

Influence of physical and chemical characteristics and moulding conditions of clay matter in claydite technology

N.E. Toropkov

Scientific supervisor – PhD, Associate Professor, V.A. Kutugin

Linguistic advisor – PhD, Associate Professor, L.V. Maletina

National Research Tomsk Polytechnic University

Russia, 634050, Tomsk, 30 Lenin Avenue, zerogoff@gmail.com

The process of obtaining claydite consists of the stages of preparation initial moldable mixture, molding the green pellets, drying them and heaving on firing. It should be noted that that the step porization pellets is the most studied of these, for which the mechanism and physical and chemical basis of the process were established. Less attention is paid in the literature to the process of plastic molding pellets [1].

The aim of this work is to study the dependence of pressing conditions from intumescent ability of pellets.

As the main component was taken clay of Kornilov deposit (Tomsk region) is used in the manufacture of claydite gravel at "Tomsk plant of building materials and products". Feature of the chemical composition of the clay is a small amount of iron oxide – up to 5.15%. It is known that to obtain satisfactory results by claydite content Fe_2O_3 [2] in the range 6–12% is recommended, therefore additive pyrite cinders for adjusting the chemical composition of the clay is used. As an additive helping to reduce the melt viscosity, calcium carbonate in the form of limestone powder was used. The total content of CaO in the mixture was 5%, which corresponds to the requirements of the raw materials for the production of claydite. To study the properties of the final moldable mixture content of Kornilov Clay 87%, calcium carbonate 5%, of pyrite cinder 8% were used. As the main supplier of gas phase at porization pellets the products of redox reactions were used, that to generate a reducing environment within the granules of the blend of the additive fuel oil in an amount of 4%.

Table 1. Data samples at different absolute moisture

Wa, %	Limiting shear stress, kg/cm ²	ρ_{wet} , kg/cm ³	ρ_{dry} , kg/cm ³	Ks,	Kl	Kg
12	189.04	2130	1903	0.746	0.228	0.026
14	77.84	2086	1829	0.717	0.256	0.027
16	38.92	2031	1751	0.686	0.280	0.034
18	22.24	1985	1682	0.659	0.302	0.039
20	11.20	1943	1620	0.635	0.324	0.041

The studies have been conducted in order to obtain dependences of compaction pressure on the absolute of mass and its ultimate shear stress on the moisture content, which determine the properties of molding clay mass. The limiting shear stress determines the power consumption in the molding and the density of produced billets products.

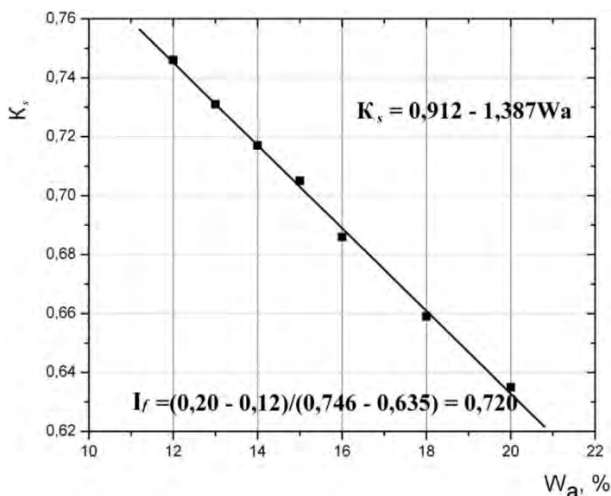


Fig. 1. The dependence of the volume fraction of the solid phase of the absolute moisture content

The equation for the test pressing of loam can be represented by the Berezhnova equation as follows:

$$\ln P = 10,05 - 37,48 W_a \quad (1)$$

Studying properties of the pellets on firing with a diameter of 3 mm and a length of 3–5 mm, which are formed by plastic molding at a pressure of 2 MPa and the absolute moisture 15% of mass. Firing pellets were conducted in the laboratory furnace plant spouted (fluidized) bed. The pellets during firing expanded, and after reaching a certain of density they were removed of the device upward flow of coolant. After firing, claydite was obtained in the form of oval and rounded grains up to 10 mm.

Thus, based on the study of loam, expanded clay gravel with a bulk density of 300–350/m³, swelling ratio of 4,86, which is determined from the ratio of K_s values of swollen and dry granules can be prepared. It was found that the use of bulk phase characteristics allows controlling process of

claydite production in different stages. The obtained data showed that in the preparation of dense dry granules molding pellets should be carried out with minimal moisture and elevated pressures.

References

1. Onackij, S.P Selection and evaluation of clay raw material in the production of claydite / Onackij S.P.– M.: State publishing literature on building materials, 1957.– 20 p.
2. Toropkov N.E. Dependence of physical and chemical properties of clay raw materials in technology of claydite // INTERNATIONAL RESEARCH JOURNAL ISSN 2303-9868.– Ekaterinburg. 2014.

The study of qualitative characteristics of coal concentrates used in the charge coke production

E.V. Vasilieva

Scientific supervisor – Professor, T.G. Cherkasova

Linguistic advisor – PhD, A.V. Nevedrov

Kuzbass State Technical University named after T.F. Gorbachev

Russia, 650000, Kemerovo, 28 Vesennyaya Street,

ctg.htnv@kuzstu.ru, kleossa@yandex.ru

Currently, there is deterioration of the raw material base of coking, along with these increased demands on the quality of coke. In this regard, the forefront of research aimed at studying the quality parameters of coal with a view to increasing the yield of coke and other chemical products [1]. The output of these products significantly affects the economics of production, for example, benzene, hydrocarbons and coal tar are valuable products of coke production, which easily find consumers, while others - undesirable, causing the cost of their disposal [2].

To solve the problem of increasing the yield of coke and other valuable chemical products investigated some of coking coal of the Kuznetsk Basin, coal concentrate presented. In the process of research were conducted technical analysis and the Analysis of caking of the studied coal concentrates, the results of which are presented in Table 1.

Also in the research process for these coals and their mixtures was determined output of chemical products of coking (dry weight). The studies were performed in accordance with GOST 18635-73 [3]. The results are shown in Table 2.

Received experimental data can be applied to optimize the coking process to increase the yield of the main product – coke and improve its quality.