

**INFLUENCE OF PHYSICAL AND CHEMICAL CHARACTERISTICS AND FORMING
CONDITIONS OF CLAY RAW MATERIALS IN TECHNOLOGY OF CLAYDITE.**N. E. Toropkov

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E-mail: zerogooff@gmail.com**ВЛИЯНИЕ ФИЗИКО-ХИМИЧЕСКИХ ХАРАКТЕРИСТИК И УСЛОВИЙ ФОРМОВАНИЯ
ГЛИНИСТЫХ МАТЕРИАЛОВ В ТЕХНОЛОГИИ КЕРАМЗИТА.**Н. Е. Торопков

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***Аннотация.** В статье рассмотрено – исследование физико-химических свойств глинистого сырья на поризационную способность глинистого сырья в технологии производства керамзита. Также проведена зависимость химического состава глинистого на порообразование в гранулах керамзитового гравия.*

Claydite is an effective and popular material in the construction industry. The process of obtaining claydite consists of stages of preparation initial moldable mixture, molding the green pellets, drying them and heaving on firing. Each of these stages has a profound effect on the quality and properties of the resulting claydite. It should be noted that the most studied of these is the step porization pellets, for which established the mechanism and physical and chemical basis of the process. Much less attention are paid in the literature on the process of plastic molding pellets, the optimal holding of which will allow to realize the possibility of obtaining green pellets with a diameter of 3-5 mm. This necessarily includes knowledge the properties of clay molding, depending on the specific molding pressure and volume of the phase composition of the moisture content of the mass. [1,2]

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

As the main component of the charge of the clay used Kornilov deposit (Tomsk region.), used in the manufacture of claydite gravel at PO «TZSMI». [3] 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 in swelling clay recommended feed with Fe_2O_3 [4] content in the range 6-12 %, therefore for adjusting the chemical composition of the clay used additive pyrite cinders. As an additive, help to reduce the melt viscosity, used calcium carbonate in the form of limestone powder. 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 containing Kornilov Clay – 87 % calcium carbonate – 5 % of pyrite cinder – 8 %. As the main supplier of gas phase at porization pellets are products of redox reactions, that to generate a reducing environment within the granules of the blend of the additive fuel oil in an amount of 4 %. Volumetric deformation of plastic ceramic materials are inherently

different from the volume deformations of the solid. Plastic deformation of the ceramic material is accompanied by a change in volume of the phase composition, which can be quantified by the values of K_s , K_l and K_g .

Studies have been conducted in order to obtain dependences of compaction pressure on the absolute moisture the 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. To control the forming process is necessary to know the quantitative relationship between these parameters and the volumetric weight of the phase composition at different pressures molding. The data in Table 1 were obtained using the mold with side opening diameter of 3 mm and using a capillary viscometer design V.A. Lotov, which produces sealing clay mass at different humidity and pressure.

Table 1

Data samples at different absolute moisture

$W_a, \%$	Limiting shear stress, kg/cm^2	$\rho_{\text{wet}}, \text{kg/cm}^3$	$\rho_{\text{dry}}, \text{kg/cm}^3$	K_s	K_l	K_g
12	189,04	2130	1903	0,746	0,228	0,026
13	122,32	2107	1865	0,731	0,242	0,027
14	77,84	2086	1829	0,717	0,256	0,027
15	61,16	2068	1798	0,705	0,270	0,025
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

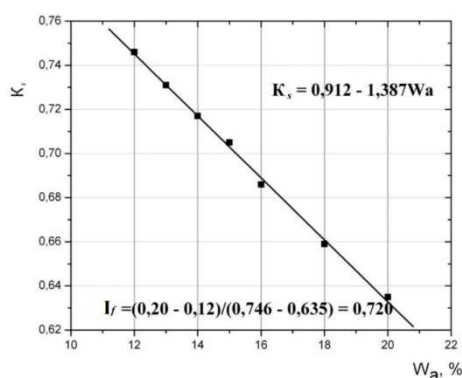


Fig. 1. The dependence of the volume fraction of the solid phase of the absolute moisture content

On the basis of these data, the dependence of the volume fraction of the solid phase (K_s) of the moisture content (W_a , relative units) on the basis of which is determined by the mixture ratio formability I_{f2} :

$$I_{f2} = \frac{\Delta W_a}{\Delta K_s} = \frac{0,2 - 0,12}{0,746 - 0,625} = 0,72, \quad (1)$$

Formability index indicates the extent to which densification processes of the solid phase and the mass movement of the filtration of the liquid phase in the structure of the mass under the influence of external pressure. Because the value varies within 0.4-1.0, we can say that the studied mass has satisfactory formability.

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

$$\ln P = 10,05 - 37,48W_a, \quad (2)$$

Substituting in equation (2), the empirical relationship obtained graphically in Figure 1, we get:

$$K_s = 0,037 \ln P + 0,54, \quad (3)$$

In studying, the properties on firing of the pellets used 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 mass %. Firing pellets was conducted in the laboratory furnace plant spouted (fluidized) bed Fluidizing medium was flue gas supplied to the combustion chamber of the furnace. Pellets peaked on firing, and after reaching a certain density, removal of the device upward flow of coolant. After firing, claydite was obtained in the form of oval and rounded grains up to 10 mm. Duration of pellets in the furnace was 3-4 minutes at a temperature of 1030-1050 °C, samples were cooled at room temperature. In carrying out the work defined volumetric phase composition of initial and baked granules. When calculating the phase composition based on the position that the sum of the volume fractions of solid, liquid and gaseous phases is equal to unity:

$$K_s + K_l + K_g = 1$$

Table 2

Phase composition of the material at various stages in the process

step of preparing	Ks	Kg	Kl
initial weight	0,62	0,23	0,15
shaped pellets	0,80	0,05	0,15
dried granules	0,73	0,23	0,03
expanded granules	0,15	0,85	0,00

Results. Thus, the test based on expanded clay loam, gravel can be prepared with a bulk density of 300-350 kg/m³ with a swelling ratio of 4,86, which is determined from the ratio of K_s values of swollen and dry granules. Found that the use of bulk phase characteristics allows you to control process for producing claydite in different stages. Also from the data obtained that in the preparation of dense dry granules forming pellets should be carried out with minimal moisture and elevated pressures. Due to the fact that the grille molding press must have openings with a diameter of 3-5 mm, it will have great resistance to advancement of the molding composition through such holes.

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