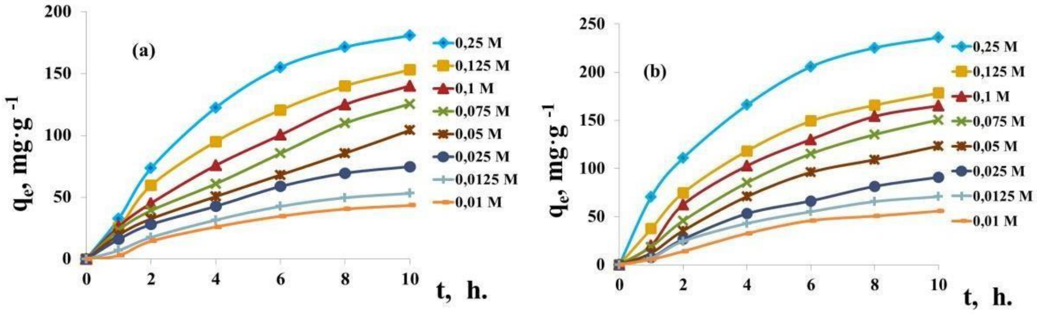
presence of ionites [2]. Therefore, the synthesis of new ionites and their application in the separation of various metal ions is one of the important tasks in the field of chemistry. Taking into account these problems, on the basis of polyvinylchloride (PVC) was synthesized polyampholite containing amino and sulfogroups. This polyampholite was registered by the Institute of Standards of the Republic of Uzbekistan under Ts 02072392-002: 2020.

In this study, the sorption kinetics of Co^{2+} and Cr^{3+} ions from artificial solutions to a new polyampholite containing amino and sulfogroups was studied. For this purpose, solutions of different concentrations of Co^{2+} and Cr^{3+} ions from 0,01 to 0,25 mol·l^{-1} were prepared using crystal hydrates $CoCl_2 \cdot 6H_2O$ and $CrCl_3 \cdot 4H_2O$. The sorption duration of metal ions from solutions was studied at 1–10 h, at temperatures of 303, 313, and 323K [3]. The following figure shows the duration of absorption of cobalt (II) and chromium (III) ions in polyampholite at different times.



Picture. Sorption kinetics of Co^{2+} (a) and Cr^{3+} (b) ions to PVC-based ionite.

As can be seen in the figure above, with increasing time and concentration of ions in the solution, the degree of sorption of various metal ions by polyampholyte increases. This suggests that the absorption of cobalt (II) and chromium (III) ions into PVC-based polyampholite, together with the thermodynamic ion exchange reaction, led to the formation of a complex between the metal ions and the ionite . Therefore, PVC-based polycomplexone can be recommended for the removal of metal ions from the water of oil and gas fields.

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EVALUATION OF THE POSSIBILITY OF USING FATTY ACIDS OF TALL OIL IN THE PRODUCTION OF SKI-3 TO IMPROVE THE ELASTIC-HYSTERESIS PROPERTIES

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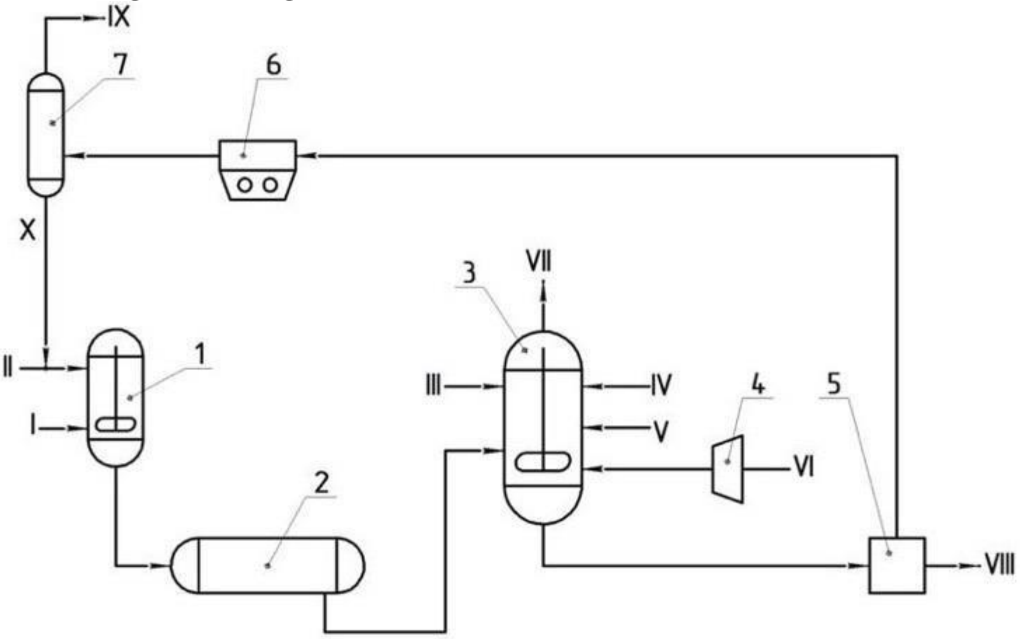
Currently the problem of modification of synthetic rubbers in order to obtain rubber compounds with high level of cohesive strength is paid increasing attention. Due to combination of such factors as predominant location of natural production in Asian countries (India, Thailand, Indonesia, Malaysia, etc.), as well as availability of wide raw material base for production and modification of synthetic rubbers in countries producing rubber products, development of technologies for bringing quality properties of SKI-3 to the level of natural or even higher has become an important task of petrochemical industry. Cis-1,4-polyisoprene rubber, which is the closest to the natural rubber by its properties, but has a lower cohesive strength, has been chosen as an object of research. Studies had been conducted using maleic anhydride (MA), which allows the introduction of functional groups into the rubber composition to improve the strength properties [1]. As a modifying additive it is suggested using tall oil fatty acids (TOFA) which have similar chemical properties, since they contain unsaturated acids C18-C20.

To evaluate the effectiveness of application of modifying additives in accordance with GOST [2], rubber compounds of SKI-3, natural rubber, SKI-3 with addition of a modifier on the basis of TOFA and SKI-3 with addition of a modifier on the basis of MA were prepared. Tests for comparison of cohesion strength indicators were carried out using a training test machine MI-20 UMT. Based on the data obtained, namely, indicators of stress at a given elongation and break, it was revealed that the rubber compound containing a modifier on the basis of TOFA has the best properties.

The innovative technology consists in the addition of TOFA in the process of oxidative destruction. The proposed technological scheme is shown in figure 1. Mixer 1 is fed with SKI-3, fresh and recirculating solvent, which is a fraction which evaporated within the range of 110-140°C. After dissolution the mixture is fed to the reactor 3, where the temperature is maintained at 90-95°C, also TOFA, an oxidation catalyst, cobalt naphthenate, and the initiator, benzoyl peroxide, are introduced there. The reaction products are fed to the solvent stripping unit 5, from which the modified oligomer emerges.



1 - mixer, 2 - tank, 3 - reactor, 4 - compressor, 5 - solvent distillation unit, 6 - air cooling system, 7 - separator

Flows: I - SKI-3, II - fresh solvent, III - TOFA, IV - initiator, V - catalyst, VI - air, VII - reaction gases, VIII - modified oligomer, IX - exhaust gases, X - recycled solvent

Figure 1. Schematic diagram of SKI-3 rubber modification

The economic efficiency of introducing TOFA into SKI-3 production has been calculated in accordance with the methodology [3], indicating that the return on investment will occur in the first year after implementation of the project. Sensitivity analysis was performed to identify the impact of changes in the initial data of the project parameters on the final characteristics, namely on the net present value. It was found that even if the volume of SKI-3 for modification decreases, the price of modified SKI-3 decreased, and the purchase price of SKI-3 for modification increases by up to 15%, the NPV will be at a high level.

Indicators of low production cost (19.1 million rubles), fast implementation time (2 years) and payback period of the project (2.08 years), as well as successful laboratory tests, indicate the advisability of its use when introducing the technology in production.

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INCREASE IN COHESIVE STRENGTH OF SKI-3 BY MEANS OF MODIFYING ADDITIVES

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Synthetic rubber is a product of the petrochemical industry and it is a direct competitor of natural rubber (NR). In order to be marketable, synthetic rubbers must not only have the properties of NR, but also surpass them. Innovative technologies are required to achieve that goal.

SKI-3 was chosen as a subject of scientific work. It has closest to NR properties, but inferior to it in cohesive strength. Due to chemical modification of SKI-3 it is possible to create compositions possessing high stability to action of heat, good elastic-hysteresis properties, sufficient level of cohesive strength and the raised adhesion to a metal cord [1].

This work focuses on the grafting of functional oxygen-containing groups into the polymer structural links, the efficiency of which is increased when oxidative degradation is performed together.

A modification based on the maleation of SKI-3 was investigated in Kazan [1]. The grafted anhydride groups promoted the formation of hydrogen bonds, through which cohesion is increased. It is worth mentioning that the attachment reaction of maleic anhydride (MA) does not occur via double bonds in the rubber, but via hydrogen atom substitution in α-methylene groups [1].

The bottom residue of butyl alcohol rectification (KORBS) contains n-butanol, isobutylisobutyrate, n-butyl butyrate, 2-ethylhexanol, C_8-C_9 unsaturated alcohols, acetals and monoglycol esters [2]. The unsaturated alcohols present in KORBS are able to attach to rubber similarly to MA, that's why we suggested its use as a modifier. However, this method is less effective, since the content of unsaturated alcohols in the residue is low.

We also proposed to use tall oil fatty acids (TOFA) as a modifying agent. TOFA are an oily liquid which consists of a mixture of acids: oleic, linoleic, linolenic, as well as palmethicone, stearic, an admixture of resin acids (up to 2%) and unsaponifiable substances (up to 2%) [3]. The addition of unsaturated acids occurs in a similar manner. The product of the modification of TOFA on the example of interaction with oleic acid is presented below: