

# IMPROVING THE QUALITY OF BITUMEN USED ON ROADS.

## LITERATURE REVIEW.

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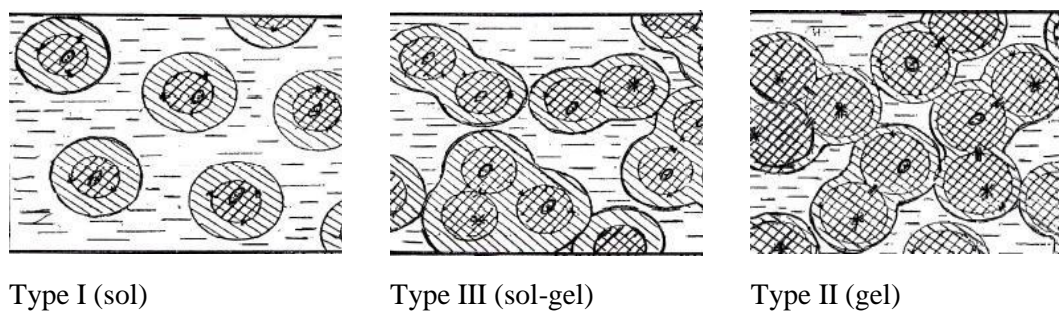
**Abstract:** In this article, the physical and mechanical properties of bitumen used in roads are considered to be improved by adding various additives.

**Keywords:** Crushed-stone-mastic asphalt concrete (ShMA), petroleum road bitumen, thermoplastic rubbers, dispersed phase, asphalt, flotation tar, road surfaces, polyethylene bitumen mixtures, Surfactants - surfactants.

### INTRODUCTION

Petroleum road bitumen is the main type of binder or adhesive successfully used in the road industry in the construction and repair of road surfaces, plastic, capable of withstanding low temperatures and temperature extremes, as well as applied deformations, without destruction. However, the specific operating conditions of such highly loaded road construction objects as bridges, overpasses, interchanges, etc. necessitate higher requirements for asphalt concrete pavements. Regulated grades of road bitumen are no longer able to fully satisfy these requirements. In addition, the load increases every year due to the increase in traffic intensity.

A.S. Kolbanovskaya And V.V. Mikhailov on basis analysis various representations of structure of oil bitumen and research processes structure formation consider bitumen as a spatial dispersed system, in which the dispersed phase - asphaltenes - swell in hydrocarbon dispersion environment, various degrees of structure with resin. Based on this, bitumen is distinguished according to I, II, III structural type, which can identify with colloidal systems "gel", "sol" and "sol-gel" (figure 1) [1].



**Drawing 1. Structure of bitumen I, II, III type**

A great contribution to the study of modified bitumen belongs to such scientists as L.M. Gokhman , V.A. Zakharov, D.A. Rosenthal and others, as well as foreign P.D. Thompson, R.H. Lewis et al. [2].

Diyarov I.N., Kemalov A.F., Fakhruddinov R.Z., Abdullin A.I. also achieved significant success in the field of bitumen modification. rubbers (polybutadiene, natural, chloroprene, butyl rubber), thermoplastic polymers (polyethylene, polypropylene, polyethylene vinyl acetate ), sulfur, crumb rubber, organomanganese compounds, thermoplastic rubbers (polyurethane, olefin copolymers, styrene- butadiene n -styrene block copolymers ) are used. The most widely used polymer-bitumen binders (PBBs) are based on styrene-butadiene-styrene block copolymers [3, 4].

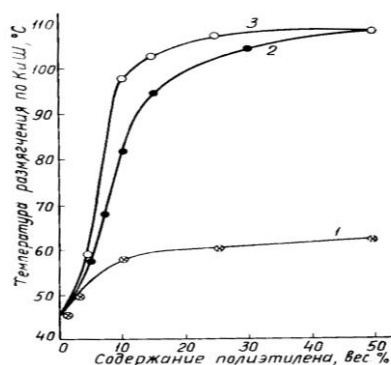
## **METHOD**

The most popular polymer additives are thermoplastic polymers, which are able to repeatedly soften when heated and harden when cooled. Thermoplastics have a linear structure of molecules, and have the ability not only to swell in a dispersion medium, but also to dissolve in organic solvents. These include polyethylene, polypropylene, atactic polypropylene, polyvinyl chloride, polystyrene, polyiso butylene, elvaloy -AM (a copolymer of ethylene with butyl acrylate and glycidyl methacrylate ), ethylene vinyl acetate , etc. [5, 6]. Rubber-like polymers (elastomers), unlike thermoplastics , consist of huge chain molecules that can unfold when stretched, and when the load is removed, restore their original configuration. [7, 8 ]. Thermoplastic elastomers ( block copolymers of butadiene and styrene SBS) are amorphous granular polymers of

a linear or branched structure, the molecules of which contain blocks of butadiene and styrene. Such polymers create a three-dimensional elastic network in bitumen, have a relatively low mass, and dissolve well in a dispersion medium [9, 10]. Walter's studies [11] showed that when the content of polypropylene in bitumen is up to 30% wt. the structure of the composition is finely dispersed, and the degree of dispersion depends only on the method of mixing. Thermogravimetric studies have shown that the degradation of polyethylene occurs at temperatures above 300°C. Up to these temperatures, polyethylene is a chemically resistant material. Since the combination of bitumen with polyethylene occurs at lower (180 ^ 250 ° C) temperatures, it is unlikely that it depolymerizes and forms radicals capable of interacting with bituminous radicals.

## RESULT AND DISCUSSION

Polypropylene is very close to polyethylene in properties, therefore, when it is introduced into bitumen, the properties of the mixture are close to those of polyethylene bitumen mixtures.



**Figure 2** . The dependence of the softening temperature of the polyethylene bitumen composition on the content of polyethylene of different molecular weights. 1 -low molecular weight polyethylene; 2 - high molecular weight polyethylene; 3 - polyethylene wax.

In accordance with the hypothesis put forward, further experiments were carried out to study the interaction of the elemental sulfur melt with tar in the temperature range 140 ° -150 ° C for 20 minutes. and 80 min. After heat

treatment of the mixtures, they were kept for 96 hours and the change in the viscosity of the mixture with time was determined. To evenly distribute the additive in the mixture and to avoid clumping of the fibers, it must be fed into the mixer in granular form. The granules must be non-hygroscopic, i.e. not wetted by atmospheric moisture, and must be strong enough. The strength of the granules is of great importance when dosing into the mixer and for "dry" mixing of the mixture components. There is also the possibility of burning cellulose, upon first contact with hot stone material 180-200 ° C , namely, fiber bridges, with which it subsequently binds to bitumen. In order to increase the strength characteristics of the granules and reduce the hygroscopicity of cellulose, tars from an oil and fat plant were used - flotation tar and a fat composition. [12].

## **CONCLUSION**

In conclusion, an alternative measure to increase the strength of asphalt concrete is to improve the quality of bitumen with additional composite material or additives. In this case, several additives can be added to the bitumen. For example: polymer resin, polyethylene, thermoplastic, rubber, cellulose, flotation plastic , etc. At the same time, the physical and mechanical properties of bitumen are also improved. By adding several substances to bitumen: polyethylene (plastic), pieces of rubber and tire granules, it is possible to increase its strength and the resistance of the road to climate and vehicles. We have also conducted research on adding Topcell RKM-2 Ecotop Chrysopro to increase the strength of the asphalt concrete pavement. and it gave a positive result. In this case, the strength of the coating increased 3-4 times.

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