

Моя профессиональная
карьера

ISSN

INTERNATIONAL
STANDARD
SERIAL
NUMBER

ISSN

2782-4365

Проверить
номер:



Научно-образовательный электронный журнал

ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ

Выпуск №74-3 (том 3)
(май, 2026)

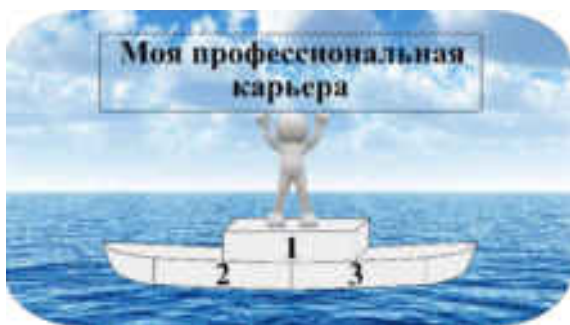


Google
Scholar



Периодичность выпуска: 1 раз в неделю

Сайт: mpcareer.ru/oinv21veke. Почта: obrmprcareer@mail.ru



Международный научно-образовательный
электронный журнал
«ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ»

ISSN 2782-4365

УДК 37

ББК 94

**Международный научно-образовательный электронный журнал
«ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ». Выпуск №74-3 (том 3) (май,
2026). Дата выхода в свет: 18.05.2026.**

Журнал объединяет авторов на территории стран СНГ и помогает обмениваться передовыми научно-образовательными исследованиями.

Содержит научные работы отечественных и зарубежных авторов по экономическим, техническим, философским, юридическим и другим наукам.

Миссия научно-образовательного электронного журнала «ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ» состоит в поддержке интереса читателей к оригинальным исследованиям и инновационным подходам в различных тематических направлениях, которые способствуют распространению лучшей отечественной и зарубежной практики в интернет пространстве.

Целевая аудитория журнала охватывает работников сферы науки и образования (педагоги, учителя, ученые, преподаватели, научные сотрудники, бакалавры, магистранты, аспиранты).

Материалы публикуются в авторской редакции. За соблюдение законов об интеллектуальной собственности и за содержание работ ответственность несут авторы работ. Мнение редакции может не совпадать с мнением авторов научных работ. При использовании и заимствовании материалов ссылка на издание обязательна.

© ООО «МОЯ ПРОФЕССИОНАЛЬНАЯ КАРЬЕРА»

© Коллектив авторов

СОДЕРЖАНИЕ

Название научной статьи, ФИО авторов	Номер страницы
Шамухаммедова Язгуль, Реджепов Мухамметнур ОСОБЕННОСТИ ФУНКЦИОНИРОВАНИЯ МАЛОГО БИЗНЕСА В УСЛОВИЯХ РЫНОЧНОЙ ЭКОНОМИКИ	16
Нурыева Аннагозел, Розыева Шемшат ОСОБЕННОСТИ ВЫРАЩИВАНИЯ ИНЖИРА	20
Бердиназарова Гулджемал, Какаева Айлар, Сейтиева Гулджан ОСОБЕННОСТИ ВЫРАЩИВАНИЯ ALLIUM	23
Asqaraliyev Muhammadyisuf Muhammadsodiq o'g'li TRAVELLING. TRANSPORTATION	26
Vahhobova Shaxnozaxon Vohidjon qizi AXBOROT XAVFIZLIGI TUSHUNCHASI. AXBOROT XAVFSZILIGINING JAMIYATDAGI ROLI	31
Vahhobova Shaxnozaxon Vohidjon qizi KOMPYUTER VIRUSLARI. ANTIVIRUSLAR.ANTIVIRUSLAR BILAN ISHLASH	36
Yegendurdiyev Yazgeldi DEVELOPING ADVANCED LISTENING SKILLS IN MODERN COMMUNICATION: COGNITIVE FRAMEWORKS AND PRACTICAL METHODOLOGIES	41
Merjen Jumakulyyeva, Mukam Ekayev, Ayjema Berdiyeva, Gulnaza Matkarimova TECHNOLOGY OF SOAP PRODUCTION FROM VEGETABLE OIL WASTE	46
Guljahan Atayeva, Mukam Ekayev, Ayjema Berdiyeva, Chinar Nuriyeva POLYURETHANE-BASED MOISTURE RESISTANT SPRAY	59
Leyla Osmanova, Mukam Ekayev, Ayjema Berdiyeva, Gulnaza Matkarimova SURFACE FUNCTIONALIZATION OF SiO ₂ AND TiO ₂ NANOPARTICLES FOR SELF-CLEANING AND ANTI- FOULING SURFACES	66
Ogulsenem Pursahedova, Mukam Ekayev, Ayjema Berdiyeva, Gulnaza Matkarimova PRODUCTION TECHNOLOGY OF SULFUR CONCRETE	74
Mahri Rejepova, Mukam Ekayev, Ayjema Berdiyeva, Chinar Nuriyeva TECHNOLOGY OF BIOPLASTIC PRODUCTION FROM BANANA PEEL EXTRACT	82

ФИО автора(-ов): *Ogulsenem Pursahedova, Mukam Ekayev, Ayjema Berdiyeva, Gulnaza Matkarimova*

OGUZ HAN ENGINEERING AND TECHNOLOGY UNIVERSITY OF TURKMENISTAN

Название публикации: «PRODUCTION TECHNOLOGY OF SULFUR CONCRETE»

Introduction

Sulfur concrete is an advanced construction material produced by replacing traditional Portland cement with sulfur as the primary binder. This material has gained considerable attention in civil engineering and industrial construction because of its high chemical resistance, rapid strength development, low water absorption, and excellent durability in aggressive environments.

Conventional concrete structures are often affected by acid attack, sulfate corrosion, freeze-thaw cycles, and moisture penetration. Sulfur concrete provides an alternative solution for environments where ordinary cement-based concrete experiences severe degradation. Because sulfur concrete does not require hydration reactions, it can achieve high mechanical strength within a short period after cooling and solidification.

Sulfur is an abundant by-product of petroleum refining and natural gas processing. The use of sulfur in construction materials also contributes to waste utilization and environmental sustainability. Modern sulfur concrete technology combines sulfur modification methods with aggregate engineering to produce durable and economically efficient construction materials.

Composition of Sulfur Concrete

Sulfur concrete mainly consists of:

- Elemental sulfur
- Mineral aggregates
- Fillers

- Modifiers and stabilizers

The binder phase is formed by molten sulfur instead of cement paste.

The percentage composition of sulfur concrete can generally be expressed as:

$$M_c = M_s + M_a + M_f$$

Where:

- M_c = total mass of concrete
- M_s = sulfur mass
- M_a = aggregate mass
- M_f = filler mass

Typically, sulfur content ranges from 10% to 25% of the total mixture mass.

Properties of Sulfur

Sulfur is a nonmetallic chemical element represented by the symbol:

S

Sulfur possesses several important properties:

- Low thermal conductivity
- High chemical resistance
- Hydrophobic nature
- Fast solidification
- Good binding ability in molten state

The melting temperature of sulfur is approximately:

$$T_m \approx 115^\circ\text{C}$$

At elevated temperatures, sulfur becomes liquid and can coat aggregates uniformly, forming a dense composite structure after cooling.

Raw Materials Used in Sulfur Concrete Production

1. Sulfur Binder

The sulfur binder is the primary component responsible for particle adhesion. Pure sulfur may become brittle after solidification; therefore, modified sulfur is often used to improve flexibility and durability.

Common sulfur modifiers include:

- Dicyclopentadiene (DCPD)
- Olefin polymers
- Bituminous additives

Modification improves:

- Thermal stability
 - Crack resistance
 - Mechanical toughness
-

2. Aggregates

Aggregates form the structural skeleton of sulfur concrete. Commonly used aggregates include:

- Sand
- Gravel
- Crushed stone
- Silica materials

The aggregate size distribution strongly influences density and mechanical strength.

3. Mineral Fillers

Fillers improve particle packing and reduce void formation. Examples include:

- Fly ash
- Silica flour
- Limestone powder

Fine fillers increase compactness and decrease permeability.

Production Technology

Heating Process

The first stage of sulfur concrete production involves melting sulfur at controlled temperatures. Sulfur is heated between:

$$120^{\circ}\text{C} \leq T \leq 150^{\circ}\text{C} \quad 120^{\circ}\text{C} \leq T \leq 150^{\circ}\text{C}$$

This temperature range ensures complete melting without excessive thermal decomposition.

Overheating sulfur can produce toxic gases such as sulfur dioxide:



Therefore, industrial production requires proper ventilation and temperature control systems.

Mixing Stage

After melting, sulfur is mixed with preheated aggregates and fillers. Preheating prevents rapid sulfur solidification during mixing.

The mixing process must ensure:

- Uniform sulfur distribution
- Proper aggregate coating
- Minimal air voids

Mechanical mixers are commonly used to achieve homogeneous compositions.

Casting and Compaction

The molten sulfur concrete mixture is poured into molds and compacted using:

- Vibratory compaction
- Mechanical pressing

Compaction improves density and mechanical strength by reducing internal porosity.

Cooling and Solidification

Unlike cement concrete, sulfur concrete hardens through cooling rather than hydration reactions.

The cooling process can be represented by heat transfer equations:

$$Q = mc\Delta T$$

Where:

- Q = heat energy
- m = mass
- c = specific heat capacity
- ΔT = temperature difference

As the material cools, sulfur crystallizes and binds the aggregate particles together.

Mechanical Properties

Sulfur concrete exhibits several excellent mechanical properties:

- High compressive strength
- Rapid strength development
- Low permeability
- Good abrasion resistance

The compressive strength may exceed:

$$\sigma_c > 60 \text{ MPa}$$

depending on mixture composition and processing conditions.

Additionally, sulfur concrete demonstrates excellent resistance against:

- Acids
- Salts
- Moisture
- Industrial chemicals

Advantages of Sulfur Concrete

Rapid Strength Gain

Sulfur concrete reaches operational strength within hours after cooling, unlike traditional concrete that requires curing for several days.

Chemical Resistance

The hydrophobic nature of sulfur significantly improves resistance to:

- Acid attack

- Sulfate corrosion
 - Marine environments
-

Low Water Absorption

The dense sulfur matrix minimizes water penetration and freeze-thaw damage.

Recyclability

Sulfur concrete can be reheated and remolded, making it recyclable and environmentally beneficial.

Industrial Applications

Sulfur concrete is widely used in:

- Chemical plants
- Sewer systems
- Industrial floors
- Marine structures
- Radiation shielding systems

Its high corrosion resistance makes it especially valuable in aggressive industrial environments.

Challenges and Limitations

Despite its advantages, sulfur concrete has several limitations:

- Brittleness at low temperatures
- Thermal expansion issues
- Fire sensitivity
- Toxic gas release during overheating

Researchers are currently developing modified sulfur systems with improved flexibility and thermal stability.

Environmental Importance

The use of sulfur waste from petroleum refining contributes to sustainable industrial development. Large quantities of sulfur produced in oil and gas industries can be transformed into useful construction materials instead of being stored as industrial waste.

This supports:

- Waste reduction
 - Resource recycling
 - Sustainable construction technologies
-

Conclusion

Production technology of sulfur concrete represents an important advancement in modern construction materials engineering. By replacing traditional cement binders with sulfur, engineers can produce highly durable, chemically resistant, and rapidly hardening concrete systems.

The manufacturing process involves sulfur melting, aggregate mixing, compaction, and controlled cooling. Sulfur concrete offers superior performance in aggressive chemical and marine environments where conventional concrete may fail.

Future developments are expected to focus on improving thermal stability, flexibility, and environmental safety while expanding industrial applications. As sustainable construction technologies continue to evolve, sulfur concrete may become an increasingly important alternative material in modern infrastructure and industrial engineering.

References

1. Piezoresistive and chemiresistive gas sensing by metal-free graphene layers
H Kitayama, MC Ekayev, T Ohba - Physical Chemistry Chemical Physics, 2020
2. Designing a Low-Cost CNC Milling Machine for Sustainable Digital Manufacturing

A Sadyk, Y Orazov, M Allyyev, S Durdyev, M Ekayev... - International Conference on Digital Age & ..., 2025

3. Optimizing EEG Signal Quality and Streaming Performance in BCIs Using ADS1299EEG-FE

Y Orazov, M Ekayev, K Ryzayev, G Mezilov - 2025 5th International Conference on Robotics ..., 2025

4. Innovative technology for extracting solar-grade silicon from the sands of the Karakum desert

M Ekayev, A Altyev, V Abdyssetdarov - Youth science and technology, 2019

5. PREPARATION OF SWEETS FROM MEDICINAL PLANTS OF TURKMENISTAN

E Mukam, R Kerimberdi - Наука и мировоззрение, 2025

6. Гидротермальная добыча полезных ископаемых

О Оразмырадова, Ч Нурыева, М Экаев - Вестник науки, 2023