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POLYMER - BITUMEN COMPOSITES PROPERTIES OF THE INGREDIENTS USED FOR OBTAINING

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Annotation. Multifunctional ingredients have been created to obtain polymer-bitumen compositions used in changing weather conditions by crushing used rubber-technical products and tires on the basis of mechanical forces **.** The effect of the created modifiers and ingredients on the heat, cold, friction, elongation, compression resistance and rheological, technological, physical-mechanical, dynamic properties of the polymer-bitumen composition was determined.

Key words *: bitumen, ingredient , gas pyrolysis tar, carbon storage material, ground tire powder, basalt fiber, bentonite clay, alkanolamines.*

Today, asphalt-bitumen compositions that are resistant to heat, cold, bending, stretching, friction and dynamic forces are used in the covering of highways and airfields in the world . Therefore, in order to increase the resistance of polymer-bitumen compositions to cold, heat, bending, friction, stretching, and service time, special attention is paid to the creation of ingredients that shape the structure of their technological, physical-mechanical, dynamic properties based on the previously given requirements. Therefore, in order to cover highways and airfields and increase their service life, it is necessary to study the composition of polymer-bitumen compositions resistant to cold, heat, bending, friction, and stretching, and to develop technologies for obtaining them, laying them on roads, airfields, selection of natural and synthetic polymers, organic and inorganic ingredients included in the composition , creation of modifiers for their modification is relevant.

In recent years, in our republic, there have been a number of efforts to repair regional roads and airfields on the basis of asphalt-concrete pavements that meet world standards based on rapidly changing weather conditions and to increase their resistance to cold, heat, friction, stretching and bending. effective work is being done. In this regard, it is important to carry out scientific research on the development of technologies for obtaining and laying polymer-bitumen compositions suitable for rapid weather changes in our Republic for covering highways and airfields based on local raw materials.

This work is aimed at solving issues such as obtaining and determining the

properties of ingredients used in the creation of polymer-bitumen compositions for highways and airfields based on local raw materials.

It is known that our Republic has a rapidly changing weather, which causes rapid failure of asphalt-concrete pavements on the roads of mountainous and desert areas. The reason for this is that bitumen, which is the basis of the composition used in them, is not resistant to cold and heat (Table 1). In order to increase the resistance of road bitumens and pavements based on them to heat, cold and friction, ingredients were selected based on local raw materials and their physico-chemical properties were studied.

Table 1

The main quality indicators of road bitumens

Bitumen brands	Softening temperature H and Sh , °C	Freezing temperature, Fraas , °C	Needle penetration depth , 0°C , 0.1 mm	Needle penetration depth , 25 °C , 0.1 mm	Stretchability 0°C, cm	Stretchability 25°C, cm	Elasticity – 0°C, %	Elasticity – 25°C, %
BND 40/60	59.35	-22.4	12.5	40	7.6	24	21.05	33.3
BND 50/70	58.5	-24.8	31	50	10.4	30.7	5.7	18.6
BND 60/90	47	-15	20	61-90	3.5	55	4	13
BND 90/130	43	-17	28	91-130	4	65	-	-

Carbon storage material . Carbon-containing material - brittle, gray substance with an odor when applied, contains metal inclusions, after cooling it was crushed in a dismembrator and its granulometric composition was determined. Based on the studies, the fraction of carbon-containing materials is 63.0%, 0.25 nm, 9.0%, 0.5 nm, and 0.045 nm. It was found that the fraction is 3.0% and contains small metal particles.

Its physical properties were studied: bulk density, acidity, moisture, sol content (Table 2).

Table 2

Physico-chemical properties of ground carbon material

$r_{n,g}/cm^3$	r H	A^d, %	W^a, %
0.408 ± 0.02	6.5-5.4	22.7 0 ± 0.44	0.4 0 ± 0.05

Here: A^d - sol level of dry mass, W^a - analytical moisture content.

It was determined by X-ray structure analysis that the material containing carbon contains 88.24% amorphous carbon, 7.59% calcite, 1.14% zinc oxide, 1.21% ankerite and other components. At the same time, its thermal stability was studied using the derivatographic method, and the first stage occurred in the temperature range of 150-640 $^{o}C.$ In this case, the mass loss was 3.46%, and the second stage occurred in the temperature range of 650-900 ^{o}C, where the mass loss was 15.7%.

the carbon- containing material. In its IR-spectrum, absorption lines with very

low intensity were observed in the region > 3600 cm $^{-1}$. This situation indicated that some organic alcohols, water and moist air were adsorbed on the surface of the body. Absorption lines belonging to the C≡C bond are also in this area, and a very weak absorption line at 2916 cm $^{-1}$ belongs to the –CH 2 - group, and absorption of hydrocarbon species into the resulting entity was also observed. Absorption areas with low intensity belonging to the group of unsaturated hydrocarbons (-CH=CH-) usually appeared in the areas of 693 cm $^{-1}$, 600 cm $^{-1}$, -CH $_2$ and -CH in the areas of 2372 and 2345 cm $^{-1}$ Absorption lines typical for groups 3 , in the area of 1720-1684 cm $^{-1}$ to aromatic hydrocarbons, in the area of 1458-1543 cm $^{-1}$ to CH $_3$ C-, (CH $_3$) $_2$ C- groups, 1100-1000 cm $^{-1}$ width (SiO $_4$) Absorption lines characteristic of $^{4-}$ and SiO $_2$ and corresponding absorption lines also appeared at 800 cm $^{-1}$. White - soot n SiO $_2$ ·nH $_2$ O (BS-50) is used as filler for automobile tires , and Me-O absorption lines of metal oxides were observed in the vibration range from 400 cm $^{-1}$ to 500 cm $^{-1}$. So the carbon-stored material can be used as an active ingredient for the polymer-bitumen composition.

Gas pyrolysis tar. In the joint enterprise "Uz-Kor Gas Chemical" 10,000 tons of tar product (GPS - gas pyrolysis tar) is generated as waste per year, it is a black odorless solid substance (Table 3).

Table 3

Chemical composition of gas pyrolysis tar

It is a glerod number	Alk a n s	Dienes –	Olefins _	Cycloalkanes _	Arenas –	S
5	0.8	0.89	4.91	0.19	0	6.79
6	0.22	0.41	3.87	0.41	32.94	37.85
7	0.25	0.14	0.84	0.45	11.23	12.91
8	0.12	0.08	0.18	0.48	9.75	10.61
9	0.04	0.1	0.04	0.15	7.56	7.89
10	0.03	0.11	9.07	0.4	5.23	14.84
11	0.18	0.69	2.95	0	0.47	4.29
12	0	0.15	1.84	0	0	1.99
S	1.64	2.57	23.7	2.08	67.18	97.17

As can be seen from the table, the composition of GPS mainly consists of alkanes, dienes, olefins, cycloalkanes and arenes formed during the pyrolysis of natural gas, its molecular mass is around 1000-1200 and the melting temperature is 180 ^{o}C.

Crushed tire powder. It is known that the problem of reusing old tires is relevant nowadays. Therefore, crushed tire powder was selected as the main ingredient in polymer-bitumen compositions. (Table 4). As can be seen from the table, the properties of the selected ingredient are sufficient for use in the composition and it was recommended to use it in this case.

Table 4

Properties of ground tire powder

Name of pointers	Properties
Particle size , mm	0.25 - 2.8
Density , kg / m ^{3}	1250-1256
Sochma o ' irli gi , kg/m ^{3}	430-435
Comparative surface , cm ^{2} /g	1100 - 2200
pH indicator	7-8
Fat absorption , ml /100 g	92-105

Basalt fiber. The use of basalt fibers was intended to improve the abrasion resistance of the polymer-bitumen composition and to prevent the coating from sliding in parking lots. The production of basalt fibers has been launched in the city of Olmaliq, Namangan and Jizzakh regions of the Republic (Table 5).

Table 5

Basalt fiber chemical composition

Amount of substances in basalt fiber (%)											Total Amount (%)
SiO2 _	Al $_2$O $_3$	Fe $_2$O $_3$ FeO	CaO	MgO	R $_2$O	MnO	TiO2 _	SO $_3$	Humidity	Ppp .	
47.05	15.74	8.77	8.45	5.44	4.88	0.08	0.3	0.10	6.61	7.94	99.7

Basalt of fiber length up to 5 mm , its diameter in the range of 0.01-0.1 mm . Flexible , liquid substances good adsorption does and As a result elasticity increases .

Bentonite clay. Bentonite clay from Moynaq, Tortkol, Khojakol, Koshkhanatov, Beltov, and Karaterang mines of Karakalpakstan was studied (Table 6). Bentonite mud of Karakalpakstan, pH value of aqueous suspension is equal to 7-9, the surface is limited by shiny layers. Its chemical composition has several characteristic features, the mole ratio between SiO $_2$ and Al $_2$O $_3$ is from 4 to 5 (Table 6).

Table 6

Chemical composition of bentonite clays of Karakalpakstan

No	Substances composition	bentonite clay (%)					
		Nail (MB)	Turtkul (TB)	Khojakul (XB)	Kushkonatov (KB)	Beltov (BB)	Darken (KB)
1.	SiO2 _	50.50	64.96	50.04	50.0	52.2	56.2
2.	Al $_2$O $_3$	17.00	12.70	16.76	13.5	15.7	16.8
3.	CaO	1.20	2.0	2.08	1.8	2.02	1.5
4.	Na $_2$O	5.06	0.28	2.48	1.8	2	3.02
5.	K $_2$O	0.27	0.13	1.22	1.03	1.10	0.3
6.	MgO	3.62	3.35	2.00	2.35	2.8	3.0
7.	Fe $_2$O $_3$	3.56	1.26	6.04	2.00	2.04	3.0

8.	FeO	0.13	0.10	0.07	0.12	0.11	0.9
9.	TiO2 _	0.30	0.10	1.00	0.50	0.70	0.90
10.	CO2 _	1.68	0.20	0 , 60	0.40	0.55	0.65
11.	SO_3	0.28	0.21	0.15	0.20	0.26	0.18
12.	H_2O^-	9.15	4.30	4.32	4.8	6.00	8.05
13.	H_2O	5.05	7.31	8.44	6.01	6.80	7.55
14.	In the water eruv chan salt ar	2.20	3.10	4.80	5.00	6.00	4.30

As can be seen from the table, almost all bentonite clay deposits of Karakalpakstan contain oxides of iron, calcium, sodium, magnesium, and titanium, which were used as activators of the process of structure formation in polymer-bitumen compositions.

Secondary alkanolamines . These are used as adsorbents in the gas processing industry and are released as waste. Physicochemical properties of secondary alkanolamines changed due to the absorption of sour gases in the gas composition, that is, the boiling point and viscosity increased, and the freezing point decreased (Table 7).

Table 7

Physicochemical properties of secondary alkanolamines

Alkanolamine solutions	**Concentration**		**boiling point, °C, (180 kPa)**	**Freezing temperature, °C**	**Viscosity (0 °C, 103 Pa*s)**
	kmol/m 3	**%**			
IMEA	2.5	65	123	-11	1.6
IDEA	2	71	124	-12	2.0
IMMEDIATELY	2	74	126	-14	2.9

IMEA-used monoethanolamine; IDEA-used diethanolamine; IMDEA-used methyldiethanolamine.

When studying its composition, sour gases in natural gas (H_2S, CO_2, SO and their compounds) and was found to consist of salts. Taking into account the compounds of sour gases contained in secondary alkanolamines, they were studied because they can be used as accelerators in the process of structuring in the polymer-bitumen composition. Before using them, the water content was removed.

A phosphorous alkylamide fatty acid. Phosphorous alkylamide derived from cottonseed oil waste was used to accelerate structuring of fatty acid in polymer-bitumen composite. The molecular weight of phosphorous alkylamide fatty acid is 1100-1200. When its composition is analyzed by infrared spectroscopy, it has the following 900, 1070, 1210, 1310 and 1370 cm^{-1}; Absorption lines at 2360, 2930 and 3300 cm^{-1} were observed: it indicates the presence of groups =CO, −N, ≡R = O, =O, = N−H . As can be seen from these groups, phosphorous alkylamide fatty acid can be used as an accelerator in sulfur vulcanization systems.

Sulfur. Waste from the oil and gas processing industry was used as a structuring agent in the polymer-bitumen composition .

Elastomers . _ Isoprene and butadiene styrene elastomers were used in the polymer-bitumen composition as an ingredient that increases elasticity and abrasion resistance. The influence of each selected ingredient on certain properties of the

bitumen composition was studied, and the optimal conditions were chosen based on

the obtained results.

the work , physical and physico-chemical (IR, rheological, thermomechanical, optical microscopic) analyzes were used, as well as mathematical methods of statistical processing of experimental data.

Conclusion. The properties of multifunctional ingredients based on the waste of the oil and gas processing industry, old rubber-technical products and tires were studied. By using them It was explained that the composition of polymer-bitumen compositions resistant to heat, cold, friction, stretching and compression, used in changing weather conditions, and the scientific basis of their technology were created. Multi -functional ingredients will serve for the production of polymer-bitumen compositions with the given structure and properties, which will replace imports in the future, competitive, targeted, used in changing weather conditions .

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