**O‘ZBEKISTON MILLIY UNIVERSITETI XABARLARI, 2023, [3/1/1]**
**ISSN 2181-7324**

**KIMYO**
http://journals.nuu.uz
Natural sciences

**UDK:691.35.2; 661.7**

***Khait TURAYEV,***
*Professor of Termiz State University*
*E-mail: hhturayev@rambler.ru*
***Dilnoza SHAVKATOVA,***
*Assistant of Karshi Engineering Economics Institute*
*E-mail: shavkatova89dilnoza@mail.ru*
***Nodira AMANOVA,***
*Associate Professor of Termiz State University, Ph.D*
*E-mail: amanova0176@gmail.com*
***Go‘zal RAXMATOVA,***
*Associate Professor of Karshi Engineering Economics Institute, Ph.D*

*Karshi State University k.f.d. Based on M. Qurbanov's review*

## STUDY OF THE PHYSICAL AND MECHANICAL PROPERTIES OF CONCRETE BASED ON MODIFIED SULFUR AND MELAMINE

Annotation

*Background*. Sulfur is produced in large quantities in gas processing plants and its rapid availability requires a comprehensive study of this substance and its use in various sectors of the national economy by turning it into environmentally friendly compounds. *Purpose of work*. Production of sulfur concrete based on melamine and modified sulfur and study of its physical and mechanical properties. *Methodology*. The microstructure of modified sulfur concretes was studied by SEM and IR spectroscopic methods, thermal characteristics were determined by differential thermogravimetric methods in the DT-60 device. *Originality*. A new type of sulfur concrete was obtained based on melamine and modified sulfur; the physical and mechanical properties of the obtained concrete were determined to have high deformation stability and adhesion properties. *Findings*. Due to the unique structure of the melamine substance and the presence of active functional groups, the formation of a copolymer with modified sulfur showed that it participates as the main binding agent in the production of sulfur concrete.

**Key words:** Melamine, sulfur concrete, modification, copolymer

**Highlights:**
- the structure and physical and mechanical properties of modified sulfur were determined;
- modification of sulfur by organic amino compounds;
- the process of obtaining sulfur concrete has been investigated.

## MODIFIKATSIYALANGAN OLTINGUGURT VA MELAMIN ASOSIDA OLINGAN OLTINGUGURTLI BETONNING FIZIK MEXANIK XOSSALARINI O‘RGANISH

Annotatsiya

*Muammoning kelib chiqishi.* Oltingugurtning gazni qayta ishlash zavodlarida ko‘p tonnali hajmda ishlab chiqarilishi va uning tez topiluvchanligi ushbu moddani har tomonlama o‘rganish va undan xalq xo‘jaligining turli tarmoqlarida ekologik zararsiz birikmalarga aylantirish orqali foydalanishni taqozo etadi. *Ishning maqsadi*. Melamin va modifikatsiyalangan oltingugurt asosida oltingugurtli beton olish va uning fizik-mexanik xossalarini o‘rganish. *Metodologiyasi.* Modifikatsiyalangan oltingugurtli beton namunalarining mikrotuzilishi skanirlovchi elektron mikroskopida, ularning tuzilishi IQ-spektroskopik usulida, termik xususiyatlari differensial-termogravimetriya DT-60 drevatogrammasida tadqiq qilindi. *Ilmiy yangiligi.* Melamin va modifikatsiyalangan oltingugurt asosida yangi tipdagi oltingugurtli beton olindi, sintez qilingan betonning fizik- mexanik xossalari,uning yuqori deformatsiyalanuvchan barqarorlikka va agdezion xossasiga ega ekanligi aniqlandi. *Olingan natijalar*. Melamin moddasining o‘ziga xos tuzilishi va faol funksional guruhlarning mavjudligi hisobiga modifikatsiyalangan oltingugurt bilan sopolimer hosil qilishi oltingugurtli beton olishda asosiy bog‘lovchi vosita sifatida ishtirok etishini ko‘rsatdi.

**Kalit so‘zlar:** Melamin**,** oltingugurtli beton, modifikatsiya, sopolimer

**Xususiyatlari:**
- modifikatsiyalangan oltingugurtning tuzilishi va fizik-mexanik xususiyatlari aniqlangan;
- organik aminobirikmalar asosida oltingugurtni modifikatsiyalash;
- oltingugurtli beton olish jarayoni sinovdan o‘tkazilgan.

## ИССЛЕДОВАНИЕ ФИЗИКО-МЕХАНИЧЕСКИХ СВОЙСТВ СЕРНОГО БЕТОНА НА ОСНОВЕ МОДИФИЦИРОВАННОЙ СЕРЫ И МЕЛАМИНА

Аннотация

*Предпосыльки проблемы.* Производство серы в больших количествах на газоперерабатывающих заводах и ее быстрая доступность, использования его в различных отраслях народного хозяйства путем превращения в экологически безопасные соединения требуют всестороннего изучения этого вещества. *Цель работы.* Получение серобетона на основе меламина и модифицированной серы и изучение его физико-механических свойств. *Методология.* Микроструктура модифицированных серобетонов изучена СЭМ и ИК-спектропическими методами, термические характеристики определены дифференциально-термогравиметрическими способами в приборе ДТ-60. *Научная новизна.*

Получена новый тип серобетона на основе меламина и модифицированной серы. Определены оптимальные условия получения этого нового типа серобетона и изучены физико-механические свойства. Было показано, что он обладает высокий устойчивостью к деформации и адгезионными свойствами. *Полученные данные.* Благодаря уникальному строению меламиновой субстанции и наличию активных функциональных групп, при образование сополимера с модифицированной серой показало, что она участвует в качестве основного вяжущего средство при производстве серобетона.

**Ключевые слова:** Меламин, серобетон, модификация, сополимер.

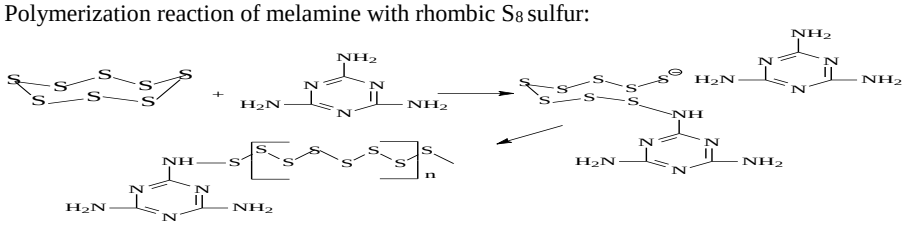
**Особенности:**

- определена структура и физико-механические свойства модифицированной серы;
- модификация серы органическими аминосоединениями;
- апробировано процесс получения серобетона.

**Introduction.** The production of sulfur in gas processing plants in large quantities and its rapid availability require comprehensive study of this substance and its use in various sectors of the national economy by turning it into environmentally harmless compounds [1]. The main reason for the interest of most researchers is the simplicity of synthesis of sulfur-containing oligomers with invaluable complex properties [2], at the same time, it is distinguished by the abundance of the raw material base. Authors [3] in their scientific work, carried out a lot of scientific and and particular, practical work on obtaining new sulfur polymer concretes and thermal oxidation destruction of primary sulfur and modified sulfur. The authors [7] carried out a large scientific and practical work on the production of new sulfur-polymer concretes and thermal-oxidative destruction of primary sulfur and modified sulfur. In this case, it is important to modify elemental sulfur and obtain various consumer goods by synthesizing many binders based on it. Mohamed and Gamal [11] also mention in their research the comparison of sulfur concrete with Portland cement concrete. In Poland, work is being carried out on the use of sulfur and its waste in the production of building materials. Research results are reflected in many articles and patents [12].

**Methods and materials.** In a 100 ml heat-resistant chemical beaker equipped with a mechanical stirrer and an oil bath and a high-temperature electric plate, we put 10 g of sulfur into it and heat it with constant stirring to a temperature of 185 °C for 30 minutes until a transparent viscous tangerine-colored liquid sulfur is formed. After that, we add 0.6 g of melamine to this liquid solution of transparent sulfur with constant stirring and hold for 1 hour at a temperature of 185-190 °C. As a result of the reaction, we observe that the viscosity of the mixture decreased slightly and the formation of brown sulfur and melamine comonomers.

Polymerization reaction of melamine with rhombic $S_8$ sulfur:



*Sample preparation and physical mechanical properties research methods*

Study of stability of sulfur concrete sample to chemical reagents. To evaluate the stability of sulfur concrete to chemical reagents, a cylindrical sample was immersed in a solution of chemical reagents with three different aggressive environments. For this, 10% HCl solution, 20% $H_2SO_4$ and 3% NaCl solutions were used as an aggressive medium. The test work was done by measuring the mass periodically and comparing it with the initial mass on a digital laboratory scale. Also, the compressive stability of the above sample in an aggressive environment for 60 days was measured. Before measuring the mass and compressive stability of the sample, the samples were removed from the chemically aggressive environment, washed several times in cold water and dried in a special thermostatic oven at a temperature of 105 °C. Three samples were initially tested for their compressive strength before exposure to the chemically aggressive environment, and after a period of exposure to the aggressive environment, the same three samples were again tested for their compressive strength.

A study on the coefficient of thermal expansion. The expansion and contraction of sulfur concrete with temperature changes affects its long-term service life. In this study, "PNST 105-2016 sulfur concrete mixture and sulfur concrete" method was used to determine the coefficient of thermal expansion of sulfur concrete samples under technical conditions. First, the samples were soaked in water for 2 days and the length of the samples was measured accurately. The sample was placed in a tank in a frame immersed in water. The temperature of the water in the reservoir was increased from 10 °C to 50 °C. The change in the length of the samples under the influence of temperature was recorded in a differential transformer. The linear expansion of the samples was measured at 0.2 °C/min.

**Results and discussion.** During the research, the test results of modified sulfur concrete were checked using centrifugal force to determine the proportions of sulfur concrete mixture. Tests revealed that the best sustained compressive and flexural strength was achieved with a 1:2 ratio of polymer sulfur concrete to aggregate. Also, sulfur concrete showed good formation at a ratio of 45% sand filler. Accordingly, it was determined that when the total volume of sulfur concrete is 100%, the amount of small and large fillers in it covers 36 and 30%. According to the results, when the polymer sulfur concrete (PSC) was replaced with 20% fly ash, sulfur concrete showed the best strength and good workability. Accordingly, it was determined that the volume ratio of PSC and fly ash is 26% to 7%. The weight of each component was calculated by multiplying the specific gravity of each material.

Mixture proportions and research parameters. Based on the results obtained above, five samples were investigated in Table 1 below, with different types and sizes of aggregates and different ratios of fly ash and sulfur polymer concrete. The main goal of the research is to find alternative proportions of mixtures.

*Table 1. Mixture proportions and research parameters.*

| Sample | A large aggregate, (%) | | Small aggregate, (%) | | SPC, (%) | | Ash powder (%) | | Maximum size of large aggregate (mm) | Large aggregate type | Study duration (days) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Volume | Mass | Volume | Mass | Volume | Mass | Volume | Mass | | | |
| №.1 | 35.2 | 39.7 | 30.0 | 32.1 | 27.4 | 22.1 | 5.8 | 5.3 | 19 | Natural | 3 |
| №.2 | 35.2 | 39.6 | 30.0 | 32.1 | 27.4 | 22.1 | 5.8 | 5.3 | 19 | Natural | 3 |
| №.3 | 35.2 | 38.8 | 30.0 | 31.9 | 18.2 | 15.2 | 13.9 | 12.6 | 19 | Natural | 3 |
| №.4 | 35.2 | 33.0 | 30.0 | 33.6 | 18.1 | 15.3 | 13.9 | 14.9 | 25 | Recycled | 3 |
| №.5 | 35.2 | 38.7 | 30.0 | 31.5 | 13.2 | 12.0 | 18.1 | 16.1 | 19 | Natural | 3 |

The properties of fly ash as a mineral filler are listed in Table 2 below.

*Table 2. Properties of fly ash used in the study.*

| $SiO_2$ (%) | Humidity (%) | Loss on combustion (%) | Comparative weight ($g/cm^3$) | Comparison surface ($cm^2/g$) |
|---|---|---|---|---|
| 48.8 | 0.1 | 3.5 | 2.14 | 3360 |

Sulfur concrete produced according to the composition obtained above was tested using different methods. Also, the properties of the obtained product were checked using modern physical research methods and analysis results were obtained.

## REFERENCES


1. Получение и свойства органических соединений серы; под ред. Беленького Л.И. М.: Химия. 1998. 560 с.
2. Корнеева Л.А., Неделькин В.И., Зачернюк Б.А. Экологические аспекти получения полиариленсулфидов на основе сери // Scientific aspects modern research: Sat. stat. intl. n.-pract. conf. Novosibirsk, 2017 С. 23-26.
3. Kolobova E.A., Lozhkina D.A. // Waste Processing Oil and Capacity Radiationresistant Composites on their Basis. conf. Penza. 2015. P.335-345.
4. Ахмедова А.Р., Серебренникова О.В., Шиганова. Геохимическая характеристика нефтей централной Сибирской платформ. // Neft Gas exposition. 2017. No. 7 (60). P.68-73.
5. Агабеков В.Е., Косяков В.К. Нефть и газ: технологии и продукти переработки. Minsk: Belarus. Science. 2011. P. 459.
6. Шветцова А.В., Седики Д.Б., Шинкар Е.В., Берберова Н.Т. Разработка процесса электромедиаторного синтеза органических полисульфидов на основе циклоалканов, сероводорода и элементной сери. //Proceedings of the VIII Intern. scientific and practical. conf. Astrakhan, 2017. С. 192-196.
7. Неделькин В.И., Кудряшова И.Н., Зачернюк Б.А., Соловева Е.Н., Чернова Н.С. Новые подходи к утилизации сери при газоочистке. //Modern problems of development of the textile and light industry: Sat. mat. intl. n.-tech. conf. M., 2012. P.30-31
8. Amanova N.D., Turayev Kh.Kh., Beknazarov Kh.S.Properties of new modified polymer sulfur concrete // Actual problems of modern science and innovation in the Central Asian region: collection of articles of the international conference. -Jizzahk, -2020. -p.71.
9. Амонова Н.Д., Тураев Х.Х., Бекназаров Х.С., Эшкурбонов Ф.Б. Исследование кинетики термоокислительной деструкции исходного и модифицированных образцов серы методами ДТА ва ТГА //Наука и мир. Международный научный журнал, № 6 (82), 2020, Том 1.
10. Амонова Н.Д., Тураев Х.Х., Бекназаров Х.С., Синтез и исследование нового полимерного серобетона // Universum: technical sciences: scientific journal. Part 3.M., Ed. "MSHO" -2020.-No. 6 (75).-C.5-8.
11. Mohamed A. M. O, Gamal M. E.. Sulfur concrete for the construction industry; a sustainable development approach. J. Ross Publishing, Inc., 5765 N. Andrews Way, Fort Lauderdale, FL 33309.
12. Książek, M. The influence of penetrating special polymer sulfur binder –Polymerized sulfur applied as the industrial waste material on concrete watertightness. Composites Part B: Engineering, 2014 – vol. 62, Issue null, PP. 137-142