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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.

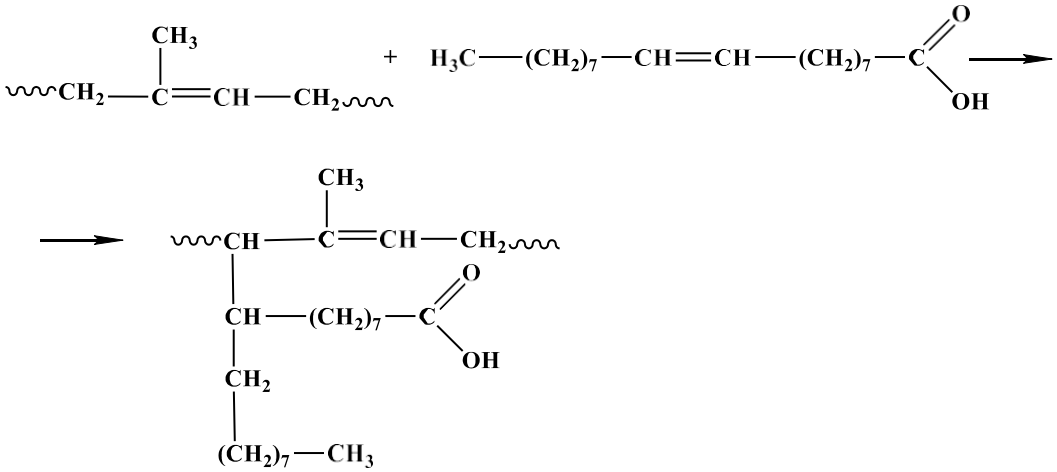
SKI-3 was chosen as a subject of scientific work. It has closest to NR properties, but inferior to it in cohesive strength. Due to chemical modification of SKI-3 it is possible to create compositions possessing high stability to action of heat, good elastic-hysteresis properties, sufficient level of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



The modification with TOFA was carried out on an apparatus consisting of a four-neck flask with a submerged air tube, an agitator and a thermometer as well as a connected reflux condenser. Rubber swollen in toluene was placed in the flask, the stirrer was turned on and TOFA was added. The rubber and TOFA were taken in a ratio of 8 : 2. The concentration of the mixture of rubber and TOFA in the solvent is 10% by weight. Then cobalt naphthenate in an amount of 0.5-1 % by weight of rubber was added to the flask. The process temperature was maintained at 90-100 ºC and air was supplied. Benzoyl peroxide 0.5% by weight of rubber was added to the reaction mixture. The reaction was carried out for 4 h.

During the analysis new peaks in the IR spectrum of modified SKI-3 were detected: in the region of 3400-3450 cm^{-1}, which is characteristic of hydroxyl groups, in the region of 1740-1780 cm^{-1}, which is responsible for the carbonyl oxygen atom, in the region 1020-1140 cm^{-1}, which determines the esters, in the region 875-890 cm^{-1}, which is characteristic of the epoxy oxygen atom.

Comparative characterization of the modifying additives shows that the most effective is the use of TOFA. In order to be most effective, the modification process was carried out in conjunction with an oxidative degradation resulting in more hydrogen bonds. This method can be successfully integrated into tyre production in order to improve the cohesive properties of SKI-3.

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ЭТИЛЕН ОКСИДИ ҲОСИЛАЛАРИ АСОСИДА ДЕЭМУЛЬГАТОРЛАРНИНГ ФОЙДАЛАНИШ ХОССАЛАРИНИ ЎРГАНИШ

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Олинган ДЭ-2 деэмульгаторлар фойдаланиш хоссаларининг тадқиқи. 1.1-жадвалида жойлаштирилган тадқиқот натижаларига кўра, одатдаги нефтни