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ABOUT IMPROVEMENT OF TECHNOLOGICAL PROPERTIES OF COSMETIC DRY BUILDING MIXTURES

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Abstract:

Our research on this topic is aimed at developing the technology of DCM based on local raw materials, in particular dewatered clay, quicklime, sand, soda ash and additives. This article presents some of the results of our research on the selection of the composition of such DCM.

Keywords: raw materials, dewatered clay, quicklime, sand, soda ash

In the market of construction materials of the Republic of Uzbekistan, the cosmetics made on the basis of dry construction mixtures (DCM) technologies of advanced foreign companies contain a number of imported chemical additives, the cost of which is more than 85-90% of all costs. One of the most pressing problems faced by the local manufacturers of DCM today is the development of technology for obtaining good quality and low cost DCM from local raw materials.

Our research on this topic is aimed at developing the technology of DCM based on local raw materials, in particular dewatered clay, quicklime, sand, soda ash and additives. This article presents some of the results of our research on the selection of the composition of such DCM.

It is known that in the past there have been many scientific studies on the use of clay, which is very common and inexpensive in our environment as a raw material [1, 2]. Most of these studies are devoted to the study of the mixed system "clay-cement", "clay-slag". Some studies [3] have shown that formation of zeolite-like structural compounds in "contaminated" systems, such as natural clay, occurs only when the compounds in the clay have the ability to catalyze the formation of minerals. However, in most cases the resulting structures do not have strength and strengthening properties. Another study [4] showed that clay-based soil-concrete did not have high strength (3.5-18 MPa) and that these values decreased by 30-60% when wetting the samples with water. However, clays formed in sedimentary basins consist of a heterogeneous, thermodynamically unbalanced polymineral system, which is a favorable environment for physical and chemical processes that lead to the formation of optimal microstructure when adding inorganic binders. Some studies [5] have shown that the use of lime to stabilize clays allows the formation of crystalline structural elements. These, in turn, can serve as crystallization centers for the formation of new products during future operation. This explains the hardening process of clay-based concrete soils. It follows from the above studies that the stabilization of clays with lime leads to the formation of typical crystalline structural elements as a result of chemical interactions, which then become the basis for the formation of such phases. It is possible that the chemical activity of the lime component could also have a significant influence on the initial processes of structure formation. The results of the above studies show that it is possible to create a low-grade binder from a mixture of lime and clay. Thus, there is an opportunity to create the composition and technology of resource-saving dry construction mixtures for plastering and finishing works from local raw materials.

In our experimental studies carried out on the basis of local raw materials in order to obtain high-quality and inexpensive DCM, the following materials were used: crushed crude lime of Angren and Yangiol deposits, crushed lime of “Zhamansoy” mine, silica sand of Maysk mine, soda ash of Kungrad plant, carboxymethylcellulose (CMC), alkaline whitewash of caprolactam production, technical lignosulfonates (LST) and additive C-3.

Preliminary experimental studies investigated the ability of DCM to retain water, which is very important.

In the study of the water-holding capacity of dry mixtures, the amount of the optimal additive concentration was used. In this case, the amount of additive was expressed as a percentage of the weight of the dry mixture in the optimal recipe. The study results of the water-holding capacity of dry mixtures are shown in Table 1. According to GOST 5802-86 "Construction mixtures" the water-holding capacity of the mixture in the laboratory conditions must be not less than 95%. The analysis of the data presented in Table 3.4 showed that the drying mixtures with the

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addition of MC, C-3 and PAD have the ability to retain water even above the normative values..

Table 1
Effect of additives on the ability of construction mixtures to retain water

Name of the additive in the composition	Concentration of additive, %	Water retention ability, %
Ingredients based on Angren clays		
1. Soda-free content	-	93,5
2. Management structure	-	93,6
3. Alkaline effluent from caprolactam production (AECP)	1.0	94,9
4. Technical lignosulfonates (LST)	1,0	94,6
5. Chemical additive C-3	1,0	96,55
6. Methylcellulose (MC)	0,2	97,30
7. Polyvinyl acetate (PAD)	20,0	97,80
8. Polyvinyl acetate (PAD)	30,0	98,25
Ingredients based on Yangiyul clays		
1. Soda-free content	-	93,45
2. Management structure	-	93,60
3. Alkaline effluent from caprolactam production (AECP)	1.0	94,85
4. Technical lignosulfonates (LST)	1,0	94,60
5. Chemical additive C-3	1,0	95,80
6. Methylcellulose (MC)	0,7	96,10
7. Polyvinyl acetate (PAD)	20,0	96,60
8. Polyvinyl acetate (PAD)	30,0	97,45

GOST 19007-73 * "Paint and varnish materials on a seven-point scale. Methodology for determining the timing and level of construction. We investigated this property for the control composition based on Angren aluminum oxide with 20% added PAD. The results of the studies are presented in Tables 2 and 3.

During the experiments it was found that the porosity of the coating obtained from the developed composition, all other things being equal, is influenced by the porosity of the base. The control composition shows the most intensive curing rate when applied to the brick foundation: up to level 1 - 21 minutes, up to level 7 - 114 minutes.

Table 2
The degree of drying of the control structure depends on the type of foundation

Speed of construction	Type of foundation		
	Brick	Cement-sand mixture	Glass
1	21 min	35 min	175 min
2	34 min	48 min	208 min
3	54 min	65 min	265 min
4	62 min	80 min	290 min
5	71 min	95 min	315 min
6	86 min	140 min	340 min
7	114 min	150 min	370 min

Table 3
Depending on the type of substrate, the drying rate of 20% of the added PAD compound

Speed of construction	Type of foundation		
	Glass	Glass	Glass
1	25 min	40 min	200 min
2	40 min	55 min	240min
3	60 min	75 min	300 min
4	70 min	90 min	330min
5	80 min	100 min	360 min
6	100 min	155 min	390 min
7	140 min	170 min	420 min

Since the surface of the cement-sand mixture base is more dense, it absorbs water in the mixture with less intensity, thereby increasing the drying time of the composition. However, when the content is applied to the glass, the moisture is not absorbed by the base, and therefore the drying of the finishing layer is only due to moisture evaporation into the environment. As a result, the drying time of the layer increases to 370 min to level 7. The compounds with the addition of PAD were characterized by slow curing (Table 3.6). This was due to the high water retention capacity of the ingredients with the addition of PAD described above (Table 3.4), based on the drying time of the contents. One day after the application of the composition on the surface, complete drying of the

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finishing layer with a thickness of up to 5 mm was observed.

PAD additives have a high viability. For example, the addition of 20% PAD in the charge to the mass of the dry mixture increases the viability of the mixture for 8-10 hours, and the addition of 30% - up to 15 hours when stored in closed containers to prevent moisture evaporation. Increasing the viability of compounds with the addition of PAD is associated with the fact that, in our opinion, coagulation of neighboring particles of the composition is impossible without overcoming the structural-mechanical barrier [6,7]. Overcoming this barrier, more precisely, the probability of displacement of the surface adsorption layer formed by the convergence of surfaces is very small due to the stabilizing and flocculating action of PAD on disperse systems.

Studies have shown that the addition of PAD can significantly increase the shelf life of the ingredients, which opens up the possibility of a relatively simple adjustment of the technological properties of DCM based on local raw materials.

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