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TERMS NOT SLIDENOTE MIDDLEWARE MOLDING MIXTURE ON THE MOLD PATTERN MATERIAL

Annotation. *In two cases, to determine the conditions not slidenote molding material mixture model forms derived mathematical formula to ensure their implementation. When different coordination numbers determined ratio adhesion and cohesion forces of the model mixture and, depending on their degree of packing defined filler particle mixture.*

Key words: *form, a mixture of a mathematical formula, packaging, coordination number, not slidenote, filler.*

Introduction

After compaction molding the mixture of grain filling her in contact with the surface of the model. After sealing contact surface with the shape model in the static tension adhesion forces arise between the thin layer of binder and model [1-3]. This, together with a thin layer of quartz particles may adhere to the surface of the model, which is a significant problem in the foundry industry.

Statement of the Problem

Determine the conditions of non-stickiness of the moldable mixture to the surface of the model mold withdraw their support for mathematical expressions.

Discussion of Results

Explain the conditions to avoid this phenomenon. When adhesion occurs a part of the relationship between active moldable mixture, coated with a thin film of the second binder and the surface model [2; 3]. Adhesion forces thin film to the surface of the clay model reduces adhesion forces on the surface of the refractory [3; 4].

For the degree of packing of particles K=6 instead of $ц_{ad}$ can be written ($\sigma_{адг} - \sigma_{адг}^{мод}$). Here on $\sigma_{адг}^{мод}$ – at the limit of adhesion strength – can be viewed in two ways:

1. In the mixture layer is in contact with the pattern material. Here, as in the other layers, and soft packing corresponds to the degree of packing of the filler particles is used with the number K=6.

2. In the mixture layer is in contact with the pattern material. Here, as in the other layers, and dense packing degree of correspondence packaging filler particles with the coordinate number K=12.

Obtain adhesion conditions for the first case. In view of the above equation 7цц given in [1], takes the form:

$$\sigma_{см.6} = \pi\left\{0,5\sigma_{адг} + \sigma_{ког}\left[\frac{\delta}{d}\left(1+\frac{\delta}{d}\right) - 2\left(\frac{1}{2}+\frac{\delta}{d}\right)^2\left(\frac{\phi}{180}-\frac{\sin\phi}{\pi}\right)\right]\right\} \quad (1)$$

In the same layer of a mixture which is near the surface of the model will be

$$\sigma_{см6}^{mod} = \pi\left\{0,5(\sigma_{адг} - \sigma_{адг}^{мод}) + \sigma_{ког}\left[\frac{\delta}{d}\left(1+\frac{\delta}{d}\right) - 2\left(\frac{1}{2}+\frac{\delta}{d}\right)^2\left(\frac{\phi}{180} - \frac{\sin\phi}{\pi}\right)\right]\right\} \qquad (2)$$

Denoting that

$$\frac{\sigma_{см6}}{\sigma_{см6}^{мод}} = a ,$$

then

$$\sigma_{см6} = a\sigma_{см6}^{мод}$$

or

$$\pi\left[0,5\sigma_{адг} + \sigma_{ког}(x-3y)\right] = a\pi\left[0,5(\sigma_{адг} - \sigma_{адг}^{мод}) + \sigma_{ког}(x-2y)\right].$$

or

$$\sigma_{адг}^{мод} = \frac{a-1}{a}\left[\sigma_{адг} + 2\sigma_{ког}(x-2y)\right] \qquad (3)$$

From here

$$\frac{\sigma_{адг}^{мод}}{\sigma_{адг}} = \frac{a-1}{a}\left[1 + 2\frac{\sigma_{ког}}{\sigma_{адг}}(x-2y)\right] \qquad (4)$$

At $\frac{\sigma_{адг}^{мод}}{\sigma_{адг}} \geq 1$ a thin layer of binder material will adhere to the surface of the model.

We find conditions for the case stickiness. It is evident that no caking under the following conditions:

$$\frac{\sigma_{ад}^{мод}}{\sigma_{адг}} \prec 1 \ \text{(a)}$$

and

$$\frac{\sigma_{адг}^{мод}}{\sigma_{ког}} ц1 \ \text{(b)}$$

The first condition (a) shows that

$$\frac{a-1}{a}\left[1 + 2\frac{\sigma_{ког}}{\sigma_{адг}}(x-2y)\right] \prec 1$$

Hence, we obtain:

$$\frac{2\cdot\sigma_{ког}}{\sigma_{адг}}(x-2y) \prec \frac{a-1}{a} - 1$$

or

$$\frac{\sigma_{ког}}{\sigma_{адг}} \succ 2(a-1)(x-2y) \qquad (5)$$

In this case, the coefficient "a" describes the adhesion strength of the pattern material defines the use of a particular material.

We now consider the conditions $\frac{\sigma_{адг}^{мод}}{\sigma_{ког}}$ ц1. Dividing the equation (3) ц$_{kog}$ and after transformations we obtain:

$$\frac{\sigma_{адг}^{mod}}{\sigma_{ког}} = \frac{a-1}{a}\left[\frac{\sigma_{адг}}{\sigma_{ког}} + 2(x-2y)\right] \prec 1$$

or

$$\frac{\sigma_{\text{адг}}}{\sigma_{\text{ког}}} \prec \frac{a-1}{a} - 2(x-2y) \qquad \textbf{(6)}$$

In accordance with the above conditions will write stickiness of the surface layers forming a mixture of the model:

$$\begin{cases} \dfrac{\sigma_{\text{адг}}}{\sigma_{\text{ког}}} \prec \dfrac{a}{a-1} - 2(x-2y) \\ \dfrac{\sigma_{\text{адг}}}{\sigma_{\text{ког}}} \succ 2(a-1)(x-2y) \end{cases} \qquad \textbf{(7)}$$

Denote curves

$$\frac{\sigma_{\text{адг}}}{\sigma_{\text{ког}}} = \frac{a}{a-1} - 2(x-2y) \ \text{ – “A”}$$

$$\frac{\sigma_{\text{адг}}}{\sigma_{\text{ког}}} = 2(a-1)(x-2y) \ \text{ – “B”}$$

Then, from (7) it can be concluded that the attachment region of the curve «A» Is located at the bottom, whereas the curve “B” above (MEN region in Fig. 1, 2 and 3).

For small values of adhesion forces to the surface of the model (a=1.2) of the equation (5) and (6) take the form:

$$\frac{\sigma_{\text{адг}}}{\sigma_{\text{ког}}} \prec 6 - 2(x-2y)$$

$$\frac{\sigma_{\text{◆◆◆}}}{\sigma_{\text{ког}}} \succ 0{,}4(x-2y)$$

From the graph shown in Fig. 1, it is seen that for a mixture, are placed at the bottom of the curve Ribbon [4], the area of destruction NE is within $0{,}009\text{ц}\frac{\delta}{d}\text{ц}1{,}3$.

With the increase in adhesion force (a=1.5) acting on the surface of the model, the area is characterized by two stickiness inequalities:

$$\frac{\sigma_{\text{адг}}}{\sigma_{\text{ког}}} \prec 3 - 2(x-2y)$$

$$\frac{\sigma_{\text{адг}}}{\sigma_{\text{ког}}} \succ x - 2y$$

In this case, the area of non-destruction NE, located on the curve A. M. Liass [5; 6], is in the range $0{,}039\text{ц}\frac{\delta}{d}\text{ц}0{,}82$.

For a=2 equation (5) and (6) take the form:

$$\frac{\sigma_{\text{адг}}}{\sigma_{\text{ког}}} \prec 2 - 2(x-2y)$$

$$\frac{\sigma_{\text{адг}}}{\sigma_{\text{ког}}} \succ 2(x-2y)$$

In the area of non-destruction stickiness area will move to the right and stationed within $0{,}092\text{ц}\frac{\delta}{d}\text{ц}0{,}62$.

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From the analysis of the graph shown in Fig. 2, it is seen that the area of non-destruction mixture NE is within 0,14џ$\frac{\delta}{d}$џ0. With "soft" package of new particles with increasing influence of the forces of adhesion decreases interval stickiness area.

When a=2,6

$$\frac{\sigma_{адг}}{\sigma_{ког}} \prec 1,625 - 2(x - 2y)$$

$$\frac{\sigma_{адг}}{\sigma_{ког}} \succ 3,2(x - 2y)$$

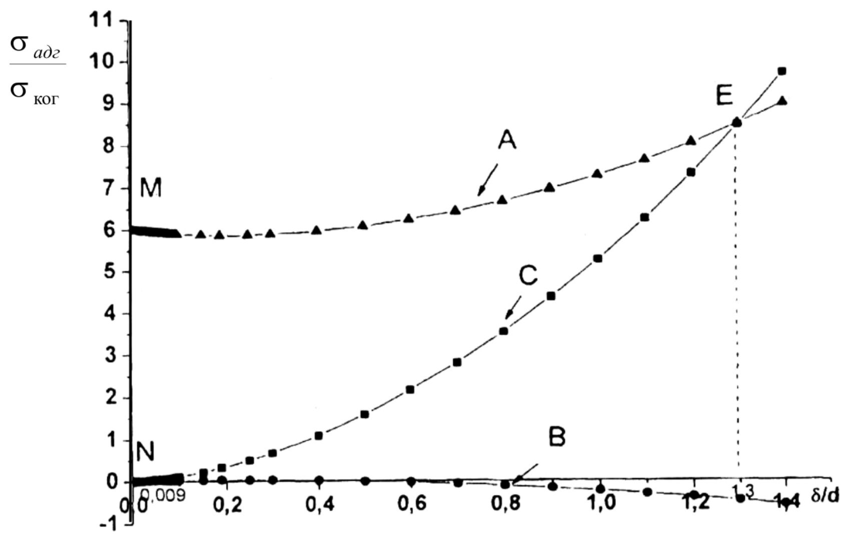

Fig. 1. Area stickiness molding the mixture at a=1.2

A further increase in adhesion force to the model increases the coefficient «a». For example, if a=3:

$$\frac{\sigma_{адг}}{\sigma_{ког}} \prec 1,5 - 2(x - 2y)$$

$$\frac{\sigma_{адг}}{\sigma_{ког}} \succ 4(x - 2y)$$

In this case, the adhesion area, characterized by curve Ribbon, will be located within 017џ$\frac{\delta}{d}$џ0,5.

For a=4 (5) and (6) will be:

$$\frac{\sigma_{адг}}{\sigma_{ког}} \prec 1,33 - 2(x - 2y)$$

$$\frac{\sigma_{адг}}{\sigma_{ког}} \succ 6(x - 2y)$$

From the analysis of the graph shown in Fig. 3 shows that the area is stickiness NE is within 0,22џ$\frac{\delta}{d}$џ0,455.

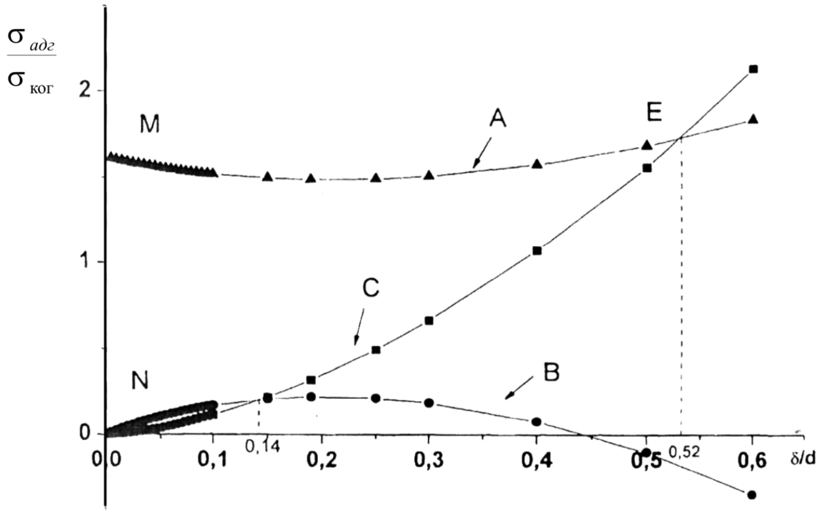

Fig. 2. Area stickiness mixture at a=2.6

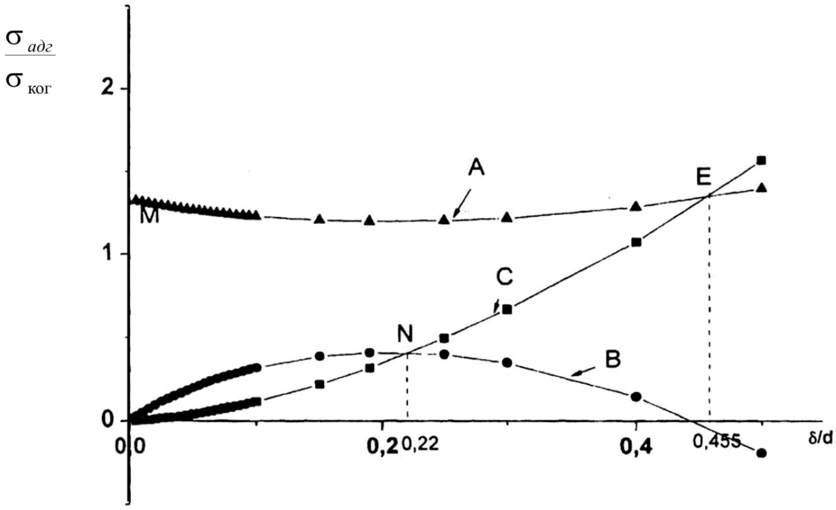

Fig. 3. Area stickiness mixture at a=4

For a=6, the formula (5) and (6) take the following form:

$$\frac{\sigma_{адг}}{\sigma_{ког}} \prec 1,2-2(x-2y)$$

$$\frac{\sigma_{адг}}{\sigma_{ког}} \succ 10(x-2y)$$

In this case, the area of destruction, which is in the area of attachment, is in the range $0,28 \le \frac{\delta}{d} \le 0,42$.

Stickiness area depends on the coefficient "a". With this decrease in its region and extends, respectively, the interval ratio increases $\frac{\delta}{d})$. This, in turn, enables expansion of the range of the moldable mixture. For example, if a=6 and $0,28 \le \frac{\delta}{d} \le 0,42$ mixture will not break down and stick.

$$a=3(0,22 \le \frac{\delta}{d} \le 0,455),\ a=2,6(0,17 \le \frac{\delta}{d} \le 0,5),\ a=2(0,039 \le \frac{\delta}{d} \le 0,82),$$

a=1,5(0,005ц $\frac{\delta}{d}$ ц0,366), a=1,22(0,009ц $\frac{\delta}{d}$ ц1,3).

This can be seen from Fig. 1, 2 and 3.

Now consider the second case, when all the layers have a mixture of dense packing (K=12).

To the mixture layer, which is in touch with the material model equation will have the form:

$$\sigma_{\text{см}12} = 1{,}15\pi\left\{0{,}5\sigma_{\text{адг}} + \sigma_{\text{ког}}\left[\frac{\delta}{d}\left(1+\frac{\delta}{d}\right) - 3\left(\frac{1}{2}+\frac{\delta}{d}\right)^2\left(\frac{\phi}{180} - \frac{\sin\phi}{\pi}\right)\right]\right\}$$

$$\sigma_{\text{см}12}^{\text{mod}} = 1{,}15\pi\left\{0{,}5(\sigma_{\text{адг}} - \sigma_{\text{адг}}^{\text{mod}}) + \sigma_{\text{ког}}\left[\frac{\delta}{d}\left(1+\frac{\delta}{d}\right) - 3\left(\frac{1}{2}+\frac{\delta}{d}\right)^2\left(\frac{\phi}{180} - \frac{\sin\phi}{\pi}\right)\right]\right\} \quad \textbf{(8)}$$

In accordance with the formula symbols take the form:

$$\sigma_{\text{см}12} = 1{,}15\pi\left[0{,}5\sigma_{\text{адг}} + \sigma_{\text{ког}}(x-3y)\right] \quad \textbf{(9)}$$

$$\sigma_{\text{см}12}^{\text{mod}} = 1{,}15\pi\left[0{,}5(\sigma_{\text{адг}} - \sigma_{\text{адг}}^{\text{mod}}) + \sigma_{\text{ког}}(x-3y)\right] \quad \textbf{(10)}$$

Is there $\sigma_{\text{см}12}^{\text{мод}}$ – tensile strength pickling in contact with the model; $\sigma_{\text{см}12}$ – tensile strength of the other layers.

Indicate that:

$$\frac{\sigma_{\text{см}12}}{\sigma_{\text{см}12}^{\text{мод}}} = a$$

then

$$\sigma_{\text{см}12} = a\cdot\sigma_{\text{см}12}^{\text{мод}}$$

To determine the area of adhesion converts last equality:

$$1{,}15\left[0{,}5\sigma_{adg} + \sigma_{kog}(x-3y)\right] = 1{,}15\cdot a\cdot\pi\left[0{,}5(\sigma_{adg} - \sigma_{adg}^{\text{mod}}) + \sigma_{kog}(x-3y)\right].$$

$$0{,}5\sigma_{\text{адг}} + \sigma_{\text{ког}}(x-3y) = 0{,}5\cdot a\cdot\sigma_{\text{адг}} - 0{,}5\cdot a\cdot\sigma_{\text{адг}}^{\text{мод}} + a\cdot\sigma_{\text{ког}}(x-3y)$$

$$0{,}5a\cdot\sigma_{\text{адг}}^{\text{мод}} = 0{,}5\cdot a\cdot\sigma_{\text{адг}} + a\cdot\sigma_{\text{ког}}(x-3y) - 0{,}5\sigma_{\text{адг}} - \sigma_{\text{ког}}(x-3y)$$

$$0{,}5a\cdot\sigma_{\text{адг}}^{\text{мод}} = 0{,}5\cdot a\cdot\sigma_{\text{адг}} + a\cdot\sigma_{\text{ког}}(x-3y) - 0{,}5\sigma_{\text{адг}} - \sigma_{\text{ког}}(x-3y)$$

$$\sigma_{\text{адг}}^{\text{мод}} = \sigma_{\text{адг}} + 2\cdot\sigma_{\text{ког}}(x-3y) - \frac{\sigma_{\text{адг}}}{a} - \frac{2\cdot\sigma_{\text{ког}}(x-3y)}{a}$$

$$\sigma_{\text{адг}}^{\text{мод}} = 1 + \frac{2\cdot\sigma_{\text{адг}}(x-3y)}{\sigma_{\text{адг}}} - \frac{1}{a}1 + \frac{2\cdot\sigma_{\text{ког}}(x-3y)}{a\cdot\sigma_{\text{адг}}}$$

$$\frac{\sigma_{\text{адг}}^{\text{мод}}}{\sigma_{\text{адг}}} = \frac{a-1}{a} + \frac{2\sigma_{\text{ког}}}{\sigma_{\text{адг}}}\left[(x-3y) - \frac{(x-3y)}{a}\right]$$

$$\frac{\sigma_{\text{адг}}^{\text{мод}}}{\sigma_{\text{адг}}} = \frac{a-1}{a} + \frac{2\sigma_{\text{ког}}}{\sigma_{\text{адг}}}\cdot\frac{a-1}{a}(x-3y) \quad \textbf{(11)}$$

At $\frac{\sigma_{\text{адг}}}{\sigma_{\text{адг}}}$ ц1 will be sticking to the model of a thin layer of binder. We find conditions for the case of lack of adhesion. It can be seen that trapping is not under the following conditions:

$$\frac{\sigma_{\text{адг}}^{\text{мод}}}{\sigma_{\text{адг}}} \prec 1 \ \text{(a)}$$

and

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$$\frac{\sigma_{адг}^{мод}}{\sigma_{ког}} \prec 1 \text{ (b)}$$

Consider first condition stickiness – ($\frac{\sigma_{адг}^{мод}}{\sigma}$ц1). From formula (11) shows that:

$$\frac{a-1}{a}\left[1+\frac{2\sigma_{ког}}{\sigma_{адг}}(x-3y)\right] \prec 1 \quad \left(\frac{\sigma_{адг}}{\sigma_{ког}}\right) \succ 0$$

After transformations we obtain:

$$\frac{\sigma_{адг}}{\sigma_{ког}} \succ 2\left(a-1\right)\left(x-3y\right) \qquad \textbf{(12)}$$

Using this equation, change the second condition stickiness:

$$\frac{\sigma_{адг}^{мод}}{\sigma_{адг}} = \frac{\sigma_{адг}}{\sigma_{ког}} + 2\left(x-3y\right) - \frac{2(x-3y)}{a} \prec 1 \qquad \textbf{(13)}$$

$$\frac{\sigma_{адг}}{\sigma_{ког}} \prec \frac{a}{a-1} - 2\left(x-3y\right) \qquad \textbf{(14)}$$

Thus, the conditions stickiness expressed in the following inequalities:

$$\frac{\sigma_{адг}}{\sigma_{ког}} \prec \frac{a}{a-1} - 2\left(x-3y\right)$$

$$\frac{\sigma_{адг}}{\sigma_{ког}} \succ 2(a-1)\left(x-3y\right) \qquad \textbf{(15)}$$

Area stickiness will LAYOUT and Gaeta between the curves described by the equation:

$$\frac{\sigma_{adg}}{\sigma_{kog}} = \frac{a}{a-1} - 2\left(x-3y\right) \qquad \textbf{(A)}$$

$$\frac{\sigma_{adg}}{\sigma_{kog}} = 2(a-1)\left(x-3y\right) \qquad \textbf{(B)}$$

For a=1.2 square stickiness expressed by the inequality:

$$\frac{\sigma_{адг}}{\sigma_{ког}} \prec 6-2x+6y, \qquad \frac{\sigma_{адг}}{\sigma_{ког}} \succ 0,4x-1,2y$$

Area of non-destruction in Fig. 4 exists in the area stickiness within **0,005ц**$\frac{\delta}{d}$**ц0,75.**

When a = 1,5 area stickiness expressed by the inequality:

$$\frac{\sigma_{адг}}{\sigma_{ког}} \prec 3-2x+6y$$

$$\frac{\sigma_{адг}}{\sigma_{ког}} \succ x-3y$$

When a=1,5 and area stickiness moldable mixture of non-destruction mixture NE area is in the area of adhesion within **0,005ц**$\frac{\delta}{d}$**ц0,45.**

Find stickiness area with a=2:

$$\frac{\sigma_{адг}}{\sigma_{ког}} \prec 2-2x+6y$$

$$\frac{\sigma_{адг}}{\sigma_{ког}} \succ 2x - 6y$$

At this time, the area stickiness is within $0,005 \le \frac{\delta}{d} \le 0,33$, and the curve is limited Ribbon (c).

When a=2,6 area stickiness expressed by the inequality:

$$\frac{\sigma_{адг}}{\sigma_{ког}} \prec 1,625 - 2x + 6y$$

$$\frac{\sigma_{адг}}{\sigma_{ког}} \succ 3,2x - 9,6y$$

a=2,6 is the area within the non-destruction $0,005 \le \frac{\delta}{d} \le 0,28$ (Fig. 5).

Find the area of stickiness for a=3:

$$\frac{\sigma_{адг}}{\sigma_{ког}} \prec 1,5 - 2x + 6y$$

$$\frac{\sigma_{адг}}{\sigma_{ког}} \succ 4x - 12y$$

For a=3 area of non-destruction mixture is in the area stickiness within $0,009 \le \frac{\delta}{d} \le 0,26$.

For a=4 area stickiness mixture describing e ed the following inequalities:

$$\frac{\sigma_{adg}}{\sigma_{kog}} \prec 1,33 - 2x + 6y$$

$$\frac{\sigma_{adg}}{\sigma_{kog}} \succ 6x - 18y$$

Fig. 6 shows that for a=4 area of non-destruction mixture is in the area stickiness within $0,14 \le \frac{\delta}{d} \le 0,52$.

Thus, comparing the area, you can identify that a decrease in the limit of adhesion strength to the material model and accordingly the value of the coefficient “a” increases the area of non-destruction, expressed curve NE. And an increasing number of recipes molding compounds, depending on the ratio of $\frac{\delta}{d}$.

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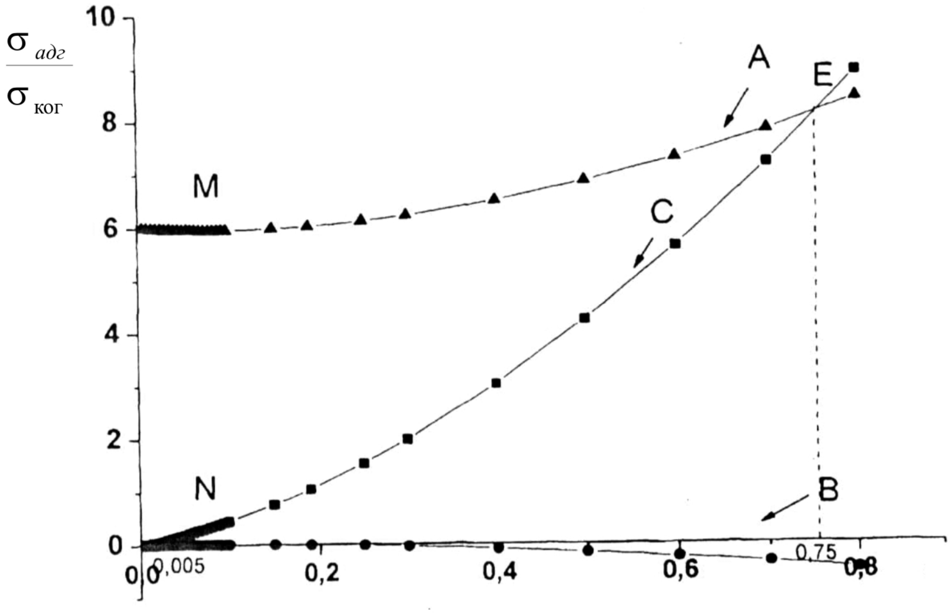

Fig. 4. The area stickiness molding the mixture at a=1.2

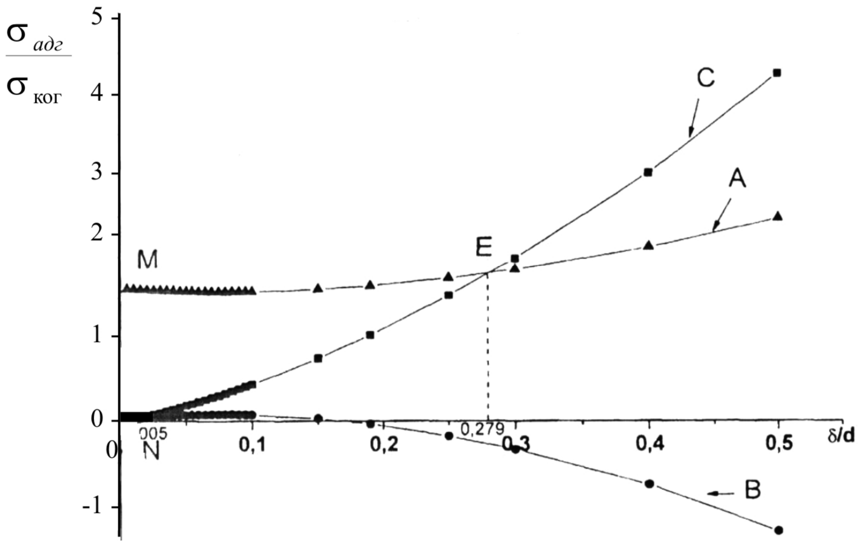

Fig. 5. The area stickiness molding the mixture at a=2.6

Table

Area of non-destruction mixture into squares stickiness

Coefficient "a"	NE area of non-destruction in the area for stickiness	
	K=6	K=12
1.2	$0,09 \square \frac{\delta}{d} \square 1,3$	$0,005 \square \frac{\delta}{d} \square 0,75$
1.5	$0,039 \square \frac{\delta}{d} \square 0,82$	$0,005 \square \frac{\delta}{d} \square 0,45$
2.0	$0,092 \square \frac{\delta}{d} \square 0,62$	$0,005 \square \frac{\delta}{d} \square 0,33$
2.6	$0,14 \square \frac{\delta}{d} \square 0,52$	$0,005 \square \frac{\delta}{d} \square 0,28$

3.0	$0,17 \square \frac{\delta}{d} \square 0,5$	$0,009 \square \frac{\delta}{d} \square 0,26$
4.0	$0,22 \square \frac{\delta}{d} \square 0,45$	$0,029 \square \frac{\delta}{d} \square 0,23$
6.0	$0,28 \square \frac{\delta}{d} \square 0,42$	$0,062 \square \frac{\delta}{d} \square 0,22$

To determine the adhesion of sand-clay mixture to the surface of the model is necessary for different formulations determine the ratio $\frac{\delta}{d}$.

For this A. M. Liass provides a formula

$$\frac{\delta}{d} = \frac{Q_{\blacklozenge}}{6\rho}$$

where Гсв=мсв/Всв – binder weight per unit volume of the mixture; $\rho_{св} = \frac{m_{св}}{V_{св}}$ – density of binder, T/m³.

The proposed formula can be represented as a ratio of the masses components included in the mix:

$$\frac{\delta}{d} = \frac{m_{св}}{6V_{св}\frac{m_{св}}{V_{св}}} = \frac{V_{св}}{6V_{св}}, \quad (16)$$

where $V_{св}$ – $\rho_{св}$ – next volume having density.

$$V_{см} = V_{гл} + V_{вода}$$

$V_{гл}$ – the amount of clay having a density $\rho_{гл}$;

$V_{вода}$ – volume of water having a density $\rho_{вода}$;

$V_{см}$ – volume of the mixture having a density $\rho_{см}$;

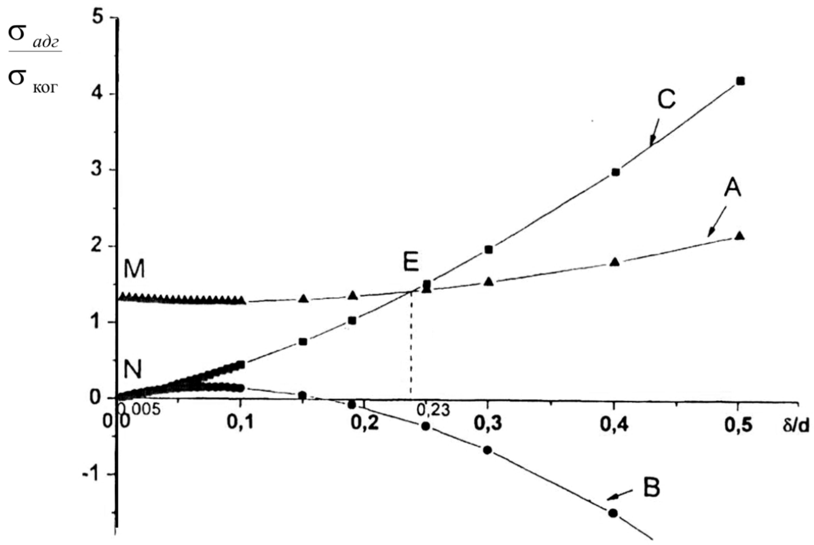

Fig. 6. The stickiness of the moldable mixture area for a=3

$$V_{см} = V_{пес} + V_{гл} + V_{вода}$$

$V_{пес}$ – amount of sand having a density $\rho_{пес}$.

Take the most used recipe sand-clay mixtures for wet forms and define for them attitude $\frac{\delta}{d}$ dackaging for various degrees. According to B. B. Gulyaev [2] density refractory filler to 2,65 T/m^3, which cubic grains packed (K=6), a porosity of 0.467 and a density of 1.3 T/m^3. At the close packing (K=12), the porosity is 0.259, and the density – 1.85 T/m^3.

Formulation of sand-clay mixture is shown below, the mass.%: Silica sand (refractory filler) – 90; refractory clay – 5; Water – 5.

For cubic packed grains (K=6), we obtain:

$$V_{пес} = \frac{0,9 \cdot m}{1,3} = 0,69 \cdot m;$$

$$V_{гл} = \frac{0,05 \cdot m}{2,5} = 0,02 \cdot m;$$

$$V_{вода} = \frac{0,05 \cdot m}{1,0} = 0,05 \cdot m.$$

$$V_{см} = (0,69 + 0,02 + 0,05) \cdot m = 0,76 \cdot m\ .$$

Here m – mass of the mixture, T.

Substituting these values into the formula (16) we obtain:

$$\frac{\delta}{d} = \frac{V_{доб}}{6V_{см}} = \frac{(0,02 + 0,05) \cdot m}{6 \cdot 0,76m} = 0,0153$$

Similarly, for K=12 we obtain:

$$V_{пес} = \frac{0,9 \cdot m}{1,85} = 0,48 \cdot m;$$

$$V_{гл} = \frac{0,05 \cdot m}{2,5} = 0,02 \cdot m;$$

$$V_{вода} = \frac{0,05 \cdot m}{1,0} = 0,05 \cdot m.$$

$$V_{см} = (0,48 + 0,02 + 0,05) \cdot m = 0,55 \cdot m$$

Then:

$$\frac{\delta}{d} = \frac{V_{доб}}{6V_{см}} = \frac{(0,02 + 0,05) \cdot m}{6 \cdot 0,5m} = 0,0201$$

From the table it follows that the moldable mixture will adhere to the surface of the model in the case of a=1,2 and small values of adhesion strength.

For dense pyramidal packaging (k=12) and $\frac{\delta}{d}$=0.0201 stickiness mixture will not be at a=1,2и3.

The second recipe mixture mass.%:

- Quartz sand (refractory filler) – 85;
- Refractory clay – 10;
- Water – 5.

When cubic packing (K = 6), the ratio $\frac{\delta}{d}$=0.02, and similarly with (K=12) $\frac{\delta}{d} = 0,037$. Comparing our results with the terms stickiness, we can determine that the cubic packing filler grains of sand and clay given mixture. It will not adhere to the model at a=1.2, i.e. in the interval (0,009ц $\frac{\delta}{d}=1,3$).

In the case of a pyramid of close packing ratio $\frac{\delta}{d}=0,02$ falls within the range area stickiness A=1,2-3. thereby increasing the packing density of the grain mixture can increase its density and thus reduce the possibility of sticking to the mold surface.

Consider the case of a mixture of the following composition, mass.%: silica sand (refractory filler) – 80; refractory clay – 12; water – 8.

The calculations show that the ratio of film thickness to the diameter of grains of the cubic packing (K=6) is $\frac{\delta}{d}=0,0287$ And packaging for pyramidal (K=12) – $\frac{\delta}{d}=0,038$.

Comparing these figures with the table, it can be noted that the forming mixture will adhere to the surface of the model only in the case of low adhesion force, i.e. when K=6, a=1, 2, and K=12, a=12, -4.

Findings

1. Increasing packing density of the grains forming mix of K=6 and K=12 with high adhesion strength, you can increase the number of cases stickiness mixture to the surface of the model Equip even for values of the coefficient a=4.

2. Reducing the adhesion strength to the surface of the model can be achieved using appropriate materials and pattern coatings that reduce the coefficient “a”, the degree of increase in grain packing the moldable mixture as well as increasing its strength characteristics.

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