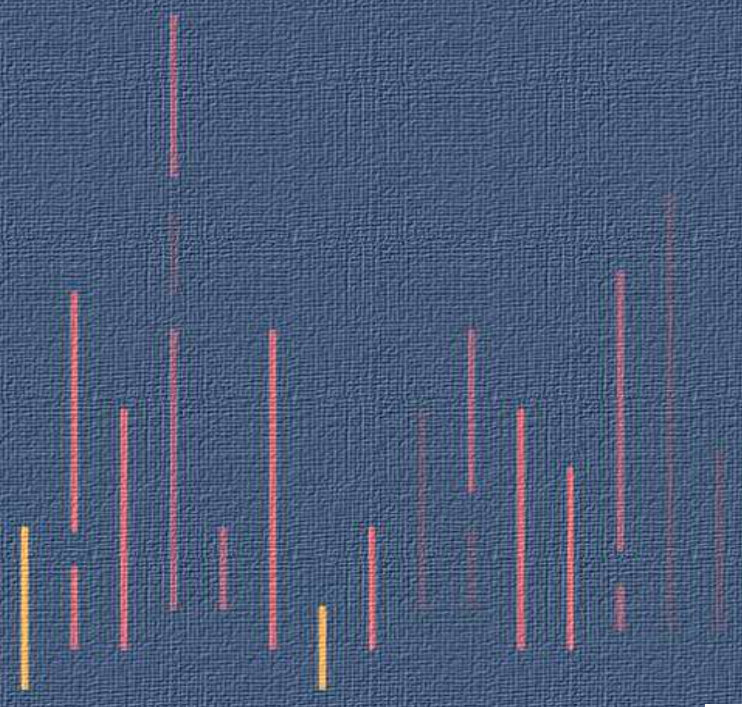
SPECIAL ISSUE

JOURNAL OF EXPERIMENTAL STUDIES

ЖУРНАЛ ЭКСПЕРИМЕНТАЛЬНЫХ ИССЛЕДОВАНИЙ
ЭКСПЕРИМЕНТАЛ ТАДҚИҚОТЛАР ЖУРНАЛИ

VOLUME II | ISSUE 3 | MAY-JUNE | 2024



ISSN: 2181-404X

IMFAKTOR
Science driven pages

Available online at www.imfaktor.com

ISSN: 2181-404X
DOI Journal 10.56017/2181-404X

ЭКСПЕРИМЕНТАЛ ТАДҚИҚОТЛАР ЖУРНАЛИ

II-ЖИЛД, 3-СОН

ЖУРНАЛ ЭКСПЕРИМЕНТАЛЬНЫХ ИССЛЕДОВАНИЙ

ТОМ-II, НОМЕР-3

JOURNAL OF EXPERIMENTAL STUDIES

VOLUME-II, ISSUE-3

ТОШКЕНТ – 2024

ЭКСПЕРИМЕНТАЛ ТАДҚИҚОТЛАР ЖУРНАЛИ

ЖУРНАЛ ЭКСПЕРИМЕНТАЛЬНЫХ ИССЛЕДОВАНИЙ | JOURNAL OF EXPERIMENTAL STUDIES

№ 3 (2024) DOI http://dx.doi.org/10.56017/2181-404X-2024-3

“Экспериментал тадқиқотлар” илмий-амалий журнали 6 та халқаро маълумотлар базаларида индексланган бўлиб, жорий йил учун UIF 2023 = 7.4 “импакт-фактор” кўрсатгичига эга. Ўзбекистон Республикаси Олий таълим, фан ва инновациялар вазирлиги ҳузуридаги Олий аттестация комиссиясининг 2023 йил 24 июлдаги 01-02/1199-сонли хатига мувофиқ ушбу журналда чоп этилган мақолалар хорижий мақолалар сифатида тан олинади.

Таҳририят манзили: Тошкент шаҳар, Учтепа тумани, “Ватан” МФЙ, Чилонзор 24-мавзеси, 2/27-уй. Почта индекси 100152. Веб-сайт: www.imfaktor.uz/com

Телефон номер: +99894-410 11 55, **E-mail:** tahririyat@imfaktor.uz

ISSN: 2181-404X
www.imfaktor.uz

ЭКСПЕРИМЕНТАЛ ТАДҚИҚОТЛАР ЖУРНАЛИ

ЖУРНАЛ ЭКСПЕРИМЕНТАЛЬНЫХ ИССЛЕДОВАНИЙ | JOURNAL OF EXPERIMENTAL STUDIES

KUCHAROV Azizbek Alisher ug‘li
Institute of General and Inorganic Chemistry of Academy of Sciences Uzbekistan, Tashkent, doctor of Science researcher

XALILOV Sanjar Usmonovich
Institute of General and Inorganic Chemistry of Academy of Sciences Uzbekistan, Tashkent, Uzbekistan, doctor of Philosophy in chemical researcher

TO‘RAYEVA Xonzoda G‘ofur qizi
Karshi State University, Faculty of Medicine, Teacher
https://doi.org/10.5281/zenodo.11170731

RESULTS OF SCIENTIFIC ANALYSIS OF COAL PROCESSING PRODUCTS

ANNOTATION

This paper investigated the total concentration of micronutrients in lignite and coals. In addition, the results of spectrum analysis of SFKM-2 with two sodium salt reagent (HR) and its complex with non-ferrous metals (Co2+ and Ni2+) (MeR) are presented.

In order to bring the quality of lignite and hard coal to the required level, it is necessary to create a method of beneficiation. One of these methods is the development and introduction of chemical processing and beneficiation technology of mined coal, and it is becoming an urgent problem to create coal production technology that meets the requirements of clean quality. Electron microscope image of 2BR-B2 Angren lignite before enrichment and its elemental composition results are also presented.

Keywords: coal, fuel, gravity, flotation reagent, coal ash content, minerals, flotation, combustion heat, chemical reagent, electron microscope, coal mine.

KO‘MIRNI QAYTA ISHLOV BERISH NATIJASIDA OLINGAN MAXSULOTLARINI ILMIY TAHLIL NATIJALARI

ANNOTATSIYA

Ushbu maqola qo‘ng‘ir tosh va ko‘mirdagi mikroelementlarning umumiy kontsentratsiyasini o‘rgandi. Bundan tashqari, SFKM-2 ning ikkita natriy tuzi reagenti (HR) va rangli metallar (Co^{2+} va Ni^{2+}) (MeR) bilan kompleksi bilan spektral tahlil natijalari keltirilgan. Qo‘ng‘ir ko‘mir va toshko‘mir sifatini talab darajasiga yetkazish uchun boyitish usulini yaratish zarur.

Bu usullardan biri qazib olingan ko‘mirni kimyoviy qayta ishlash va boyitish texnologiyasini ishlab chiqish va joriy etish bo‘lib, toza sifat talablariga javob beradigan ko‘mir qazib olish texnologiyasini yaratish dolzarb muammoga aylanib bormoqda. 2BR-B2 Angren qo‘ng‘ir toshining boyitishdan oldingi elektron mikroskopdagi tasviri va uning elementar tarkibi natijalari ham keltirilgan.

Kalit so‘zlar: ko‘mir, yoqilg‘i, flotatsiyon reagent, gravitatsiya, ko‘mirning kul tarkibi, minerallar, flotatsiya, yonish issiqligi, kimyoviy reagent, elektron mikroskop, ko‘mir manbai

РЕЗУЛЬТАТЫ НАУЧНОГО АНАЛИЗА ПРОДУКТОВ ПЕРЕРАБОТКИ УГЛЯ

АННОТАЦИЯ

В данной работе исследована общая концентрация микроэлементов в буром гните и углях. Кроме того, представлены результаты спектрального анализа СФКМ-2 с двухнатриевым реагентом (HR) и его комплексом с цветными металлами (Co2+ и Ni2+) (MeR). Для того чтобы довести качество бурого и каменного угля до необходимого уровня, необходимо создать способ обогащения.

Одним из таких методов является разработка и внедрение технологии химической переработки и обогащения добываемого угля, и актуальной задачей становится создание технологии добычи угля, отвечающей требованиям чистого качества.Представлены также электронно-микроскопическое изображение ангренского бурого угля 2БР-Б2 до обогащения и результаты его элементного состава.

Ключевые слова: уголь, топливо, гравитация, зольность угля, минералы, флотация, теплота сгорания, химический реагент, электронный микроскоп, угольная шахта

Introduction

Nowadays, the world’s leading scientific research centers are conducting scientific research in the direction of creating economically effective technologies of coal enrichment and creating a new generation of reagents used in these technologies [1].

In this regard, the selection of suitable raw materials for demineralization of coal with a high ash level [2]; to determine the technological mode of reducing water consumption in the technologist [3]; development of alternative conditions of gravity and flotation processes; determining the flotation ability of the obtained flotation reagents [4]; scientific substantiation of the possibility of using technological waste as secondary raw materials [5]; it is necessary to develop the technology of beneficiation of unusable coal based on local raw materials.

Currently, there are small oil reserves in the Republic of Uzbekistan, and the volume of production does not meet the needs of all sectors of the national economy [6]. In this regard, there was a need to develop new methods of obtaining alternative fuel by processing coal resources located on the territory of the republic [7], [8].

As a result, coal became the most important source of energy needed for the development of industry and transport in a short time to meet the energy needs of the society [9]. Lignite 2BR-B2 and 2BOMSh-B2 brands, which have 1 million tons of reserves in the Angren coal mine in Uzbekistan, remain unusable due to poor quality and low combustion heat, and this issue is becoming an urgent problem [10].

Therefore, the aim of the research is to develop low-cost and high-efficiency beneficiation methods for high-ash coals [11], [12].

For the last 30 years, the global energy supply generally falls into nuclear, hydro, wind, solar, biofuels and waste, natural gas combustion, coal combustion, and oil combustion [13].

Although clean energy (nuclear, hydro, wind, solar, biofuels, and waste) draws more and more attention considering environmental problems, fossil fuels (oil, natural gas, and coal) accounts for around 80% of the energy supply around the world due to high heat value and low costs, implying that the consumption of fossil fuels will stay high for quite a long time [14], as shown in Fig. 1.

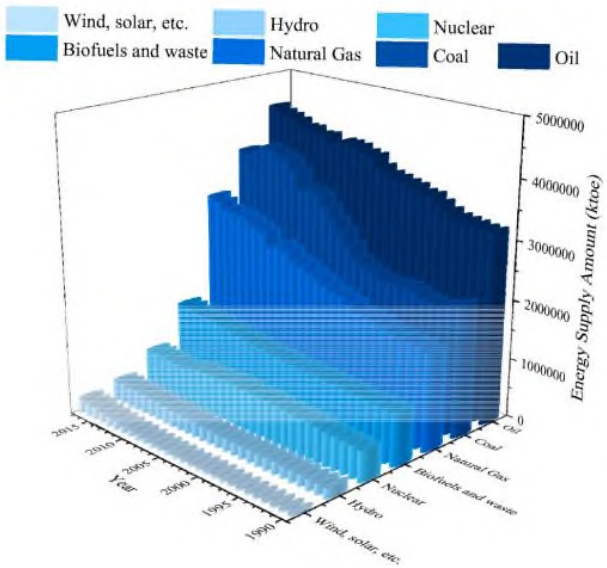


Figure 1. Current global energy supply ratio (IEA, 2019a)

It would be desirable to develop cheap and highly efficient methods of beneficiation of high-ash coals. It is through beneficiation of coal that the raw material can be turned into a commercial product that can compete with oil and gas in the organic energy market. This allows to expand the use of coal, because enrichment removes slag and ash from the fuel, improves the quality of coal, which is more economical for the consumer and prevents environmental pollution. It refers to the requirements for the quality of coal by foreign consumers. Thus, today in all industrialized countries from 70% to 90% of all mined coal is enriched, in particular in Germany - 95%, in Great Britain - 75%, in the USA - 55%. In particular, the world leaders in coal enrichment are South Africa and Australia, where exported coal is 100% enriched [15].

Experimental

Method of determination: 2 ml of sulfanol and SFCM-1 reagent solution, 5 ml of universal buffer solution pH=6.0, 50 μg/ml Ni(II) solution was taken in a flask and mixed with distilled water and brought up to the mark. The light absorption spectrum of the resulting new complex compound was measured in a spectrophotometer "UV-1800" using standard quartz and glass cuvettes with a thickness of 1-1.0 cm compared to the reference solution. of the reagent swallowing spectrum while distilled to water relatively received. The results are presented in Figure 1. In this given swallowing spectrum according to sulfanol and SFCM-1of the disodium salt reagent Ni (II) complex maximum optical density light swallow branch l_{comp} = located at 550 nm, 2,4-dinitro- sulfanol and SFCM-1 disodium salt reagent maximum optical density light swallow lower wave length in the field ie Observed at λ_{nm} =440 nm ($\Delta\lambda$= 110 nm). Harvest has been complex don't join the highest optical density from the value using (l=550 nm in sphere) (ε) molar turn off coefficient ε_k value using the following formula determined:

$$\varepsilon_k = A/C*l = 43500$$

Here: $\varepsilon_{k\text{-of}}$ the beam molar turn off coefficient;
C- of nickel (II). concentration (mol /l);
l- absorbing layer thickness (cm);
A- complex don't join comparison solution relatively measured optical density value.

Work developed of the method Sendel according to sensitivity indicator μg /cm^2 in units of 0.001 light swallowing using the following formula is:

$$С.б.с \quad \frac{Q \cdot l \cdot 0{,}001}{A \cdot 25} = \frac{40 \cdot 1{,}0 \cdot 0{,}001}{0{,}435 \cdot 25} = 0{,}00367 \text{mkg/sm2}$$

Sendel according to sensitivity values was determined. Received analysis from the results so to the conclusion to arrive possible reaction somewhat to contrast (l= 110 nm) and average has sensitivity (SBS 0.00367 μg /cm$^{2)}$.

Results and discussion

After the coal processing process the obtained minerals are dissolved with non-ferrous metals and surfactants in the solution and it optical density results analyzed.

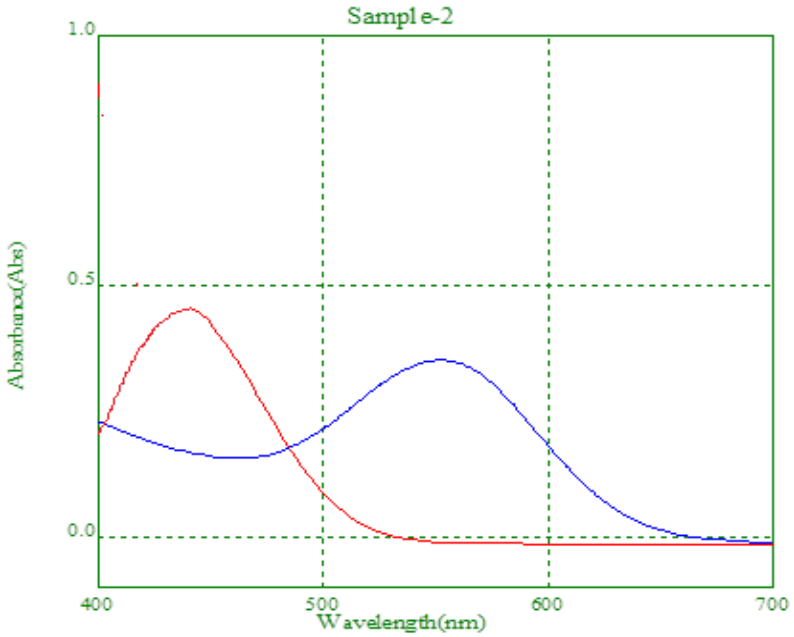


Figure 2. SFKM-2 is prepared by disodium salt reagent (HR) and his colorful metals (Co $^{2+}$ and Ni $^{2+)}$ with spectrum of the complex (MeR)

After the coal processing process the obtained minerals are dissolved with non-ferrous metals and surfactants in the solution to the situation past colorful metals and in solution surface active substance and with him mutually harvest did complex light repetition in a spectrophotometer was measured results the following in the picture presented (Fig. 1).

When the absorption spectra of the organic reagent in solution and the absorption spectra measured after immobilization on a solid fibrous sorbent were compared, the results were observed to be identical.

Table 1

Spectral description of complexes formed by nickel (II) ion

Complex color	**pH**	**l, HR nm**	**l, MeR**	**Mr**	**Ni $^{2+}$ μg**	**S Co $^{+}$, Mol/ l**	**A**	**Sendel according to sensitivity μg / cm^2**
Light red	6.0	440	550	110	50	2, 62 ·10 $^{-5}$	0, 435	0.0 0367

So, after the coal processing process the obtained minerals are dissolved with non-ferrous metals and surfactants in the solution and in solution surface active substance and with him mutually harvest ion is stable complex harvest to do also work developed method high sensitivity have that let's see can.

Scanning electron microscope (SEM) analysis

Morphological studies and elemental composition of the substance were carried out using SEM-EVO MA 10 (Zeiss, Germany) scanning electron microscopy. In the sample prepared for the analysis, the non-ferrous metals and the surface active substance in the solution and the complex that interacted with the dissolved non-ferrous metals contained in the minerals extracted during coal processing were placed in the medium and taken after 5 minutes. ngra was examined under a scanning electron microscope.

The results are presented in Figures 2 and 3.

The condition of the surface of Angren lignite of 2BR-B2 brand, obtained before enrichment and as a result of enrichment, was studied using an electron microscope. From the electron microscope images obtained during the study, it was found that the surface of Angren lignite before enrichment is flat because the pores on the surface are not opened (see Figure 3).

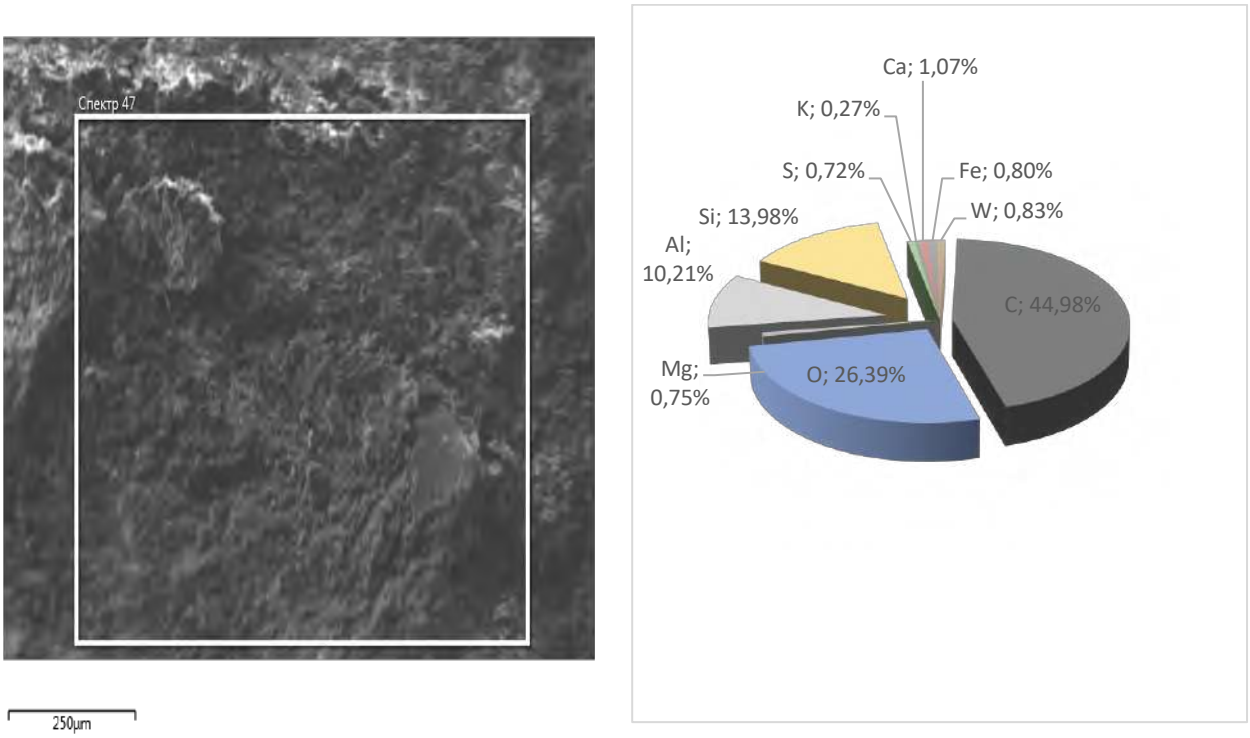


Figure 3. Electron microscope image of 2BR-B2 Angren lignite before enrichment and its elemental composition

SEM analysis shows that in the samples before enrichment, the surface of the coal part is not clear in the image due to the inclusions in the Angren lignite brand 2BR-B2. It is known from the composition of elements that the amount of carbon is 45%, aluminum is 10% and silicon is 14%. It can be seen that the content of silicon and aluminum is high and the content of carbon is low.

In the research work, Angren lignite was treated by various physical, mechanical and chemical methods, and the surface of the coal samples was observed under an electron microscope.

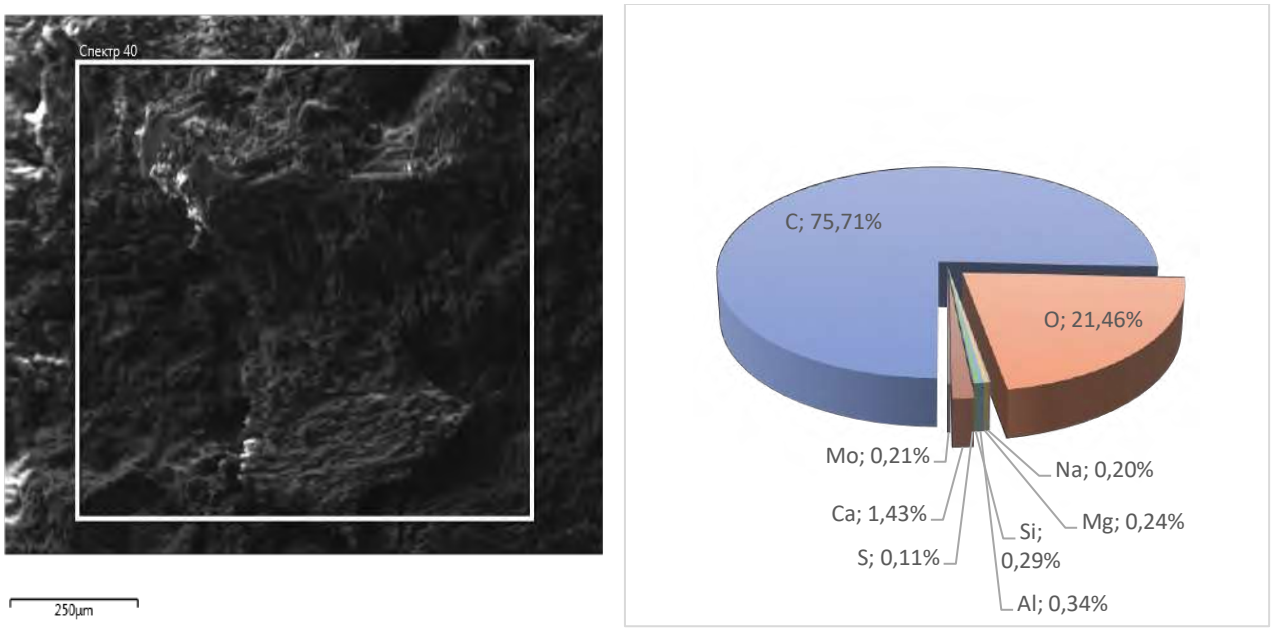


Figure 4. Electron microscope image of 2BR-B2 Angren lignite after enrichment and its elemental composition

From the obtained results, it can be said that Angren greatly improves the surface morphology of lignite, that is, it significantly reduces the flatness (see Figure 4). This is because Angren forms pores on the surface of lignite and removes excess substances. As a result, the combustion of Angren lignite is improved. For lignite used as a solid fuel, an important indicator is the heat of combustion and the level of ash. Therefore, by reducing the level of ash and increasing the heat of combustion, quality coal is obtained.

The 0-30 cm fractional samples of lignite 2BR-B2 and 2BOMSSh-B2 located in the Angren coal mine of Uzbekcoal OJSC were enriched in the created pilot equipment. For this, the coal samples were first injected with water under pressure and passed through a vibrating screen. Vibrating screens consists of 0.3-1.0 cm sieve, 80 cm wide and 100-120 cm tall.

When water is pumped into the vibrating screen under pressure, the mineral content and small fractional coal from the coal pieces are mixed and fall into the gravity drum. Surface-active substance (SAS) is added to the coal and mineral fraction falling into the gravity drum and mixed at low speed 18-25 times per minute.

The resulting suspension is separated into two parts and the heavy part settles. The coal is mixed with water and transferred to the flotation reactor in the state of suspension. At this stage, the coal is divided into classes depending on the size of the coal particles and the presence of mineral additives. The basis of the method of gravity enrichment of coal is a method based on the separation of coals based on the difference from each other due to the density and speed of movement of various particles in air or water. But through a small suspension, the mineral part can be swallowed with a small amount of liquid. To avoid this, secondary enrichment by flotation is more effective.

The flotation method is based on the properties of mineral particles: at this stage, based on water and surfactants, coal adheres to the surface of air bubbles, heavy parts sink to the bottom. Special machines (pneumatic, mechanical or mechanopneumatic) are used to enrich coal with this method (see Figure 5).

Pulp, that is, a suspension of coal and water is loaded into the device, air bubbles are sent from the bottom through the barbatage through the flotation reactor - surfactants form a foamy emulsion, and only coal grains stick to them. The heavy part sinks to the bottom of the flotation reactor and the waste is separated through the bottom tap.

Figure 5. A pilot plant designed for beneficiation of coal

The efficiency of the process depends on the properties of the flotation agents used. Flotation agents create favorable conditions for flotation of enriched coal particles. As a flotation agent in the enrichment process, collectors and foaming agents are used together as a complex reagent.

Foam formers are organic surfactants that form an adsorption film on the outer layer of the foam and increase the stability of the foam. Collectors are organic substances whose molecules are composed of non-polar (hydrocarbon) and polar (carboxyl, hydroxyl, etc.) parts. These substances are adsorbed on the surface of coal with their polar part and dramatically increase the hydrophobicity of coal. As a result, hydrophobic coal particles accumulate on the surface of the bubbles and float to the surface of the liquid. The resulting concentrate is separated and dried.

Angren lignite grade 2BR-B2 had a mineral content of 52% before beneficiation (see Figure 5). The amount of minerals when enriched with water on the first stage sieve was 25.7%. The size of the fraction is between 3-100 mm and the moisture content is 27-35%. After the second stage gravity drum enrichment, the amount of minerals was 30.9%. Moisture was 26.5% after filtering the coal samples. the amount of minerals decreased to 25.7% and the moisture content was 24-30% when enriched in the third stage flotation reactor. The coal suspension is filtered and dewatered in a simple way.

Conclusion

The physico-mechanical properties and chemical composition of lignite were studied, the main parameters of beneficiation and optimal conditions for demineralization in an aqueous environment were determined. Factors affecting the heat of combustion were studied.

On the basis of the developed technology, for the first time, Anrgen lignite with an ash level of 50-55% was reduced to 20-30%, as a result, the combustion heat was increased from 1500 kkal to 7000 kkal.

Optimum conditions for acceleration of the gravity process were determined, where 18 rotations per minute and enrichment of 100 kg of coal in 300 l of water for 20 min were determined.

As a flotation reagent, a new composition was created on the basis of sulfanol, which was created on the basis of local raw materials. It was found that the optimal conditions of use during the enrichment process are to use 50 ml of the composition for 20 min.

REFERENCES. СНОСКИ. ИҚТИБОСЛАР.

1. Худойбердиев, Д. And Кўчаров, А. 2023. Педагогик Техника Асосида Кимё Фанини Ўқитишнинг Илмий Тадқиқи. *Journal of Pedagogical and Psychological Studies*. 1, 7 (Jul. 2023), 3–7.

2. Xursandov, Bobomurod, et al. "Study of changes in the physical and mechanical properties of sulfur asphalt concrete mixture based on polymer sulfur." *AIP Conference Proceedings*. Vol. 3045. No. 1. AIP Publishing, 2024.

3. Qurbonov, Azizjon, Azizbek Kucharov, and Farxod Yusupov. "Development of a technology for obtaining an anti-corrosion coating for gas pipelines." *AIP Conference Proceedings*. Vol. 3102. No. 1. AIP Publishing, 2024.

4. Султонов, Садулла. "Нордон Газлардан Олтингугурт Ажратиб Олиш Учун Кўмирни Бойитиш Натижасида Ҳосил Бўладиган Технологик Чиқиндилар Асосида Катализатор Олиш Технологиясини Ишлаб Чиқишнинг Илмий Асослари." *The Journal Of Research And Development* 1.3 (2024): 29-34.

5. Yusupov, Farxod, et al. "Development and study of adsorption properties of a new sulfur polyvinyl chloride cation exchanger for water treatment." *IOP Conference Series: Earth and Environmental Science*. Vol. 1231. No. 1. IOP Publishing, 2023.

6. Ko'charov A., Yusupov, F., & Yaxshieva, Y. (2023). Ishlab Chiqilgan Polimer Holatidagi Adsorbentni Fizik Kimyoviy Tahlil Natijalari. *Journal of Research and Innovation*, *1*(8), 39–46. Retrieved from https://imfaktor.com/index.php/jorai/article/view/616

7. Kocharov, A. A., et al. "Scientific Analysis of the Ecological Condition of the Soils Around the Angren Coal Mine." *International Congress on Biological, Physical And Chemical Studies*. 2024.

8. Халилов, Санжар, And Азизбек Кўчаров. "Кўмир Таркибидаги Рангли Ва Қора Металларни Экологияга Таъсирини Илмий Тадқиқи Натижалари." *Journal of Experimental Studies* 1.3 (2023): 8-12.

9. Саидмуродов, Рашид, And Фарход Юсупов. "Ишлатилган Цеолитларни Термик Ишлаш Орқали Табиий Газни Қуритиш Жараёнига Боғлиқлигини Таҳлили Натижалари." *Journal of Experimental Studies* 1.4 (2023): 1-9.

10. Ko'charov, A., Yusupov, F., & Nuriddinova, D. (2024). Ishlab Chiqilgan Ionitdagi Adsorbsiya Kinetikasi Va Adsorbsion Izotermalarning Ilmiy Tadqiqi Natijalari. *News of Uzmu Journal*, *3*(3.1), 397-401.

11. Xursandov, B., Kucharov, A., & Yusupov, F. (2024). Polimerlar Hamda Boyitilgan Ko'Mir Namunalari Asosida Sintez Qilingan Sorbentlarning Ilmiy Tahlil Natijalari. *Journal of Research and Innovation*, *2*(3), 75-81.

12. Юсупов, Фарход Махкамович, et al. "Улучшение качества бурых углей марки 2бр-в2 и 2бомсш-62 с помощью химической обработки." *Universum: технические науки* 3-2 (72) (2020): 43-46.

13. Хурсандов, Бобомурод Шухратович, Азизбек Алишер Угли Кўчаров, and Фарход Махкамович Юсупов. "исследование свойств сернистого битума, полученного на основе модифицированной полимерной серы." *Universum: технические науки* 12-6 (105) (2022): 21-25.

14. Юсупов, Фарход Махкамович, et al. "Свойства сферических гранул на основе оксида алюминия." *Universum: химия и биология* 3-1 (69) (2020): 59-63.

15. Kucharov, Azizbek, et al. "Development of technology for water concentration of brown coal without use and use of red waste in this process as a raw material for colored glass in the glass industry." *E3S Web of Conferences*. Vol. 264. EDP Sciences, 2021.

ISSN: 2181-404X
DOI Journal 10.56017/2181-404X

ЭКСПЕРИМЕНТАЛ ТАДҚИҚОТЛАР ЖУРНАЛИ

II-ЖИЛД, 3-СОН

ЖУРНАЛ ЭКСПЕРИМЕНТАЛЬНЫХ ИССЛЕДОВАНИЙ

ТОМ-II, НОМЕР-3

JOURNAL OF EXPERIMENTAL STUDIES

VOLUME-II, ISSUE-3

«Экспериментал тадқиқотлар» электрон журнали 2022 йил 22 декабрь куни № 054835-сонли гувоҳнома билан оммавий ахборот воситаси сифатида давлат рўйхатидан ўтказилган.

Муассис: «**IMFAKTOR Pages**» масъулияти чекланган жамияти.

Таҳририят манзили: 100152, Тошкент шаҳри, Учтепа тумани, “Ватан” МФЙ, Чилонзор 24-мавзеси, 2-уй.

Телефон номер: +99894-410 11 55

Эл. почта: tahririyat@imfaktor.uz

Веб-сайт: www.imfaktor.uz