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Improvement of Bitumen Using Local Mineral Fillers for Highways

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Abstract: *The article presents the results of studies of the first developed effective compositions of composite materials filled with mechanically activated natural sands and other ingredients, which allow improving the strength properties, heat resistance, shear resistance and crack resistance and, in general, the performance and durability of asphalt concrete composite pavements of roads, bridges and airfields.*

Keywords: *Physical and mechanical properties, heat resistance, composition, fillers, mechanical activation of ingredients, shear resistance, crack resistance, performance characteristics, durability, asphalt concrete compositions.*

INTRODUCTION

The article presents the results of studies of the first developed effective compositions of composite materials filled with mechanically activated natural sands and other ingredients in general, the performance and durability of asphalt concrete composite road pavements.

In this regard, conducting research on the creation and production of import-substituting and export-oriented high-performance, composite materials based on mechanically activated and chemically modified ingredients from local and secondary raw materials of organic and mineral origin for asphalt concrete pavements and sealing mastics for filling concrete expansion joints and cracks in asphalt concrete roads, bridges and airfields in order to improve their heat-frost-resistant, shear-resistant and crack-resistant properties and, accordingly, increase the service life in the temperature range from -250C to +800C is a very urgent problem.

Purpose of the study. Creation of effective compositions of import-substituting and export-oriented composite materials with high physical, mechanical and operational properties for pavements of asphalt concrete roads that can be operated in a wide temperature range from -25 to +800C, based on local mineral and secondary raw materials of organic and inorganic origin.

Object and methods of research. The objects of study are LLC Fergana Oil Refinery, bitumen grades BN-60/90, rubber crumb, gossypol resin, secondary polyvinyl chloride filler and activated Chinese and Chirchik river, Yazyavan and Yangiyer dune sands and compositions based on them.

Research results and discussion. Let us consider the results of studies of physical, mechanical and operational properties and the development of effective compositions for asphalt concrete road surfaces using organic, modified and activated inorganic ingredients based on local and secondary raw materials.

Table 1 Physical and mechanical bitumen BND 60/90 developed at the Fergana Oil Refinery

Quality indicators	Normalized requirements		Actually
	Designation of the normative document	Content of requirements	
Depth of needle penetration, 1 mm:	GOST 22245-90		
at 25 ˚C		61-90	82,3
Softening temperature for ring and ball		not lower than 47 ˚C	47,5
Extensibility			
at 25 ˚C		at least 55 cm	91,6

Based on the results of physical and chemical studies of modified bitumen and gossypol resin to create compositions for asphalt concrete road surfaces, we have developed bituminous compositions, the composition and properties of which are shown in tables 2. [1].

Table 2 Developed formulations of bituminous compositions based on ingredients from local raw materials recommended for use in road pavements

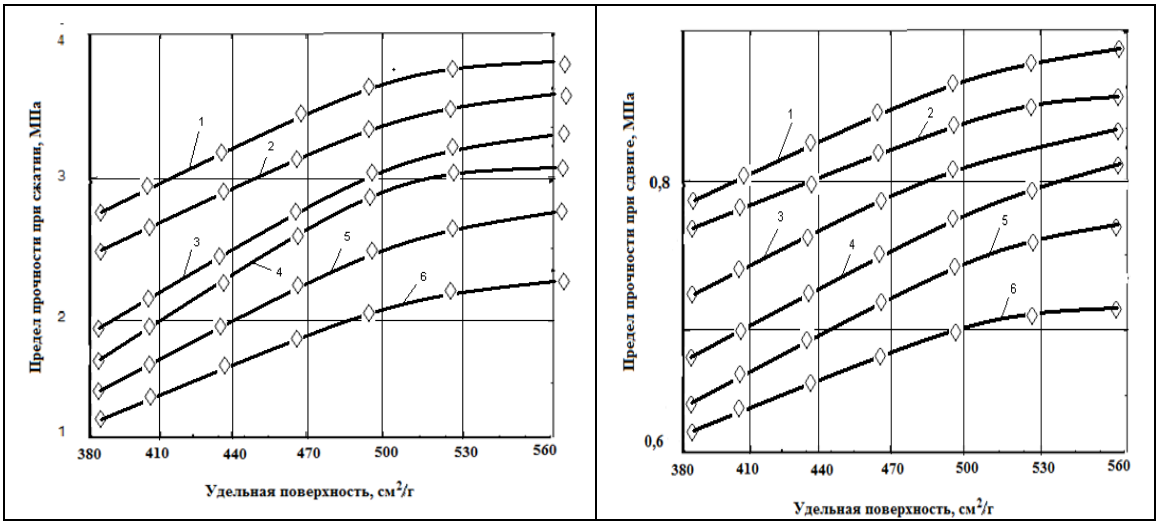
Name of ingredients	Contents wt.h		
Bitumen BN-60/90	40	40	40
Gossypol resin	35	35	35
Recycled PVC		25	25
Recycled polyethylene	25		
Total:	100	100	100

The mechanical properties of asphalt concrete compositions mainly depend on the particle size distribution, the degree of mechanical activation of the fillers and the properties of the binders.

In this regard, the dependences of the ultimate strength in shear and compression on the value of the specific surface of sand particles during their mechanical activation and the effect of mechanical activation on the shear strength of asphalt concrete pavements were studied.

Figure 1(a,b) shows the results of studies of the compressive and shear strength of asphalt concrete compositions obtained with mechanically activated natural sands.

As can be seen from the course of the curves in Figure 1 (a, b), when using all mechanically activated sands, an increase in the compressive and shear strength of asphalt concrete pavements containing sands is observed with an increase in the specific surface area of their particles. The maximum increase in compressive and shear strength of asphalt concrete composite materials is observed at a specific surface area of 550 cm2/g. In this case, the ultimate strength increases from 1.3 to 3.9 MPa, and the shear strength increases from 0.6 to 1.0 MPa, respectively.



1 - Chinaz; 2 - Zhamashui; 3 - Yazyavansky; 4 - bose; 5 - Yangier; 6 – Chirchik

Fig. 1. Dependence of the compressive strength (a) and shear strength (b) of asphalt concrete composite materials on the values of the specific surface of the particles of mechanically activated natural sands

Based on complex studies and the revealed patterns of the results obtained, an effective composition of composite materials was developed using mechanically activated natural sands and organic ingredients for asphalt concrete pavements of roads, bridges and airfields.

Conclusion. A scientifically based approach to the creation of heat-frost-resistant, shear-resistant and crack-resistant composite materials based on local and secondary raw materials for asphalt concrete pavements and sealing expansion joints and cracks in concrete, asphalt concrete roads, bridges and airfields with improved physical, mechanical and operational properties, capable of being operated

Literature:

1. Makhkamov Dilshod Ismatillayevich, Inoyatov Qaxramon Muydinovich, Abdurazakov Mirzokhid Abdurakhmonxujayevich, O'ktamov Sardor Makhmudjanovich. Use of mechanically activated components in road construction. An international multidisciplinary research journal.Vol. 10, issue 5, may 2020. p.1558-1566 India.
2. Негматов С.С., Собиров Б.Б., Иноятов К.М., Салимсаков Ю.А. Композиционные асфальтобетонные материалы для покрытия дорог // Ташкент: ГУП «Фан ва тараккиёт», 2012.
3. Негматов С.С., Собиров Б.Б., Абдуллаев А.Х.,Рахмонов Б.Ш., Иноятов К.М.,Салимсаков Ю.А. Модифицированные битумные композиции многофункционального назначения // Ташкент: ГУП «Фан ва тараккиёт», 2012.
4. O'GQ.Y.N.Z.et al. YO'L TO'SHAMALARIDA PAYDO BO 'LADIGAN DEFORMATSIYALARNI O 'RGANISH VA UNI YECHIMLARI //Трансформация моделей корпоративного управления в условиях цифровой экономики. – 2022. – Т. 1. – №. 1. – С. 158-164.
5. Qo'Ysinaliyev N. et al. SCIENTIFIC FUNDAMENTALS OF GROWING BITUME ON THE LOCAL AND SECONDARY RAW MATERIALS FOR ROADS //Экономика и социум. – 2022. – №. 5-1 (96). – С. 169-173.
6. QO'YSINALIYEV N. et al. METHODS OF INCREASING THE STRENGTH OF ASPHALT CONCRETE MIXED //МОЯ ПРОФЕССИОНАЛЬНАЯ КАРЬЕРА Учредители: Общество с ограниченной ответственностью" Моя профессиональная карьера. – 2022. – Т. 1. – №. 35. – С. 72-78.
7. Murodjon M., Qo'ysinaliyev Nuriddin A. R. Sementbeton qoplama va uni yotqizish texnologiyasi» uzacademia scientificmethodical journal republican number 3 on the subject

«Increasing the innovative activity of youth, improving the spirituality and achievements in science» collection of materials august 31, 2020 part 12 pages 65-67 //ISSN (E)–2181–1334.– 2020.

8. Qo'Ysinaliyev N. Z. O. G., Muxiddinov S. Z. O. G. AVTOMOBIL YO'LLARIDA SEMENTBETON QOPLAMALARINING AFZALLIGI //Academic research in educational sciences. – 2021. – Т. 2. – №. 10. – С. 356-362.
9. Koysinaliev N., Erkinov S., Ahmadjonov M. Improving the drainage system of highways using plastic materials in response to today's demand //Экономика и социум. – 2021. – №. 3-1 (82). – С. 146-149.
10. Mutalibov I., Qo'Ysinaliyev N. Use of mineral powder in the construction of asphalt concrete roads //Экономика и социум. – 2021. – №. 2-1 (81). – С. 245-248.
11. Saydazimov, N., Qo'Ysinaliyev, N., Mutalibov, I., & Maxmudov, S. (2020). Research of methods of repair of cement concrete pavels. Экономика и социум, (11 (78)), 1663-1666.
12. Maxkamboy o'g'li S. G. et al. Study of Deformations that Occur on Road Surfaces and Develop Measures to Prevent Them //Web of Synergy: International Interdisciplinary Research Journal. – 2023. – Т. 2. – №. 1. – С. 395-400.
13. Abdusalom o'g'li, A. X. (2023). Application of New Road Construction Composite Materials in the Design of Road Overflow Structures. Web of Synergy: International Interdisciplinary Research Journal, 2(1), 324-328.
14. O'G, Qo'Ysinaliyev Nuriddin Zafarali, Madaminova Dilnoza Dilshodbek Qizi, and O. Xakimov. "YO 'L TO 'SHAMALARIDA PAYDO BO 'LADIGAN DEFORMATSIYALARNI O 'RGANISH VA UNI YECHIMLARI." Трансформация моделей корпоративного управления в условиях цифровой экономики 1.1 (2022): 158-164.
15. Hidoyatillayevich, Xabibullayev Alimardon, Qo'ysinaliyev Nuriddin Zafarali O'gli, and Abduqaxxorov Xusniddin Abdusalom O'g'Li. "Yo'l to'shamalarida paydo bo'ladigan deformatsiyalarni o'rganish va uni yechimlari." Механика и технология 4.9 (2022): 198-204.
16. Hidoyatillayevich, Xabibullayev Alimardon, Qo'ysinaliyev Nuriddin Zafarali O'gli, and Abduqaxxorov Xusniddin Abdusalom O'g'Li. "Yo'l to'shamalarida paydo bo'ladigan deformatsiyalarni o'rganish va uni yechimlari." Механика и технология 4.9 (2022): 198-204.
17. Saydazimov, N., Mutalibov, I., Qo'ysinaliyev, N., & O'ktamov, S. (2020). IMPROVING THE ELASTICITY OF CEMENT-CONCRETE ROADS. Теория и практика современной науки, (11), 6-10.
18. Ismatullaevich, M. D., Xidoyatillayevich, X. A., & O'gli, Q. N. Z. (2022). Avtomobil yo'llari uchun mahalliy va ikkilamchi xom-ashyolar asosida mastika olishning ilmiy asoslari. Механика и технология, 4(9), 204-210.
19. Ismatillayevich, M. D., Hidoyatillayevich, X. A., Ogli, Q. N. Z., & Ogli, N. D. X. (2022). Композицион асфальтобетон материалларни ишлаб чиқишда махаллий ва иккиламчи хом ашёлар асосида органоминерал ингредиентлар қўллаш орқали физик кимёвий хусусиятларни тадқиқ этиш. Механика и технология, 3(8), 178-185.
20. Nosirjon S., Qo'ysinaliyev Nuriddin M. I., Sirojiddin M. Research of methods of repair of cement concrete pavels. – 2020.
21. Mutalibov, I., & Qo'Ysinaliyev, N. (2021). Use of mineral powder in the construction of asphalt concrete roads. Экономика и социум, (2-1 (81)), 245-248.
22. Nosirjon, S., & Ibroxim, M. (2020). Qo'ysinaliyev Nuriddin, O'ktamov Sardor" Improving the elasticity of cement-concrete roads".
23. O'G, Qo'Ysinaliyev Nuriddin Zafarali, Madaminova Dilnoza Dilshodbek Qizi, and O. Xakimov. "YO 'L TO 'SHAMALARIDA PAYDO BO 'LADIGAN DEFORMATSIYALARNI O 'RGANISH VA UNI YECHIMLARI." Трансформация моделей корпоративного управления в условиях цифровой экономики 1.1 (2022): 158-164.