3.Випробування на займистість у замкнутому просторі

<table>
<tr><td colspan="4">Початкова маса розпилювача, г</td></tr>
<tr><td>Розпилювач 1</td><td colspan="2">Розпилювач 2</td><td>Розпилювач 3</td></tr>
<tr><td>434</td><td colspan="2">435</td><td>435</td></tr>
<tr><td colspan="4">Початковий внутрішній тиск у розпилювачі, Мпа</td></tr>
<tr><td>Розпилювач 1</td><td colspan="2">Розпилювач 2</td><td>Розпилювач 3</td></tr>
<tr><td>3,5</td><td colspan="2">3,5</td><td>3,5</td></tr>
<tr><td colspan="4">Початкова швидкість вивільнення вмісту г/с</td></tr>
<tr><td>Розпилювач 1</td><td colspan="2">Розпилювач 2</td><td>Розпилювач 3</td></tr>
<tr><td>2,36</td><td colspan="2">2,36</td><td>2,36</td></tr>
<tr><td>Температура 20°C</td><td colspan="3">Відносна вологість 65%</td></tr>
<tr><td>Фактичний об’єм камери, 200 л</td><td>Розпилювач 1</td><td>Розпилювач 2</td><td>Розпилювач 3</td></tr>
<tr><td>Початковий рівень наповнення,%</td><td>80</td><td>80</td><td>80</td></tr>
<tr><td>Тривалість вивільнення вмісту до досягнення займання, сек.</td><td>32</td><td>32</td><td>32</td></tr>
<tr><td>Маса аерозолю, розпиленого під час випробування, г</td><td>56,32</td><td>57,02</td><td>56,93</td></tr>
<tr><td>Часовий еквівалент (t_{eq}), за якого відбувається займання в 1 м-3
$t_{eq} = \frac{1000 \text{* час вивільнення аерозолю (с)}}{\text{фактичний об’єм камери (дм}^3\text{)}}$</td><td>170,98</td><td>170,98</td><td>170,98</td></tr>
<tr><td>Густину дефлаграції (D_{def}), за якої відбувається займання
$D_{def} = \frac{1000 \text{ * кількість розпиленого аерозолю (с)}}{\text{фактичний об’єм камери (дм}^3\text{)}}$</td><td>291,81</td><td>295,44</td><td>294,97</td></tr>
</table>

Висновок**:**у відповідності до п.1.11.1 - 3) - в) аерозольний розпилювач класифікується як незаймистий.

Conducting tests to determine the category of an aerosol sprayer

Kuzin Dmytro, LCC " Technikal spray"

Artificial aerosols are widely used in many areas of human activity: in the chemical, food, perfumery and cosmetic, construction industry, medicine, agriculture, etc., due to their high efficiency.

***Key words**: aerosol sprayer, heat of combustion*

УДК 662.74:537.311

IMPROVING THE ELECTRICAL RESISTIVITY OF BLAST-FURNACE COKE

Valentine Koval[1] , Denis Miroshnichenko[2], Yevhen Soloviov[3]
[1]*Coal Department State Enter prise "Ukrainian State Research Institute for Carbochemistry (UKHIN) Kharkiv, Ukraine e-mail:* kovalen79@gmail.com
[2]*The Department of Oil, Gas and Solid Fuel Refining Technologies National Technical University «Kharkiv Polytechnic Institute»* Kharkiv, Ukraine *e-mail:*dvmir79@gmail.com
[3]*The Department of Oil, Gas and Solid Fuel Refining Technologies National Technical University «Kharkiv Polytechnic Institute» Kharkiv, Ukraine* yevhen.soloviov@ihti.khpi.edu.ua

The study examines the impact of petroleum coke on coal charges and blast furnace coke quality. Four charge variants with different coal concentrate and petroleum coke contents were analyzed. Adding 5% petroleum coke increased coke structure orderliness and nanostructures while boosting gross coke output by 1.3-1.4%. However, it raised sulfur content (0.12-0.14%) and reduced ash content (0.3-0.4%), while slightly worsening mechanical properties, reactivity, structural strength, abrasive hardness, and electrical resistance. The use of "Svyato-Varvarynska" coal improved coke quality, whereas its lower share in the charge led to a significant decline.
Keywords *— Coal charges, blast furnace coke, concentrates, petroleum coke, electrical resistivity, quality indicators.*

Due to the fact that the carbon structure of coke contains nanomaterials - nanotubes, fullerenes, etc., coke can be used to obtain anodes for the electric arc synthesis of nanotubes from it. It is also possible to extract natural fullerenes in the form of nanodispersed aqueous compositions or extracts. It is also possible to obtain suspensions that, without additional processing, can be used as micro impurities in construction and paint materials. So, for example, micro impurities of about 0.005% obtained from dust collected during coke production strengthen the cement stone by 1.8 times after adding them to the cement mortar. The purpose of this study was to establish the effect of adding petroleum coke on the quality of coal charges and on the quality of blast furnace coke obtained from them. For this purpose, we investigated the coal that forms the coking base of the main coke-chemical enterprises of Ukraine.

The lower current electrode is inserted into the measuring channel of the matrix and a measured amount of tested coke powder weighing (3,000±0,007) g is carefully poured into the channel through the funnel. After that, the upper current electrode is inserted into it. The measuring matrix is installed on the support of the jack between the support surfaces of the press and the U-shaped bed. At the same time, the cylindrical heel of the lower current electrode must be in the socket of the reference contact. After installing the matrix in the press, tighten the screw of the jack, make several swings with the handle of the jack until the upper current electrode rests against the bed. 3 together with the installation instructions, assemble the block diagram of the device for measuring the electrical resistance of coke powder. The handle of the hydraulic press is used to raise the rod to the "caliber" stop in the upper base of the press. The endurance of the sample under pressure is determined by the time during which the measurements show SER values that practically do not change. For analytical coke powders, the indicated holding time is from 1 to 2 minutes. The measurement results are recorded in a logbook with an indication of the characteristics of the sample. Cleaning the channel of the matrix from pressed powder is carried out by pressing it with a ramrod made of wood or plastic. A metal ramrod can damage the textolite channel of the matrix, it is necessary to clean the channel with the help of a hair-trimmer.

Research of components of charges.

Initially, the components that were part of the coal charge (Haju, brand "DG"; CPP "Dobropilska", brand "G (G1)"; CPP "Myrnogradska", brand "G(G2)"; CPP "Svyato-Varvarynska", brand "K") were tested by the methods of technological (W^r, A^d, S^d_t, V^{daf}), plastometric (X, Y) and petrographic (R_0, petrographic composition) analyses. The obtained data are presented in the tables I and II.

Table I.

Technological properties of components of coal blends

Component	Grade	Proximate analysis, %				Plastometric indexes, mm	
		W^a	A^d	S^d_t	V^{daf}	X	Y
Haju	DG	2.2	5.4	1.40	40.2	48	9
CPP "Dobropilska"	G (G1)	1.7	4.4	1.31	38.1	44	16
CPP "Myrnogradska"	G (G2)	1.1	6.2	1.35	38.7	38	16
CPP "Svyato-Varvarynska"	K	1.4	8.6	0.67	28.4	25	15
Petroleum coke		0.7	0.6	4.13	12.9	Not defined	

Coking

Coking was carried out in a 5-kg laboratory furnace designed by Ukhin State Enterprise The condensed methodology is as follows. A metal chamber (retort) with a width of 150 mm, a length of 270 mm, and a height of 300 mm was filled with a coal charge weighing 4.5–5.0 kg, the grinding of which was adjusted to 80% of the content of the grade less than 3 mm, moisture content to 8%, and bulk density ~800 kg/m^3. After that, the retort was loaded into an electric furnace preheated to 1100 °C. Upon reaching a temperature equal to 950 ± 10 °C in the loading center, the research was stopped.

The duration of the experiment was 2 hours 50 minutes - 3 hours. Coke was quenched by the dry method, after which its output was determined.

The obtained coke was subjected to destructive forces for the realization of cracks by dropping it 4 times from a height of 1 m onto a metal plate, after which the coke was subjected to screening (calibration) on sieves with round holes with a diameter of 70, 60, 50, 40, 25 and 10 mm. Based on the results of screening, the yield of individual size classes was calculated.

Coke larger than 25 mm after dumping was subjected to destruction in a 4-section drum.

To do this, all the coke was divided into 4 equal portions. The weight for each portion was calculated taking into account the ratio of size classes in coke larger than 25 mm after reset. The weight of each portion ranged from 790 to 800 g. Each portion was loaded into a separate section of the drum and tested simultaneously with the others. After scrolling 300 complete revolutions of the drum at a rotation speed of 45±1 rpm, the drum was unloaded. Coke from each section was screened on round sieves with hole diameters of 25 and 10 mm. The yield of coke greater than 25 mm, which characterizes the coke grindability index (M_{25}), and the grade yield of less than 10 mm, which characterizes the attrition index (M_{10}) of coke, was determined.

The table VIII presents the gross yield of coke, parameters of its mechanical (M_{25}, M_{10}) and (SS) structural strength, abrasive hardness (AH), as well as technologica analysis data (A^d, S^d_t, V^{daf}), and specific electrical resistance (SER) of coke, which were determined after coking.

Bibliographic list

1. R. Sakurovs, M. Grigor, A. Sokolova and Ya. Mata “Effect of high temperature on nanopores in coke,” Fuel, vol. 334 (2), pp. 126821,- 2023. https://doi.org/10.1016/j.fuel. - 2022.126821

2. Hb. Zhu, Wl. Zhan, Zj. He “Pore structure evolution during the coke graphitization process in a blast furnace,” Int J Miner. Metall., vol. 27, pp. 1226–1233, 2020. https://doi.org/10.1007/s12613-019-1927-1

УДК 661.9

ВИПРОБУВАННЯ ЩОДО ВИЗНАЧЕННЯ ВІДСТАНІ, НА ЯКІЙ ВІДБУВАЄТЬСЯ ЗАЙМАННЯ АЕРОЗОЛІВ, ЩО РОЗПИЛЯЮТЬСЯ

С. Л. Жаров[1]

[1]*ТОВ Ньютон Про сервіс*

Штучні аерозолі знаходять широке застосування в багатьох областях людської діяльності: у хімічній, харчовій, парфумерно-косметичній, буді- вельній промисловості, медицині, сільському господарстві і т. д., що обу- мовлене їх високою ефективністю.

***Ключові слова**: розпилювач, теплота згоряння, аерозоль.*

1. Визначення теплоти згоряння

Згідно до п.1.12 Технічного регламенту аерозольних розпилювачів теплота згорання може бути вирахувана за розрахунковим методом, як:

$$\Delta H_c = \sum \left[\sum_i^n [w(i) \Delta Hc(i)] \right]. \quad (1)$$

де ΔH_c - теплота згоряння аерозолю, кДж/г; wi - масова частка i-го компонента аерозолю у відносних одиницях; ΔHc(i) - теплота згоряння i-го компонента аерозолю, кДж/г.

40% вмісту аерозолю є вуглеводневим пропелентом, що складається з пропану, бутану та ізобутану. Масові частини кожного з цих вуглеводнів у товарному пропеленту є варіативними показниками, тому за принципом найгіршого сценарію у розрахунках теплоти згоряння аерозолю приймаємо теплоту згоряння бутану за теплоту згоряння пропеленту. 65 % суміш розчинників у наступному співвідношенні: метил ацетат – 40%, етил ацетат -10%, ксилол – 10%.

$$\Delta Hc = (48,0*0,40+15,4*0,40+23,6*0,10+40,3*0,10)*0,80=25,35 \text{ (кДж/г)}. \quad (2)$$