NEW TECHNOLOGIES FOR OBTAINING DRY CONSTRUCTION MIXTURES BASED ON DOMESTIC INDUSTRIAL WASTE

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Abstract
This article covers the results of research on obtaining binders for dry building mixtures based on asbestos-cement waste, increasing the hydraulic activity of asbestos-cement waste (ACW), the effect of filler on the physical-mechanical properties of asbestos–cement waste-based binder, the effect of plasticizing additives on the rheological and physical-mechanical properties of dry building mixtures based on asbestos-cement waste, and physical chemical analysis of.

Keywords: Physical chemical analysis of industrial waste, asbestos cement waste (ACW), microsilica, dry construction mixtures with new composition, physical and mechanical properties, rheological and physical and mechanical properties, plasticizing additives, dry construction mixture compositions based on asbestos–cement waste.

Introduction

The rational use of Natural Resources is considered by most countries of the world as one of the main factors of sustainable economic development. Disposal of industrial waste is one of the main problems in the current period, when there is a great emphasis on Environmental Protection. Every year, businesses dump hundreds of thousands of tons of waste into landfills, polluting the environment and negatively affecting the environmental situation. Man-made waste, which is harmful to the environment, is in most cases a valuable raw material that can be used in the production of building materials. Many projects for the disinfection of such waste, the application of low-waste and waste-free technologies are being developed abroad. The use in the production of man - made waste allows you to achieve great economic efficiency by avoiding two important problems-environmental pollution and saving natural raw material resources.

A total of 11,250,000 tons of waste is generated in one night's day around the world [1]. Solving the problem of waste is considered one of the most urgent environmental tasks in Uzbekistan. The annual average is. more than tons of industrial, domestic and other waste are formed, and 15...20% of them are toxic.

Among such waste, it is possible to include Lime waste, which is formed in the chemical water treatment unit of the sewage neutralization and treatment plant in chemical fertilizer production enterprises. At the same time, 10 large chemical fertilizer enterprises operate in our republic, more than 594 thousand tons of lime slurry (solid waste of waste water-SWOW) are generated per year in one Ferganaazot fertilizer production enterprise [2,].

According to available data, Uzbekistan is the second largest producer of greenhouse gas emissions in Central Asia after Kazakhstan. Of these, 80% are mostly in the energy sector. Much of the toxic waste is generated in Navoi, Tashkent and Jizzakh regions. In industrial waste landfills, for example, in the new Angren TES, 62 mln. tons, 4.4 million in Angren TES. tons of ash-slag waste were collected, amounting to $ 0.5 million annually. increasing in tonnage [3,4,5,6].

At the moment, the amount of solid waste in Uzbekistan is as it is (in the percentage of total waste): paper-19; tree-4.9; metals-3.4; gaseous waste-3.9; rubber (polymers) -1; glass-4.0; ceramics and Stones-9; building materials (cement, lime, plaster, concrete, asbestos, asphalt and other) -20 and other emissions-34,8 [4,7].

Many years of research have shown that most of the industrial waste generated differs little in its mineralogical and chemical composition from raw materials extracted from underground. Most waste is irreplaceable raw materials in the compositions used to produce high-quality building materials. With this in mind, the development and implementation of energy-efficient advanced technologies that process waste in the building materials industry is of urgent importance. In addition, the use of waste from various sectors of the national economy to obtain building materials will help solve the problem of environmental pollution, and most importantly, the release of useful huge areas of land occupied by these waste [8,9].

By applying poor-quality cement products and waste to the technological process, the problem of expanding the raw material base for the production of quality binders can be solved [9,10].

Methods

Studies were conducted in mixtures based on ACWB with 67% ACW, 28% lime and 5% glass waste, 0-0.5% MPQ and Polyplast SP-1 plasticizing additives.

Dipping deformations were determined by testing 4x4x16 mm scale samples in the manner outlined in GOST 24544-81.

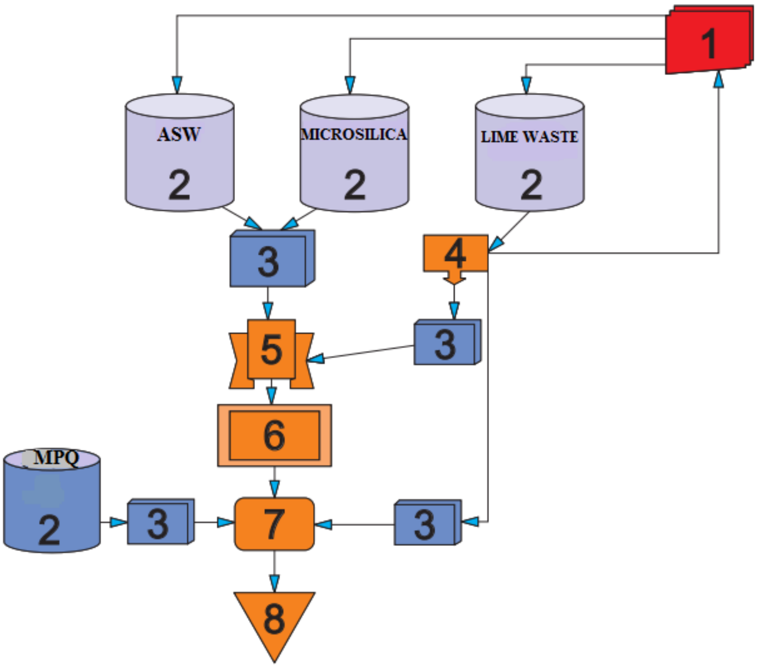
Results

Rational solution to the problem of industrial waste is the composition of the substance of waste, their aggregate state, quantity, technological descriptions and other. will depend on factors.The advantages of using new types of dry construction mixtures in modern construction include:

- ✓ Water resistance as well as moisture resistance;
- ✓ Competitiveness of strength;
- ✓ Simplicity of technology;
- ✓ Meet environmental requirements;
- ✓ Resource savings;
- ✓ Cost significantly cheaper than traditional dry construction mixtures on the economic side;
- ✓ Sufficient raw material stock due to its extraction from local industrial waste;
- ✓ Ease of use in indoor and outdoor plastering of industrial and public buildings;

- ✓ Lightness of the mass compared to the usual dry building mixtures;
- ✓ The presence of the possibility of large-scale modification of the construction time;
- ✓ The possibility of sequential execution of work after plastering due to rapid drying;
- ✓ Does not require a separate type of equipment at the time of use;
- ✓ The possibility of using more surfaces compared to traditional dry construction mixtures;

That imported raw materials do not require, etc.



Picture-1. Technological scheme for obtaining dry construction mixtures based on asbestos industry waste and local industrial waste.

1-grinder, 2-bunkers, 3-ruler, 4-sieve, 5-planetary mill, 6-oven, 7-turbulent mixer, 8- packing machine.

The technology for the production of new structural dry construction mixtures based on ACW and domestic industrial waste includes the following processes:

- transportation of raw materials to the enterprise;
- drying raw material;
- grinding raw material;
- sift lime waste;
- measurement and appetite of raw materials;
- burning raw material;
- homogenization by adding filler and plasticizer to the burnt product;
- packaging of finished products.

The raw materials are transported to the warehouse of the enterprise in limestone cars (motor vehicles) and dried in drying drums at a temperature of 100-110^{0}C. The drying drum is made of steel, with a diameter of 2m, with a length of 20m mounted in an inclined position, and is actuated by rotating using an electro engine (the drying drum is not specified in the technological scheme). The raw materials are dried with smoke gases from the incineration furnace (5).

Raw materials are initially ground in a jaw or conical grinder (1) to pieces measuring 0-20mm and collected in reserve bunkers (2) equipped with saucer (plate) feeders.

ACWB and glass exhaust meters are measured in (3)in quantities of 67% and 5%, respectively, and are transmitted to the mill (5)for mechanical activation. The type of Mill and the duration of the appetite are selected taking into account the fact that the thinness of the materials of the raw material provides the desired value ($3000 sm^2/g$) of the appetite. For this, it will be advisable to use ball mills or planetary Mills.

Lime waste sieve (4) is separated into fractions of 0.2 mm and larger and smaller sizes. From fractions less than 0.2 mm, 28% is given a mill (5), while large fractions are returned to a grinder (1).

The desired raw material mixture is given to the incinerator furnace (6) for thermal activation at 600^0C. For this purpose, the use of Shaft mills, which ensure the simultaneous implementation of incineration and homogenization, will work well.

A 0.3% MPQ plasticizer by mass and 55% filler (0.2 mm lime waste) are added to the burnt ACWB and directed to a turbulent mixer for homogenization, then to the packaging equipment. Dry construction blends packaged in paper bags are delivered to consumers.

As a result of the tests carried out, GOST 31357-2007 received a class B30, cold-resistance class F75 algal and finishing DCM.

The actual characteristics of DCM's obtained under Real production conditions correspond to the results obtained using a mathematical model, which makes it possible to use technological processes in operational management

The results of the semi-industrial test of DCM production technology showed that the organization of industrial production of different types of DCM's can be carried out in the conditions of operating enterprises, using standard equipment.

On the basis of ACW and domestic industrial waste, a technological regulation of DCM extraction was developed.

Dipping deformations in the form of macro and microcracks are formed by the hydrotation of the binder contained in the algae layers on the surfaces that are flooded with DCM mixtures and the evaporation of excess water.

Expanding binders and chemical additives that reduce the water demand of the mixture are usually used in order to eliminate dipping deformations.

Studies were conducted in mixtures based on ACWB with 67% ACW, 28% lime and 5% glass waste, 0-0.5% MPQ and Polyplast SP-1 plasticizing additives.

Dipping deformations were determined by testing 4x4x16 mm scale samples in the manner outlined in GOST 24544-81.

The results of the study conducted showed that due to hydration of the binding (ACWB) contained in the DCM composition obtained on the basis of ACWB, there was no significant decrease in the deposition of the slag with the addition of MPQ plasticizer 0.2%, SP-1 plasticizer 0.3%. Increasing the plasticizers from this amount made it possible to reduce the dive value in the algae crust to 0.01-0.04 mm/m. Lost visible on plastered surfaces by applying a finishing layer over.

According to the selected X1, X2, X3, experimental factors, DCM it is enough to analyze the linear correlation dependence and the linear equation formula to characterize the growth kinetics of the bite strength over time to determine the optimal content parameters that determine the maximum values of the bite strength of the mixture with concrete and brick surfaces.

Table 1 Variable intervals of variable input factors and degrees

Variable input factors		**Variable input factors**			**Variable input factors**
Designation	**Cod**	**-1**	**0**	**+1**	
The amount of glass waste in DCM, mass. %;	X_1	2	5	8	3
Water to DCM ratio, s/DCM, to form a mixture with sufficient dispersion;	X_2	0,42	0,47	0,52	0,5
With the residual amount in a standard sieve with a size of 0.2 mm the estimated ACWb substance is the degree of softness of S, %.	X_3	9	14	19	5

1-based on the conditions presented in the table, a plan of experiments was drawn up. According to him, the content of components was selected in the range of intended changes.
A full-factor pilot plan for the selection of the optimal composition of DCM is presented in Table 1.
Data processing and drawing up regression equations based on known correlation coefficients through analysis of experimental and research results, presented in tables 2-3.
As a result of the processing of experimental data, a regression equation was compiled, which adequately describes the kinetics of the bite strength of the plaster mixture with concrete and brick surfaces according to the optimal amount of components.

$Y_{concrete}$=0,44+0,02 x_1 +0,01 x_2+0,01 x_1 x_2+0,05 x_1 x_3 -0,01 x_2 x_3-0,01x_1 x_2 x_3

Y^{brick}= 0,38+0,02 x^1 +0,01 x^2+0,01 x^1 x^2+0,05 x^1 x^3 -0,01x^1 x^2 x^3

Plan number	**Variable input factor code and matrix**			**Variable input factors designation**			**Bite strength of DCM, MPa**	
	X_1	**X_2**	**X_3**	**The amount of glass waste in DCM, mass. %;**	**Water and DCM ratio, S/DCM**	**ACWB the residue of 02 mm in the sieve, mass %**	**With concrete**	**With brick**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	+	+	+	8	0,52	19	0,47	0,42
2	-	+	+	8	0,42	19	0,37	0,33
3	+	-	+	8	0,52	19	0,45	0,39
4	-	-	+	8	0,42	19	0,45	0,37
5	+	+	-	2	0,52	9	0,36	0,31
6	-	+	-	2	0,42	9	0,51	0,46
7	+	-	-	2	0,52	9	0,36	0,32
8	-	-	-	2	0,42	9	0,51	0,46
9	-	0	0	5	0,42	14	0,51	0,46
10	0	+	0	8	0,47	19	0,45	0,40
11	0	-	0	2	0,47	9	0,50	0,47

Table 2 Constructing regression equations (for concrete)

Correlation levels							
Bite average strength value MPa	**$=X_1 \cdot Ua$**	**$=X_2 \cdot Ua$**	**$=X_3 \cdot Ua$**	**$=X_1 \cdot X_2 \cdot Ya$**	**$=X_1 \cdot X_3 \cdot Ya$**	**$=X_2 \cdot X_3 \cdot Ya$**	**$=X_1 \cdot X_2 \cdot X_3 \cdot Ya$**
0,47	-0,47	-0,47	-0,47	0,47	0,47	0,47	-0,47
0,37	0,37	-0,37	-0,37	-0,37	-0,37	0,37	0,37
0,45	-0,45	0,45	-0,45	-0,45	0,45	-0,45	0,45
0,45	0,45	0,45	-0,45	0,45	-0,45	-0,45	-0,45
0,36	-0,36	-0,36	0,36	0,36	-0,36	-0,36	0,36
0,51	0,51	-0,51	0,51	-0,51	0,51	-0,51	-0,51
0,36	-0,36	0,36	0,36	-0,36	-0,36	0,36	-0,36
0,51	0,51	0,51	0,51	0,51	0,51	0,51	0,51
0,51	-0,51	0,51	0,00	-0,51	0,00	0,00	0,00
0,45	0,00	-0,45	0,45	0,00	0,00	-0,45	-0,00
0,50	0,00	0,00	-0,50	0,00	0,00	0,00	0,00
bo=	$b_1=$	$b_2=$	$b_3=$	$b_{12}=$	$b_{13}=$	$b_{23}=$	$b_{123}=$
0,44	0,02	0,01	0,00	0,01	0,05	-0,01	-0,01
0,44>0,007	0,02>0,007	0,01>0,007	0,00<0,007	0,01>0,007	0,05>0,007	0,01>0,007	0,01>0,007

Table 3 Constructing regression equations (for brick)

Correlation levels							
Bite average strength value MPa	**$=X_1 \cdot Ua$**	**$=X_2 \cdot Ua$**	**$=X_3 \cdot Ua$**	**$=X_1 \cdot X_2 \cdot Ya$**	**$=X_1 \cdot X_3 \cdot Ya$**	**$=X_2 \cdot X_3 \cdot Ya$**	**$=X_1 \cdot X_2 \cdot X_3 \cdot Ya$**
0,42	-0,42	-0,42	-0,42	0,42	0,42	0,42	-0,42
0,33	0,33	-0,33	-0,33	-0,33	-0,33	0,33	0,33
0,39	-0,39	0,39	-0,39	-0,39	0,39	-0,39	0,39
0,37	0,37	0,37	-0,37	0,37	-0,37	-0,37	-0,37
0,31	-0,31	-0,31	0,31	0,31	-0,31	-0,31	0,31
0,46	0,46	-0,46	0,46	-0,46	0,46	-0,46	-0,46
0,32	-0,32	0,32	0,32	-0,32	-0,32	0,32	-0,32
0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46
0,46	-0,46	0,46	0,00	-0,46	0,00	0,00	0,00
0,40	0,00	-0,40	0,40	0,00	0,00	-0,40	0,00
0,47	0,00	0,00	-0,47	0,00	0,00	0,00	0,00
bo=	$b_1=$	$b_2=$	$b_3=$	$b_{12}=$	$b_{13}=$	$b_{23}=$	$b_{123}=$
0,38	0,02	0,00	0,01	0,01	0,05	0,00	-0,01
0,36>0,00	0,04>0,00	0,00<0,0	0,01<0,00	0,02>0,00	0,05>0,00	0,01<0,00	0,02>0,00

The analysis of the equations was carried out in the method of sections, using the mathematical package "MathCad"", with the help of which graphs of lines of equal degree were compiled. To do this, one of the variable factors was set to a constant value (maximum, minimum or average), and the other two were constructed with correlation graphs.

Conclusions

1. Adding 28% lime and 5% glass waste to ACW and thermomechanical processing at 600^0C allows obtaining an asbestos cement binder (ACWB) with a softening coefficient of Kyu=0.92 and a strength of 26.5 MPa.
2. The inclusion of up to 50% lime waste as a filler in ACWB -based DCM does not affect its properties.
3. Research on the modeling of the physical and mechanical properties of ACWB-based DCM has been found to fully meet the requirements of GOST 31357-2007, with a mixture of new-containing DCM algal and burnishing with surfaces of concrete and brick wall structures, with a bite strength of 0.44 and 0.38 MPa, respectively.
4. The results of studies on the water retention capacity of DCM have shown that the introduction of "Polyplast SP-1" as well as complex polymer-mineral additives of the MPQ brand at 0.3% in ACWB-based enclosures fully meet the requirements of the proposed DCM's water retention capacity GOST 31356-2007, i.e. 94-99%.
5. The porous structure parameters of DCM are heavily influenced by plasticizing additives. In particular, it made it possible to obtain a small porous DCM composition of 0.3% to the composition of mixtures of 0.3% "Polyplast SP-1" and MPQ brand complex polymer-mineral additives uniformly distributed in addition sizes.
6. Using "Polyplast SP-1" as well as complex polymer-mineral additives of the MPQ brand, it was found that an average density of 1750 kg/m^3 and a compressive strength limit of 32.5 MPa could be obtained based on ACWB.

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