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Research Article

ANALYSIS OF THE CHEMICAL COMPOSITION OF CAR TIRE RUBBER

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ABSTRACT

The analysis of the disposal situation of used car tires showed that the problem of their recycling is global and there is no single point of view on its solution.

The market for the sale of recycled tires and the requirements for them were analyzed. The sequence of processing car tires is determined.

KEYWORDS

Automobile, tire, disposal, steel, zinc, rubber, manufacturing, recycling, particulates.

INTRODUCTION

Any tire of any quality and quantity includes the following main components: rubber, soot, silicon, oil, sulfur, zinc oxide, steel, nylon, aramid, viscose, and polyester.

The main types of rubber for production:

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- natural rubber;
- styrene-butadiene rubber;
- butadiene rubber;
- butyl rubber.

Natural rubber is found in the milky sap of Hevea (Hevea brasiliensis), latex in the form of an aqueous dispersion containing up to 40% rubber. Latex consists of a large number of rubber particles – globules [1,2,3,4]. Depending on the season of latex collection, humidity, the geography of tree location, and the type of planting (forest and plantation), the resulting rubber has a different quality. The most important rubber grades are Prime Standard Ribbed Smoked Sheets and Fine Standard Latex or crepe Pale Smoking crepe Rubber. The first varieties also include base crepe and spray rubber [5-9].

The main part

The lowest grades of rubber waste are obtained: 2nd-grade light crepe, brown crepe, wood crepe, shell crepe, and ground crepe.

The composition of raw rubber includes rubber hydrocarbon, moisture, acetone extract substances, nitrogen-containing substances (proteins), ash (inorganic). The composition of these substances can be very different [10-19].

The hydrocarbon of all-natural rubbers consists of the same elementary isopentenyl groups (C5H8).

The main properties of rubber depend on the presence of a high polymer content (C5H8) P in its composition. Rubber hydrocarbon contains isopentane groups formed during the polymerization of isoprene:

The linear structure of the rubber molecule has been proven by several works.

Isoprene polymerization proceeds as follows:

In order to separate the acetone extract substances, crushed rubber is extracted with hot acetone under blackening conditions.

These substances include oleic and linoleic acids - 45%, stearic acid - 6%, styrene - 8%, and styrene derivatives - 10%, the content of other substances is not specified. As for nitrogen-containing substances, firstly, the nature of these proteins (glycoproteins or plant proteins) is not fully understood, and secondly, amino acids are the result of the breakdown of proteins that are the means for the development of bacteria, but they, in turn, make rubber. protects against ageing. [21-27]

Ash includes CaO, HgO, K2O, Na2O, P2Os, Cl, and Fe oxides.

Styrene-butadiene rubber is a product of the co-polymerization of butadiene with styrene or methyl styrene, this polymerization is carried out in aqueous emulsions, which allows for obtaining homogeneous rubbers with high polymer and

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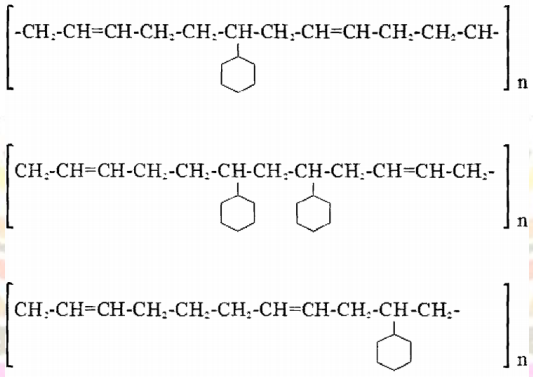
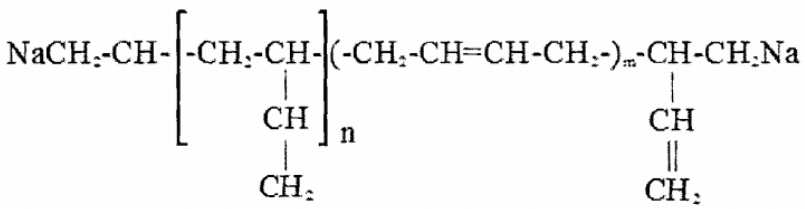
linear structure [28-34]. The sequence of a combination of butadiene and styrene molecules can be very different: butadiene-styrene, butadiene-styrene-styrene; butadiene-butadiene-styrene:



Synthetic sodium butadiene rubber is a product of butadiene polymerization under the influence of sodium, after polymerization, sodium cannot be completely removed, it remains in the rubber and turns into sodium carbonate [35-41]. Micromolecules of sodium butadiene rubber consist of units connected by bonds in positions 1-2 and 1-4; sodium is included in the last groups:



Butyl rubber is obtained by co-polymerization of isobutylene and isoprene or butadiene.

It is 1 ... 5% of the unsaturation of natural rubber with the ratio of isoprene and isobutylene.

Butyl rubber has the following structure:

$$\left(-\underset{CH_3CH_3}{\overset{CH_3CH_3.}{C}}-CH_2C-CH_2-\right)_2-\underset{CH_3CH_3}{\overset{CH_2}{CH}}-C=CH-CH_2-\left(-\underset{CH_3CH_3}{\overset{CH_2CH_3}{C}}-CH_2-C-CH_2\right)$$

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In addition to these types of rubber, rubber compounds include:

- vulcanizing agents;
- vulcanization accelerator;
- accelerator activators;
- antioxidants;
- plasticizers;
- fillers;
- will be restored;
- components for special purposes;
- auxiliary materials.

Treatment agents include sulfur, di- and trinitrobenzene, organic peroxides, quinones, diazo compounds, Zn, Pb, Cd, Mg oxides. However, to date, mass products are made from sulfur vulcanized rubber. In order to include sulfur in rubber compounds, it is necessary to have it in a finely dispersed state [42-43]. The most optimal production method is the decomposition of polysulfide metals with acids ( ), a necessary condition for production is a homogeneous distribution in the sulfur mixture. Rubber is a solvent for sulfur, its solubility increases when the temperature rises, and the excess sulfur in the solution recrystallizes on further cooling. The sulfur content in rubber compounds does not exceed 3 ... 3.5%. Vulcanization accelerators are usually referred to as chemical compounds that shorten the vulcanization time and improve the physicochemical properties of rubber. Currently, inorganic accelerators (caustic soda, soda, magnesium oxide, lead oxide, etc.) and organic (thiazoles, guanidines, etc.) are used. For example, for natural rubber, dibenzothiazoline disulfide is used as an accelerator, butadiene - for styrene rubber - mono-di and triethanolamine. Activators actively accelerate the vulcanization process and improve the quality of vulcanizates. These include oxides of zinc, magnesium, lead, calcium, cadmium, etc. The main disadvantage of rubber products is their rapid ageing, i.e. loss of elasticity with changes in physical and chemical properties. The main cause of ageing is the oxidation of rubber and rubber. Antioxidants are used as antioxidants. Natural rubber contains resins - natural antioxidants. The following antioxidants are actively used in all types of rubber: phenols, aminophenols, secondary naphthylamines, etc. Plasticizers are substances included in rubber compounds to reduce internal friction in the system. These include oxides of zinc, magnesium, lead, calcium, cadmium, etc. The main disadvantage of rubber products is their rapid ageing, i.e. loss of elasticity with changes in physical and chemical properties. The main cause of ageing is the oxidation of rubber and rubber. Antioxidants are used as antioxidants. Natural rubber contains resins - natural antioxidants. The following antioxidants are actively used in all types of rubber: phenols, aminophenols, secondary naphthylamines, etc. Plasticizers are substances included in rubber compounds to reduce internal friction in the system. These include oxides of zinc, magnesium, lead, calcium, cadmium, etc. The main disadvantage of rubber products is their rapid aging, i.e. loss of elasticity with changes in physical and chemical properties.

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Currently, several hundred types of plasticizers are known, the main part of which are plasticizers consisting of oil, fuel oil, tar, naphthalene, asphalt, bitumen, and others. In addition, coal tar, vegetable resin, etc. are used. For example, fatty acids, paraffin, ozocrite, etc. are used for butadiene and styrene-butadiene rubbers, and trichlorophenyl ethers, benzyl ethers, etc. are used for butyl rubber. Mechanical strength and elasticity are one of the most important properties of rubber. These properties largely depend on the presence of fillers in the rubber. This includes styrene polymers, polyethene, polyisobutylene, formaldehyde, epoxy and other resins, in addition to various types of carbon black. It serves as a rubber substitute in recovery rubber compounds.

Conclusion

Regardless of the nature of recovery, its inclusion in rubber compounds improves their technological properties. Currently, based on the practical data of production enterprises, it is generally accepted that 1 kg of raw rubber can be replaced by 1 kg of hydrocarbons included in the renewed mixture. if the hydrocarbon content is 50%, 2 kg of regenerant is needed accordingly. In the same case, if there is no rubber in the mixture, that is. the mixture is formed only from regenerate, then the amount of sulfur and accelerators should be taken based on the amount of hydrocarbons present; previously used ingredients are considered fillers.

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