International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 05 Issue 08 August 2022
DOI: 10.47191/ijcsrr/V5-i8-20, Impact Factor: 5.995
IJCSRR @ 2022
www.ijcsrr.org

Determination of Technological Factors of the Use of Complex Binding Materials in Increasing the Strength Limits of Road Surfaces

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ABSTRACT: One of the ways to improve the complex properties of interpolymer materials (IM) is their modification by adding various additives to their composition. This, in turn, improves the material's strength, hardness, heat resistance, water resistance, and a number of other important properties. One of the ways to improve the complex properties of interpolymer materials (IMs) is physical modification by adding various fillers to their composition. This results in improved IM strength, hardness, heat resistance, water resistance, and a number of other important properties.
Modification methods are used to improve the properties of polymer-polymer complexes and to expand the directions of their use. In order to improve the complex properties of composite materials (CMs) made from PPKs, they have different composition.

KEYWORDS: Composite road pavement, Complex Binding Material, Road Surface, Strength Limit, Technological Factors.

One of the ways to improve the complex properties of interpolymer materials (IM) is their modification by adding various additives to their composition. This, in turn, improves the material's strength, hardness, heat resistance, water resistance, and a number of other important properties. One of the ways to improve the complex properties of interpolymer materials (IMs) is physical modification by adding various fillers to their composition. This results in improved IM strength, hardness, heat resistance, water resistance, and a number of other important properties.

Modification methods are used to improve the properties of polymer-polymer complexes and to expand the directions of their use. In order to improve the complex properties of composite materials (CMs) made from PPKs, they have different composition.

Complements are modified by insertion. In this case, the physical and mechanical properties of KM: strength, hardness, heat resistance, resistance to the effects of water and aggressive substances in it, and a number of other important properties change in a positive direction.

It is necessary to use the method of continuous construction in the entire length of the roads, or in its parts, as well as in the execution of certain types of road construction works. If the construction objects are scattered, short in length, and the performed work is the same, then specialized continuous working groups should be organized, which take turns from one object to another, and they should usually be in the complex of the unified organizational system of the road construction organization. The speed of successive construction, the size of the organizational and technological breaks between certain stages of work, are accepted as a result of comparing technical and economic options, taking into account the extremely complex and labor-intensive construction processes and other organizational and economic factors (readiness and use of technical resources level, ability to quickly and rationally use resources, use devices and materials that mechanize the construction process as much as possible, use existing materials on the premises, etc.). The total moisture content of phosphogypsum is up to 45%, therefore phosphogypsum was heated at 1500C for 1 hour before use, crushed, powdered and then used. As an additive, sand with a particle size of 0.2-0.25 mm is used.

We made KM by mixing PPK and fillers together and sampled them by pouring them into molds. Because it helps them to study their chemical and physical-mechanical properties. It is known that the quality of the heat-retaining layers, consisting of concrete, stone materials treated with binders, reinforced soil and ash-slag mixtures, and the strength of the samples are controlled based on the requirements of the relevant chapters of these regulations regarding the determination of the phase of binder and filler ingredients and the strengthening of the protective layer of the product. The quality of the heat-retaining layer made of penoplast is checked by measuring the thickness of the slabs laid evenly on the surface of the road base and the thickness of the first layer of the

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road surface on the penoplast. When laying waterproofing, dirt-repellent and capillary protection layers, the thickness of their top and bottom, granulometric composition of the primer layer, the quality of the connection of the material along the surface and the first layer of the road surface on the floor are checked.

IR-spectroscopy and X-ray phase analysis, optical microscopy methods were used to determine the composition of interpolymer complex and dispersed fillers, their effect on the micro- and macrostructure of the obtained KM. Optimum conditions for obtaining KMs with oriented properties and structure based on water-soluble interpolymer complexes were found.

When building an additional protective layer from porous and less porous soils, their quality is sampled at least 3-10 times for every 500 m3 volume in the quarry itself, and the sand and dust particles in its content are checked, the size of the filtration coefficient is determined by GOST 25584. The size of the filtration coefficient can also be determined by calculating the granulometric composition of sandy granite. The thickness of the road surface and soil in the upper and lower part of the layer is checked using a ruler at three points of the cross-section (on the axis and at the edge of the road base) at an interval of no more than 100 m. The density of the layer material in the cross section at 3 points (on the axis and at the edge of the road surface) is 100 m. is checked according to the clause at intervals not exceeding The granulometric composition of the soil layer is checked once per shift both above and below the waterproofing layer. One of today's new technological factors is to increase the strength limits of road surfaces and to use composite complex binding materials. As a result of scientific experiments and researches, maintenance of layers of newly mixed soils strengthened with inorganic binders is carried out by sprinkling 0.5-0.8 dm3 /m2 per 1 m2 of emulsions using 50% fast-degrading or medium-degrading bitumen, or other organic binders.

Maintenance of newly laid reinforced soil layers (used as a base for road pavements) can be done by sprinkling neutralized tar (GND) at the rate of 0.5-0.6 dm3/m2 per 1 m2, or a layer of sand with a thickness of not less than 5 cm, while maintaining moisture.

- when liquid bitumen is used, use of lime, shale ash, dry fly ash, ash-ash mixtures with or without lime additives, crushed powdered lime; - when using shale bitumen, bitumen emulsions, use lime, lime dust, cement, fly ash; - organic binders (except carbomidoformaldehyde resin) - cationic and anionic substances (E-1 type SJK residue, secondary oil tar, gossypol resin, etc.) should be used.

It is allowed to build foundations and coatings from soil reinforced with organic binding materials and complex binding materials (KBM) at a dry air temperature of not less than 100 C. KBM consists of bitumen, crude oil and gossypol tar. Mixing the soil with bitumen emulsion is carried out in conditions where the air temperature is not lower than 50 C.

When hot asphalt concrete is laid, it is necessary to heat the edges of the previously laid pavements (for example, with infrared rays) so that the joint lands are well united, or a hot mixture 15-20 cm wide is laid on top of the previously laid pavement. Before laying the pavement of the next corridor, it is collected.

Every year, the number of car fleets in the world is increasing, which naturally leads to the generation of waste tires. According to the statistics of the European Association for Secondary Recycling of Tires in Europe, 9 mln. more than tons of amortized car tires are produced. In 2010, the number of used tires in the USA was 1.5 million. was a ton. Almost 500,000 tonnes of waste tires are generated in the UK every year, of which 34% are recycled, 26% are recycled, 15% are incinerated and 6% are sent to landfill. 96 million tons in Japan in 2008. useless tires (1056 thousand tons) appeared, 88.5% of them were directed to processing, during this period more than 400 thousand tons in France, -460-510 thousand tons in Germany, and 1 million in Russia. more than tons of waste tires are generated, up to 10% of which are recycled. Among the methods of practical disposal of used car tires, the optimal method is thermal decomposition pyrolysis.

A car tire is an expensive secondary raw material, which consists of 60-70% rubber, 10-15% technical carbon, and 10-15% metal scrap. Purpose of work. Study of physicochemical properties of technical carbon obtained by pyrolysis of used car tires.

Methodology. The density, ash (residue), rN of the obtained technical carbon was studied, and the granulometric composition was determined by state standard methods, and the composition was determined by X-ray phase and IR-spectroscopy methods.

Scientific novelty. For the first time, the physico-chemical properties of technical carbon obtained by pyrolysis of used car tires were studied.

The results obtained. The results of the study of the physical and chemical characteristics of technical carbon obtained from the pyrolysis of used car tires are presented. The powder density, ash content, pH, moisture content and granulometric composition of ground technical carbon were determined. It was found that with the decrease in the size of the technical carbon particles, the density,

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acidity and moisture of the powder increases, and practically the amount of ash remains unchanged. Using the X-ray phase analysis method, it was determined that the composition of technical carbon consists mainly of 88.4% amorphous carbon, 7.59% calcite, 1.21% ankerite, 1.14% zinc oxide and other components.

The thermal decomposition of technical carbon in the temperature range of 150-900 0C was determined using the method of thermal analysis. The physico-chemical characteristics of the obtained technical carbon are of great importance in determining the areas of its use for consumers.

Features:

* technical carbon obtained from the pyrolysis of waste car tires;
* its use as a secondary raw material for rubber-technical products.

It is known that in the production of elastomer composite materials, a multi-component system is used, which differ from each other in terms of chemical composition, activity, structure and amount in the composition. In this regard, the effects of carbon storage materials were mainly studied in standard recipes, as it is necessary to conduct research in production recipes to obtain final conclusions. 20 studies of production recipes have shown that elastomeric compositions filled with carbon-retaining material fully meet the requirements of TR, TSh, GOST in all respects, and in some cases, the operational characteristics increase by 1.2-1.4 times compared to the initial compositions. Composite elastomer materials filled with carbon-retaining materials and products based on them met the requirements of technical documents without changing the technological process under production conditions. The results of the dissertation research were tested and put into practice in the relevant enterprises in 2018-2019.

Recycling is also useful economic terms. From car tires you can get various types of valuable secondary raw materials, as well as the production of large quantities of finished products. Very fine fraction (about 0.2 mm) powder rubber waste is used to produce new car tires and rubber shoes, this secondary resource is popular in Russia and the CIS countries.

The powder obtained from the waste of larger fractions is used in the production of composite roofing materials, rubber-bitumen mastics, waterproofing materials and rubber coatings. Scrap metal is obtained from metal cord, which is also used by Russian entrepreneurs. Textiles and rubber are also obtained from tires.

The most professional way. A technological line is a sequence of installed working devices, passing through which the material turns into a finished product.

Tire preparation. First, they are washed and cleaned of impurities, after which they are transported by conveyor to the primary crusher, where they are crushed into large pieces (30-50 mm) with knife grinders.

In the second stage of the technological process, the primary processed raw material is fed through a belt conveyor to a hammer crusher, where it is further crushed into smaller sizes (10-20 mm). At this stage of processing, metal and textile cord, bead wire are separated from rubber. Textiles are separated by a special textile removal system, and metal by a magnetic separator. The collected metal waste is then briquetted.

At the final stage, the processing of the crumbs is already underway. An extruder is used as equipment for processing tires into a shredder - a grinder in which the rubber mass is turned into a fine powder. At this stage of tire processing, additional cleaning of textiles and metal scraps is also carried out using a traction separator. After that, the crushed rubber is divided into fractions and packed in 20 kg polyethylene bags or large bags (soft containers) with a load capacity of up to 1000 kg.

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In addition, there is an effective, but expensive physical chemical method of processing tires into shredded rubber - cryogenic grinding of car tires. Grinding of rubber is carried out in a special cooling chamber at very low temperatures (up to -120°C). Refrigerant (liquid nitrogen) is supplied to this chamber, which is cooled to very low temperatures. Under strong cooling conditions, rubber becomes glassy. Crushing of rubber occurs when it is hit with a special hammer. After grinding, textiles and metal are removed from the crushed rubber.

There are many mini tire recycling plants. A business plan for recycling car tires is very simple. Its implementation requires modern tire recycling equipment, warehouse equipment, fuel tanks, tools and overalls for workers, as well as equipment installation costs. It is necessary to register an enterprise and a license that allows you to engage in this type of activity. Starting this business requires a large initial capital.

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Tires are composed of three materials. If these elements are not properly processed, they become the main enemy for the ecosystem and endanger the health of living creatures living on the planet; and again when their burning exercises are done.

This practice causes severe pollution that produces pollutants and gases that are very harmful to health and contribute to global warming. There are medical studies which prove that the gas released during tire burning can cause diseases such as tumor, suffocation, bronchial and lung diseases, emotional pollution, water seeping into the environment and underground layers.

All these collisions are physically useless, because tires are such a durable, complex and noble material that, if they are recycled and reused properly, they can create different types of products and help reduce environmental pollution.

This modern chemical method makes it possible to determine the quality of products and the functional groups of the chemical structure of substances. This modern method is superior to other methods due to the fact that a very small amount of material is used for the analysis, and the analysis is carried out quickly and clearly.

We know that in every molecule, the atoms are chemically bonded to each other and are in constant oscillating motion. Since any compound has its own infrared spectrum, this spectrum is also called the passport of this compound.

It is known that the processing of crushed tires and the preparation of an environmentally safe product based on them, considering that it consists of structurally complex components, the use of modern analytical methods in their research helps to better study the product. The use of the infrared spectroscopy method in the research of the structural components of the crushed tire composition allows to determine the state of the substances and the degree of aggregation to a certain extent.

Today, using this chemical method, the structure of chemical groups of very complex physico-chemical and structurally heterogeneous mixtures and the structure of various fractional compounds are being studied using additional different methods (chromatography and group chemical composition), although it is not possible to fully identify individual compounds determines that it is possible to make sufficiently correct and reasonable conclusions about.

CONCLUSIONS AND RECOMMENDATIONS

The composite road pavements obtained on the basis of used tire slag and interpolymer phosphogypsum were tested at the Jizzakh Regional Road Use Unitary Enterprise (Jizzakh Polytechnic Institute Road Quality Control Accreditation Laboratory, Reference No. 7 dated May 20, 2022). As a result, economic efficiency increased by 40% as a result of the development of new composite road pavements based on modified secondary products.

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Composite road pavements based on used tire slag and interpolymer phosphogypsum were introduced in the district road use departments under the Jizzakh Regional Transport Department of the Ministry of Transport of the Republic of Uzbekistan (reference No. 231-N of June 21, 2022 of the Jizzakh Regional Transport Department). As a result, it was possible to reduce the imported composite materials by 40%.

A new technological process was developed for the process of obtaining a liquid composition with the help of secondary tire sawdust and interpolymer phosphogypsum, and a recommendation was made for the production of technical conditions and technological regulations.

Thermoanalytical analysis, anti-oxidation properties, rheological and technological properties of the liquid composition through secondary tire slag and interpolymeric phosphogypsum ingredients are explained.

The physico-mechanical, dynamic and operational properties of the liquid composition obtained by the secondary tire sawdust and interpolymeric phosphogypsum ingredients were studied, and its optimal amount in the composition was recommended.

It was recommended to produce road pavements and pavements that can be used in various conditions using the liquid composition obtained by using the secondary tire sawdust and interpolymeric phosphogypsum ingredients.

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Cite this Article: Maxmud Omonov, Sirojiddin Jiyanbaev, Kamola Iriskulova (2022). Determination of Technological Factors of the Use of Complex Binding Materials in Increasing the Strength Limits of Road Surfaces. International Journal of Current Science Research and Review, 5(8), 2975-2980