

**COMPOSITION AND PROPERTIES OF AERATED CONCRETE USING LIME WASTE.**

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**Abstract:** The article analyzes the application of lime waste (sludge) to foam concrete and the results of a study of the thermal insulation of lime waste of aerated concrete and the compressive strength of structural aerated concrete. Various ratios of solid lime waste to lime waste were studied for more efficient use in the development of new foam concrete building materials. Based on laboratory experiments, it was found that lime waste (sludge) foam concrete can be used as a filler.

**Keywords:** strength, lime waste (sludge), average density, thermal insulation, structural thermal insulation

**Introduction:** the main components in the production of lime aerated concrete are cement and fillers. Practice has shown that, depending on the type of lime-spent aerated concrete being extracted, the composition of the components varies significantly. An increase in the amount of filler leads to an increase in the strength and average density of calcareous aerated concrete.

In addition, when using heavy coarse-grained fillers, the aerated concrete mixture settles. For this reason, fillers smaller than 2.5 mm are used in the manufacture of aerated concrete, mainly sand, lime waste (sludge) and crushed industrial waste.

Considering that the solid particles and mineralogical composition of sand and calcareous waste are different, the effect of the composition of the components on the properties of aerated concrete obtained from calcareous waste was considered.

**Working methods:** the research was carried out in the following order, initially the components were notified: cement binders, filler (sand, ash and lime sludge), aluminum powder gas dispenser. Then the mixture was prepared, cement and filler (sand, ash and lime sludge) were added to the water, and aluminum powder was added at the end. It took 1 minute to mix the aerated concrete mixture. The mixture was then poured into metal molds measuring 150x150x150 mm. The aerated concrete samples were cured in natural conditions. The characteristics of the obtained samples were determined after 7, 14 and 28 days.

When determining the effect of the granulometric composition of sand, sand and sifted sand of a natural solid composition were used as fillers in Tables 1 and 0.63; 0.315; 0.14 and 0.14, and in Tables. 2 as a filler, the size modulus of lime waste is 300 microns 150 microns 0.75 microns or more.

Table 1

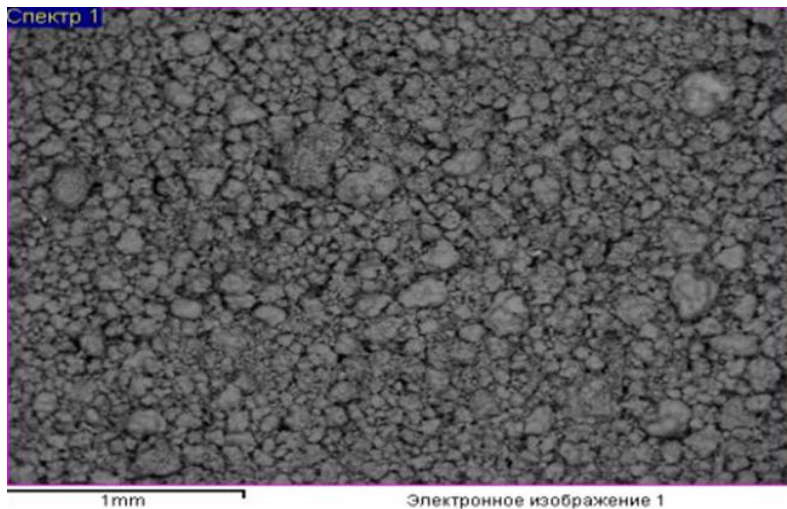
**Physical characteristics of spring sand**

№	Pointers	Units of measurement	Quantity
1	Actual density	gr/sm <sup>3</sup>	2,33
2	The size module	-	1,6
3	Bulk density	kg/m <sup>3</sup>	1,56
4	№ 0,63 residue in the sieve	%	13,2
5	Number of large grains: 10 mm.	%	0,3

	5 mm. 0.16 mm.nevertheless		7 25
6	The amount of clay and pollen	%	0,3

**Table 2**  
**Physical parameters of lime waste (sludge)**

№	Pointers	Units of measurement	Quantity
1	Actual density	gr/sm <sup>3</sup>	2,69
2	The size module	-	1,6
3	To'kma zichligi	kg/m <sup>3</sup>	1,025
4	№ 0,75 the remainder in the sieve	%	53.91
5	Number of large grains: 300 microns. 150 microns. 0,75 microns. nevertheless	%	0,3 5,12 25
6	the amount of powdered substance of lime waste (sludge)	%	40,14



**Fig.1. Electron microscopic analysis of a mixture of lime waste.**

**Table 3**  
**The effect of the composition of lime waste and solid particles on the properties of foam concrete**

The composition of the mixture	Water hardness	Average density, kg/m <sup>3</sup>	Compressive strength, MPa		
			Solidification time, day		
			7	14	28
Cement-60% lime sludge-40%	0,5	605	0,6	1,2	1,9
Cement-50% lime sludge-50%	0,5	620	0,5	1,1	1,5
Cement-40% lime sludge-60%	0,5	670	0,4	0,8	1,2
Cement-30% lime sludge-70%	0,5	710	0,3	0,6	1,0
Cement-20% lime sludge-80%	0,5	750	0,5	0,5	0,8

**Analysis:** The effect of lime waste on the strength of aerated concrete will be studied in this article. The density of aerated concrete in the dry state used in this experiment is 600 kg/m<sup>3</sup>, which is mainly used in aerated concrete for heat preservation in construction. [3,4]

To make more efficient use of solid lime waste for the development of new aerated

concrete building materials, various ratios of lime waste are investigated, and this article analyzes the appearance of density, mechanical properties and microstructure of aerated concrete in a dry state with different service life.

For experimental studies, Portland cement of the PS400 D20 brand from the Kuvasoy cement plant, the composition of aerated concrete (Tables 4, 5), the brand of thermal insulation and structural aerated concrete M800 were used.

In an experimental study of various compositions of aerated concrete, high performance indicators of the components were observed in the presence of lime waste. The construction aerated concrete of lime waste was studied by manufacturing 2 serial samples of twin prisms measuring 40x40x160 mm. The first series is with control samples, the second is with a lime dump. The trial periods are 7, 14 and 28 days after quenching. The test results are shown in the table.

**Table 4**

**Laboratory composition with sand, thermal insulation and thermal insulation structural aerated concrete mixtures**

№	Name of the material	The composition of the foam concrete mixture, kg	
		per 1 m <sup>3</sup>	Test control in a volume of 5 liters
1.	Cement	300	1500
2.	sand fraction. 0-5 mm	300	1500
3.	aluminum powder	50	250
4.	Water, l	160	800

**Table 5.**

**Laboratory composition with lime waste, thermal insulation and thermal insulation structural foam concrete mixtures**

№	Name of the material	The composition of the foam concrete mixture, kg	
		per 1 m <sup>3</sup>	Test control in a volume of 5 liters
1.	Cement	260	1500
2.	Lime waste	240	1500
3.	aluminum powder	50	250
4.	Water, l	180	900

The introduction of lime waste into the composition of thermal insulation and thermal insulation structural aerated concrete increases the strength of thermal insulation and thermal insulation structural aerated concrete during the entire solidification period.

**Table 6**

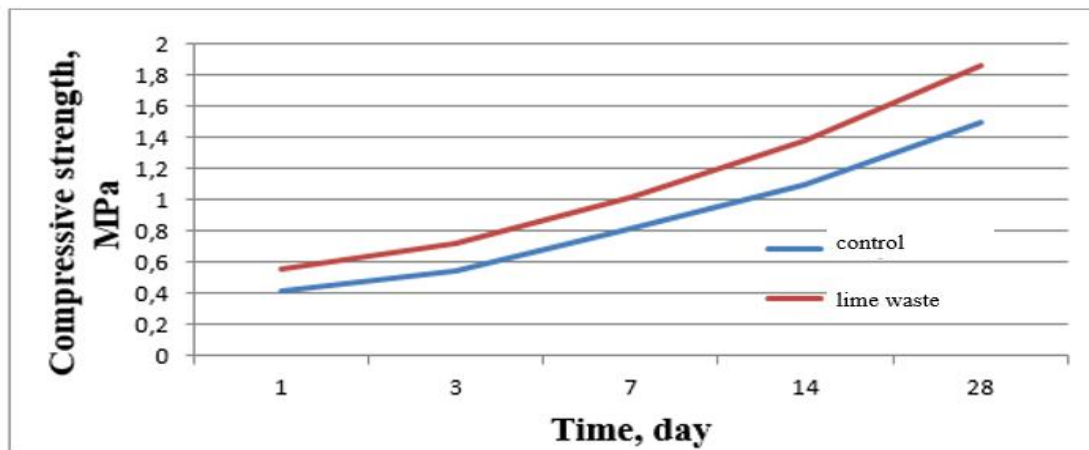
**The results of the study of the compressive strength of thermal insulation and structural aerated concrete**

№	Name of the material	Average density, kg/m <sup>3</sup>	Thermal insulation and thermal insulation the strength of structural foam concrete (MPa) and its increase during the day (%).				
			1	3	7	14	28
1	Aerated concrete made of sand	700	$\frac{0.85}{100}$	$\frac{1.55}{100}$	$\frac{2.9}{100}$	$\frac{3.8}{100}$	$\frac{4.2}{100}$

2	From lime waste aerated concrete	605	$\frac{0.96}{113}$	$\frac{1.72}{114}$	$\frac{3.25}{112}$	$\frac{4.3}{113}$	$\frac{4.75}{113}$
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### Graph 1.

The effect of thermal insulation of lime waste and thermal insulation on the compressive strength of structural aerated concrete



**Conclusion.** Thus, various compositions of aerated concrete with the addition of lime sludge (slurry) as a filler in the production of chemical fertilizers as a secondary resource have been experimentally studied, without losing the strength of aerated concrete, but, on the contrary, increasing its strength. It turned out that higher rates of lime-spent (slurry) aerated concrete can be achieved using various superplasticizers.

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