 | 15,5 | 50 | 14 | 18,75 | 1,75 |

Treatment of samples with chemical reagents.

After the samples were made, it was necessary to expose them to chemical reagents. Therefore, the following reagents were tested:

> 1% aqueous solution of sulfuric acid;

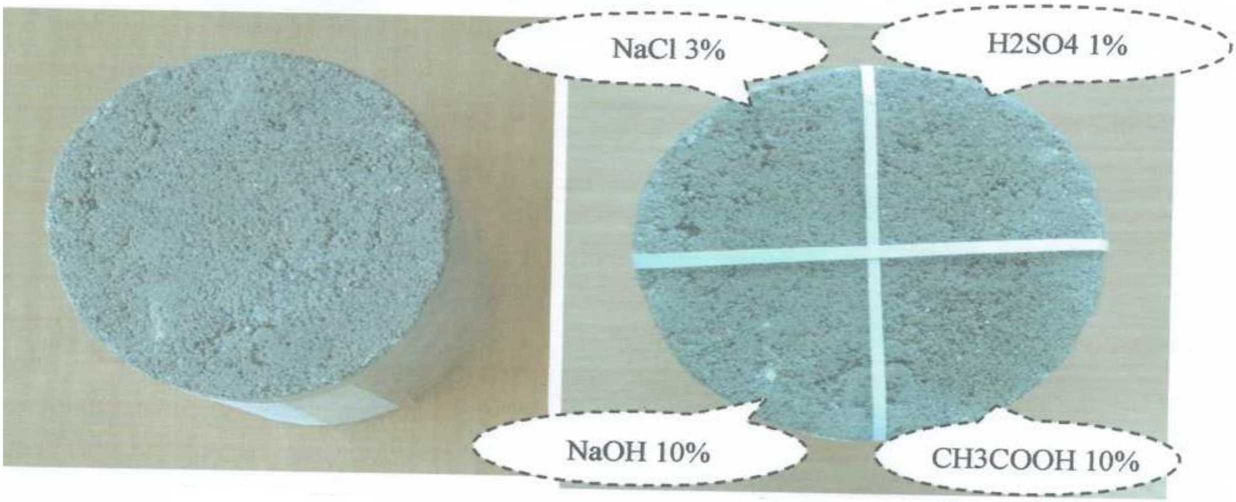
> 10% aqueous solution of acetic acid;

> 3% aqueous solution of table salt;

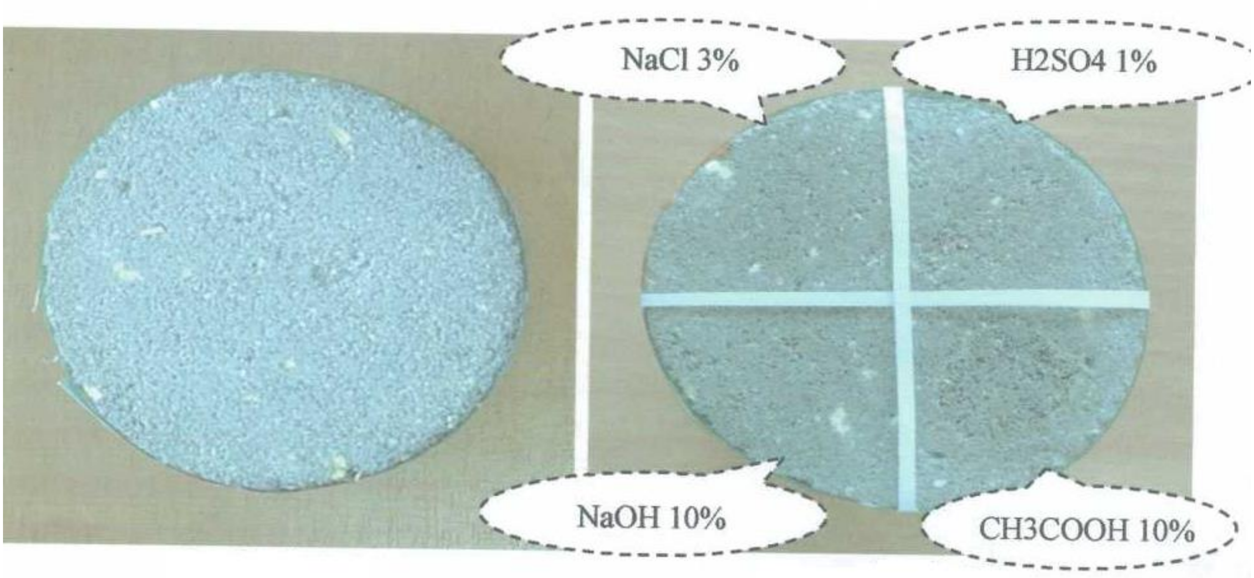
> 10% aqueous sodium hydroxide solution.

A sample of ordinary concrete was first exposed to chemical reagents:

As can be seen from Figure 1, significant damage is noticeable in the sector exposed to acetic acid and sodium hydroxide. Areas affected by table salt and sulfuric acid were less affected.




Next, sample No. 2 was exposed to chemical reagents before and after chemical treatment:




After treating the surface of sample No. 2 (see Figure 2), which contains sulfur binder without heat treatment, damage is also noticeable in the sector exposed to acetic acid and other reagents, but there is less damage than when processing conventional concrete.

Next, sample No. 3 was exposed to chemical reagents before and after chemical treatment and the damaged areas of this sample were shown.

As can be seen from Figure 3, damage from the effects of reagents on sample No. 3, which contains sulfur binder, thermally treated at a temperature of 150 °C, is minimal compared to the previous two samples.

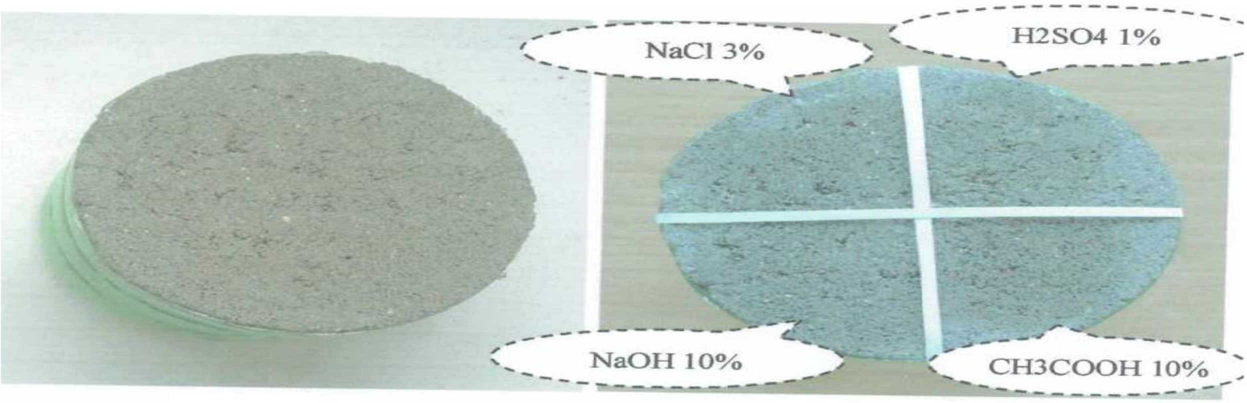
In sulfur concrete, which contains the maximum amount of sulfur binder - 38.4% (see Figure 4), damage is noticeable only in the area of exposure to sulfuric and acetic acids.

The last was sample No. 5, which is a sample of complex processing of rubber and sulfur waste [8] (see Figure 5):

In this case, noticeable surface damage was observed in the acetic acid sector and minor damage in the sulfuric acid sector.

**Conclusions:**

Thus, from the experiments performed it follows that:
the addition of sulfur binder increases the resistance of concrete to chemical reagents;
The rubber fraction does not help eliminate the unpleasant odor of sulfur.
sulfur concrete, unlike ordinary concrete, gains strength immediately after cooling (we noticed during production);
sulfur concrete has higher rates of water resistance and frost resistance (sulfur is hydrophobic in nature, as a result of which its addition to the concrete composition eliminates two causes of concrete destruction at once: in the summer, due to elevated temperatures, the moisture in the concrete evaporates and, as a result, - due to a lack of water, the structure of concrete becomes weaker; in winter, due to snow and heavy rains (increased moisture), water gets inside the concrete, which freezes and cracks at low temperatures, destroying the structure of concrete);
the preparation of sulfur concrete is not limited by weather conditions (follows from the previous paragraph);




available raw material base.
As a result of the production of this type of concrete (sulfur concrete), the environmental problem of the accumulation of unclaimed raw materials, as well as the quality of the road surface, is solved. This reduces traffic accidents due to poor-quality road surfaces during highway construction.

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