EMJ MS
EUROPEAN MULTIDISCIPLINARY JOURNAL OF MODERN SCIENCE
ISSN 2750-6274 https://emjms.academicjournal.io Volume: 16 | Mar-2023

Physical-Mechanical Properties and Chemistry Study of Brown Coal

Namazov Sunnat Zokirovich
Senior Lecturer of the Department «Metallurgy», Navoi State University of Mining and Technology, Uzbekistan, namozov.s@inbox.ru

Doniyarov Nodirjon Abdihakimovich
Prof. Dean of the Chemical and Metallurgical Faculty of the Navoi State University of Mining and Technology, Uzbekistan, ndoniyarov@mail.ru

Abstract: Currently, coal is one of the main fuels for industry, the national economy and thermal power plants. Coal is a solid fuel that must contain enough heat to make it economically profitable to use, as well as in the incineration of which no man-made waste is released. In this work, the physical and mechanical properties and chemical composition were studied, as well as the microscopic analysis and enrichment of high ash coal by gravity method, which is mined in «Angren» section. Man-made waste that is not recycled after the use of coal causes damage to the environment by clogging it, but do not forget that this waste reduces the calorific value of the fuel. Thus, coals containing various impurities do not provide effective calorific value, which increases economic costs as well as reduces our natural wealth.

Keywords: Brown coal, coal density, mechanical strength, chemical composition, gravimetric and photocolorimetric analysis.

Introduction. Hard and brown coal play an important role in the world's energy system. According to the literature, coal reserves account for 90-97% of the total fossil fuel resources of the earth, while oil and gas account for only 3-10% [1]. The Republic of Uzbekistan has proven reserves of 1,890 million tons of coal, including brown. 1,843 million tons. Stone - 47 million tons. Total. Projected resources are about 5 billion tons. Including stone - 1 billion tons. [2].

The coal industry is one of the priority industries in the energy sector worldwide. Coal accounts for 29% of world fuel and energy consumption. The main centre of coal consumption is in China - 3.8 billion tons (or 49% of total coal consumption) and India - 0.95 billion tons (or 12%). Other major coal consumers include the U.S. 0.8 billion tons (10%) and the EU 0.73 billion tons (more than 9%) [3].

Currently, in the creation of efficient technologies in the fuel and energy industries, special attention is paid to research and development of technologies, In this regard, the Working Group agreed that the Working Group should continue its consideration of this item.

Uzbekistan has explored 1,900 million tons of coal, including: brown -1,853 million tons, stone - 47 million tons. Estimated resources are over 5.7 billion tons of coal. Large reserves of hard coal are concentrated in the southern regions of Surkhan Darya and Kashkadarya regions. There are currently three coal mines fields: Angren brown coal field, Shargun and Baysun stone coal deposits.

In Uzbekistan, coal is consumed on the domestic market to ensure consumers in the national economy, power plants and coke plants.

Currently in the Republic, the processing and enrichment of coal for industrial use is an urgent problem. Issued Decrees of the President of the Republic of Uzbekistan «Deepening of economic reforms in the energy sector of Uzbekistan» from 22.02.2001. on increasing the share of coal use in the fuel and energy balance of the economy of the Republic and the Cabinet of Ministers of Uzbekistan On the measures for the implementation of the first stage of re-equipment of the coal industry of the RUZ 203 from 02.05.2001, The Investment Program of the University for 2002 457 of 22.11.2001. Timely [4].

As part of the implementation of measures for the further comprehensive development and improvement of the coal industry in the Republic of Uzbekistan, a presidential decree was issued for the further development of coal industry enterprises, ensuring faster implementation of priority and infrastructure investment projects, Increase the production and supply of coal and coal products, taking into account the projected future demand for the needs of the economic, social and population sectors for the period 2020-2024 [5].

In many cases, the coal produced does not meet the requirements of consumers for the main qualitative indicators: ash, humidity, calorific value and sintering properties. Improvement of the quality of coal raw materials at the present stage is possible only with the use of enrichment methods, which will make it possible to obtain high-quality coking and energy coals, which are in demand on both domestic and foreign markets [6].

Currently, gravitational and flotation enrichment methods are used for coal enrichment. It follows from practice that the enrichment of coal with difficult and very difficult enrichment of the heavy medium as well as the coal of light and medium enrichment is done by depositing machines. When heavy-duty hydrocyclones are used, the magnetite suspension is regenerated, which can cause high costs [7]. Enrichment in suction machines and spiral separators is characterized by low efficiency of thin sludge. The flotation method [8] is most effective for their enrichment.

In view of the above, the aim of this paper was to study the physical and mechanical properties and chemical composition of the coals of the Angren deposit.

Research methods and results. The paper coals of 2BR-B2 and 2BOMSH-B2 of Angren field were used as the research object.

The article uses modern and classical methods of research, allowing to determine physical and mechanical properties and chemical composition of coals, as well as methods of research according to the State Statistical System.

The study determined the density, bulk density, mechanical strength, ash content, humidity and sulfur content of 2BR-B2 and 2BOMSH-B2, and analyzed their chemical composition and microscopic analysis.

The density of coal is its mass to volume ratio. The true density is the quantitative expression of the ratio of the body’s weight, which is devoid of air and water, to its volume [9]. The actual density of the 2BR-B2 and 2BOMSH-B2 coals was determined and the following results (Table. 1) were obtained.

Table 1 Actual coal density

Coal grade	Density, kg/m^3
2BR-B2	1180-1340
2BOMSH-B2	1230-1570

Bulk density is determined by the quantity ratio of the latter to the volume filled with a free or compressed filler, i.e. in a cup, wagon, bunker or other packaging. It varies over a very wide range and depends on the density, same size, screen composition and coal humidity.

The results of bulk density determination of 2BR-B2 and 2BOHMS-B2 are shown in Table 2.

Table 2 Bulk coal density

Coal grade	Bulk density, kg/m^3
2BR-B2	688-830
2BOMSH-B2	710-770

The mechanical strength of the coals is characterized by crushing, fragility, hardness, temporary compression resistance, and thermal stability (for anthracites). The overall index is mechanical strength. It is found by breaking samples of coal with a particle size of 13 to 100 mm in a rotating closed drum. At the end of the specified grinding time, the remaining unexposed mass of the parts (accuracy above the lower limit of the test class) shall be determined. For the respective sorted coal grades, expressed as a percentage of the mass loaded on the drum, the output of the latter is an indicator of mechanical strength.

The greatest mechanical strength is anthracites, the smallest - brown and bituminous coals (F, K, OS) in the middle stage of metamorphism. Mechanical power determines the composition of the coal mined, changes in its transportation, storage and enrichment processes, and the formation of sludge, influences the choice of processes and enrichment schemes. The mechanical strength of the coals shall be determined according to GOST 15490-70 [8]. The mechanical abrasion strength of 2BR-B2 and 2BOMSH-B2 coals has been determined, the results of which are shown in table 3.

Table 3 Mechanical strength of coals

Coal grade	Mechanical strength, %
2BR-B2	0,2-5,9
2BOMSH-B2	0,7-9,2

To determine the chemical composition of the original brown coal sample, an integrated approach was used, which included gravimetric, complexonometric titration and photocolorimetric analysis. The results of the chemical analysis are presented in table 4.

Table 4 Brown coal chemistry of 2BOMSW-B2 grade

Sample name	Content in original sample, %.							
	Fe_{total}	C_{total}	C_{org}	S_{total}	S_S	SiO_2	Al_2O_3	TiO_2
Original coal sample	2,1	26,8	26,3	1,2	0,47	33,1	11,6	0,42
	Fe_2O_3	CaO	MgO	Na_2O	K_2O	P_2O_5	MgO	A^d_{ash}
	3,00	1,47	0,60	0,15	1,25	0,08	3,00	54,5

Conclusion. According to the chemical analysis, the use of enrichment processes is required to remove the non-combustible part of the coals. Based on the chemical analysis data, further research on the enrichment of the Angren 2BR BOMSH drill coal field is planned to be carried out at each size class using an individual approach, because the difference in size does not allow for one specific enrichment method.

Bibliography:

1. Belovolov V.V., Bochkov Yu.N., Davydov M. In Technology and technology of coal enrichment. - M.: Science, 1995. - 622 p. (in Russian).
2. Vasiliev V.P., Morozova R.P., Kochergina L.A. Workshop on analytical chemistry: Training Manual for Universities. - M.: Chemistry, 2000. - 328 p. (in Russian).
3. Coal Information 2000-2018 // International Energy Agency Statistics, OECD/IEA, 2018.
4. Rakhmonov H.G., Tilloev L.I., Hayitov R.R. Determination of physical-mechanical properties and chemical composition of coal of Angren deposit // Universum: Technical Sciences: Electron. Scientific. Zhurn. 2019. 12 (69). (in Russian).
5. Resolution of the President of the Republic of Uzbekistan PP-4234 of 07.03.2019 «On measures for further complex development and improvement of the coal industry of the Republic of Uzbekistan». (In Uzbekistan)
6. Doniyarov N.A., Namazov S.Z., Zhumaev M.K. Exploring the possibility Enrichment of high ash coal from the «Angren» section by gravity method // Universum: Technical Sciences: Electron. Scientifically. zhurn. 2020. 11(80). (in Russian).
7. Klein M.S., Vahonina T.E. Technology of coal enrichment: study. manual. Kemerovo, 2011. P. 63-80. (in Russian).
8. Fomenko T.G., Butovetsky V.S., Pogartseva E.M. Coal enrichment research. M.: Nedra, 1978. P. 175-183. (in Russian).
9. Hayitov R.R., Narmetova G.R. (2016). Activated coals from local raw materials for the regeneration of alkanolamine purification of natural gas instead of sorbent AG-3. The world of oil products. Bulletin of oil companies, (11), 23-26. (in Russian).