Obtaining high-strength mastering mortars using ultra-disperse active mineral additives based on technogenic raw materials of Uzbekistan

Rakhimboy Rakhimov[1*], *Gulmira* Marupova[2], *Marguba* Egamova[2], *Bobur* Matyokubov[2], *Dilbar* Rustamova[2], *Xayrulla* Mamadaliyev[2], and *Nurmuhammad* Razzaqov[2]

[1]Urgench State University, Urgench, Uzbekistan
[2]Samarkand State Architecture and Construction University named after Mirzo Ulugbek (SamSACU), Samarkand, Uzbekistan

Abstract. The paper presents a study aimed at developing high-strength masonry mortars using ultra-dispersed active mineral additives derived from technogenic raw materials in Uzbekistan. The primary objective is to enhance the adhesion strength between the mortar and silicate bricks, thereby facilitating the industrialization of construction in seismic regions and expanding the application of silicate bricks in masonry. The research focuses on utilizing mineral and man-made resources available in Uzbekistan, as well as incorporating waste products from the building materials industry and construction sites to improve technical and economic indicators.

1 Introduction

The construction complex can be compared to a locomotive pulling the country out of the crisis. Analysis of the forecast data shows that in the next 5 years, housing, including individual construction, will receive priority development. An annual increase in living space of 1 m^2 for each citizen of Uzbekistan will require an increase in the total amount of residential space by 20-25%, which will lead to a significant increase in the demand for small-piece wall products and adhesives (cement-sand mortars) [1].

Since the main wall material for the enclosing structures of residential buildings, which meets the requirements for both the design resistance to compression and thermal protection, are piece structural heat-insulating and heat-insulating products (ceramic bricks and stones, concrete blocks with a dense and porous structure), the need for them in 2020 will reach 17–18 billion pieces of conventional bricks, and the volume of production of masonry cement mortars will increase to 17 million m^3 per year [2].

In world practice, two methods of production of mortar mixtures are known: wet (centralized production on stationary mortar mixing plants and transportation to construction sites by road in a ready-to-use form) and dry (production of dry building mixtures at

* Corresponding author: pulatovich93@gmail.com

specialized plants and mixing with water at the right time and required volumes at the facility under construction). Each of them has its own advantages.

Since 2020, in accordance with the law on technical regulation and self-regulation, as well as technical regulations "On the safety of buildings and structures", "On environmental safety", "On the safety of building materials and products" at capital construction facilities, it is necessary to consistently ensure the design characteristics of materials and structures, high quality of construction processes when laying walls made of piece wall materials, safety and reliability of construction objects in general [3, 4].

To implement the above conditions, it will be necessary to develop and implement innovative methods for the preparation of highly effective masonry mortar mixtures with improved technological properties (high water retention capacity, good plasticity during leveling, non-segregation during transportation, etc.), which allow stable and reliable formation of design operational parameters of mortars: required grade strength , structure homogeneity, high frost resistance, low thermal conductivity, etc. [5,6].

Of the widespread building materials (excluding polymers), silicate brick is one of the youngest. Silicate brick is considered one of the affordable and high-strength materials in the Aral Sea region. Its technology was developed at the end of the 19th century, but mass production and use began in the middle of the last century. It can be said that in more detail what a silicate brick is, the pros and cons of this building material.

Before we consider the advantages and disadvantages of silicate bricks in detail, it is necessary to understand the material from a technological perspective. Limestone brick is almost similar to the natural material limestone, which has been used for thousands of years. But, as known, almost always natural stone (including due to delivery costs) is much more expensive than artificial ones. [7,2].

2 Materials and methods

One of the most effective methods of ensuring the properties of mortars, including reducing their cost, is the use of modifying additives from local man-made raw materials. In this regard, it is promising for the Kushkupir district and the city of Urgench, Khorezm region (Uzbekistan) to use rice husk ash as raw materials using ultra-dispersed active mineral additives. To carry out masonry in the harsh conditions of the Khorezm region areas, it is relevant to develop compositions and technologies for the preparation of cement mortars using fine microsilica and additives based on rice husk ash [8,9].

Abroad, for example, in China, there are quarters where rice husks are used as fuel for heating. The reliability of the results is ensured by a methodically justified set of studies using modern verified instruments, using methods of chemical studies of DTA (Thermal analysis is a physicochemical method of studying transformations occurring in a substance with heat release or absorption (exothermic or endothermic), PPA (X-ray phase analysis (PPA) is a method for quantitative and qualitative determination of the phase composition of crystalline samples, based on the study of X-ray diffraction.), IR-spectral analysis (IR spectroscopy is a method of rapid structural-group analysis of a substance, which allows determining its quantitative composition in various aggregate states and a wide temperature range), using mathematical methods of planning experiments and statistical processing of results, as well as experimental tests and their positive practical effect [10].

It has been shown that in order to ensure high thermal protection properties of the stone structures of the building, it is necessary to reduce the thermal insulation characteristics of the masonry mortar and the main wall material.

An overview of the factors affecting the main technological (mobility, water holding capacity, delamination, viability and others) and operational (strength, average density, adhesion and others) properties of solutions is given.

Analysis of regulatory, technical and literature sources made it possible to establish the requirements that modern masonry mixtures and solutions must meet. It has been shown that an increase in the total production of masonry solutions with increased technological and operational requirements, especially in terms of their frost resistance, is possible by targeting their structure with functional additives. Thus, the simplest way to control the porosity of solution mixtures is to use air-entraining additives [11, 12].

A brief description of modifying additives for solution mixtures is given depending on the main effect of their effect.

To solve the problem of reducing the cost of masonry solutions, the relevance of their production using local raw materials, including functional additives, is shown, which will eliminate the use of expensive imported analogues.

A scientific justification of the choice of functional additives to improve the quality characteristics of masonry solutions was carried out.

Theoretical justification of the use of ultrafine silica additives for waterproofing solutions follows from the analysis of the literary review.

Microsilica is used in compositions of waterproofing mixtures. When the microsilica is introduced into the Portland cement binder, the structure of the cement stone changes, with the predominance of dispersed weakly crystallized low-basic calcium hydrosilicates of type C-S-H (I), which compact the structure and have high strength and stability to different external influences of the medium. Cement gel has the lowest water permeability of cement stone components. The amount of cement gel increases with the introduction of silica, so it is advisable to study the effect of silica additives having a higher specific surface area compared to silica. The pozzolane activity of these additives should be higher than that of the microsilica and, therefore, an improvement in the performance of Portland cement compositions can occur with less. The effect of morphological characteristics of pozzolan additives on the performance properties of mortars has not yet been investigated.

Therefore, the most important task should be considered the creation of new effective wall materials with consistently high thermal insulation characteristics, having increased strength of adhesion to masonry solutions, this is especially important for construction in earthquake-hazardous regions.

3 Results and discussion

The reliability of the research results is confirmed by the consistency of the results of the theoretical provisions with the data obtained by the author experimentally, the indicators of production introduction, as well as the conduct of experiments on modern testing equipment. The results of the experiments were obtained by testing the required number of samples in batches and evaluated by the coefficient of variation based on statistical processing.

The results of studies show that the adhesion of the masonry mortar to the surface of the brick is very variable, which leads to certain difficulties in calculating the elements and cross-sections of stone structures made of si¬likatnogo brick according to the limit states of the first group, taking into account the resistance of the masonry to stretch along unbonded seams [10].

In order to increase the adhesion factor of the masonry mortar with silicate bricks, the possibility of adding ultra-dispersed amorphous silica from rice husk ash was studied. The ash used in our experiments was obtained from rice husks - waste from processing rice grown in the north of the Republic of Uzbekistan. To develop the technology, a number of sources were analyzed to obtain ultrafine amorphous silica. Rice husks were dried and then burned in a laboratory furnace at temperatures of 600-800 ° C, followed by rapid cooling and grinding of the resulting product in a ball mill for 640 minutes.

Determining the phase composition of a sample is the most common and relatively easily solved task of X-ray diffraction analysis. Each phase has its own crystal lattice, which means it is characterized by a certain set of interplanar distances. Therefore, in order to solve the question of which phase is present in the sample, it is not necessary to determine its crystal structure, but it is sufficient to compare the obtained series of interplanar distances with tabular values (coincidences within experimental errors) of experimental and tabular values of d/n and the relative intensity of lines to unambiguously identify the phase present in the sample.

If multiple phases are present in the sample being analyzed, the X-ray diffraction pattern is the result of superimposing diffraction patterns from all of these phases, the line intensity of each phase depending on its volume fraction.

The analysis is based on a quantitative comparison of the intensity of lines of different phases with each other or with the intensity of the reference lines removed under the same conditions.

The lime-sand mortar, from which the production of silicate bricks is carried out, was the most common masonry material before the invention of Portland cement, but it has a huge disadvantage - it is not moisture resistant. Then, after a few years, it becomes resistant to water, but these periods are much longer than that of the now standard concrete.

But naturally, the finished products did not have decent moisture resistance. A physician's compatriot (but in the field of chemistry) Michaelis from Berlin tried to process a mixture of lime and sand with steam under pressure. Silicate brick manufacturing technology October 5, 1880 can be considered the date of its birth. Patent for reinforced sand and lime blocks. The main idea was that he proposed to process them for several hours with hot steam at high pressure.

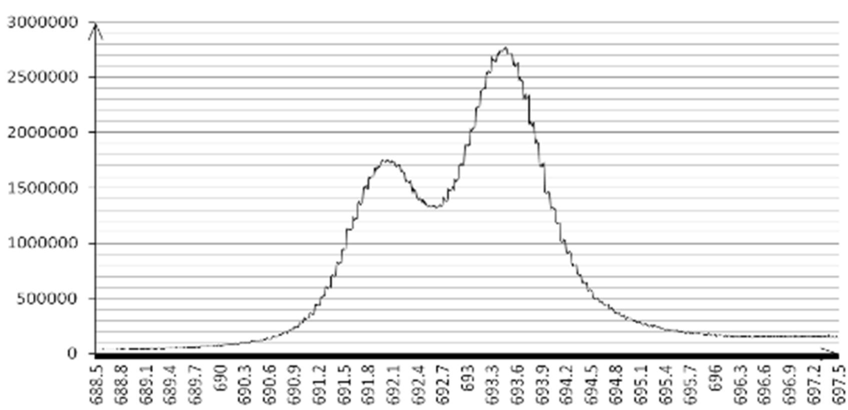

Fig. 1. X-ray phase analysis of alumina into two Gaussian curves.

To determine the width of the peaks and the maximum of their values, the obtained curves were decomposed into two Gaussian curves (Figure 1) and three Gaussian curves (Figure 2). The height and width of the peaks are practically the same for different expansions.

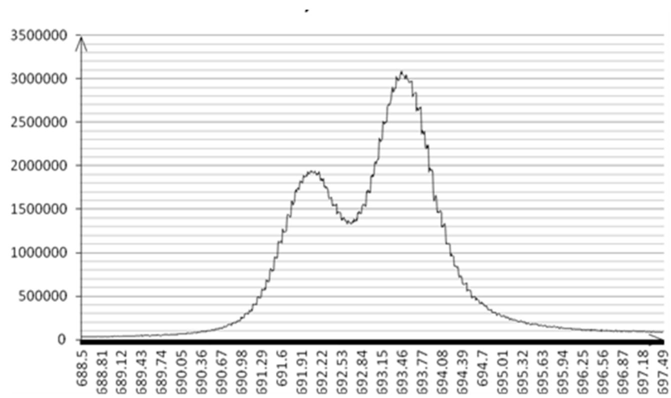

Fig. 2. X-ray phase analysis of alumina into three Gaussian curves.

The following values were obtained: for a sample with an AUDC content (amorphous ultradispersed silicas of 1%, the magnitude of peaks at 692.572 nm and 694.117 nm, peak widths of 1.054 nm and 1.294 nm, respectively, for a sample with a CCM (ultradispersed silica material) content of 0.25% were received data 692.672 nm, 694.147 and 1.054 nm, 1.174 nm These data correspond to the literature.

It is known that silica additives are used to improve the performance properties of mortars based on Portland cement. Implementation of a pilot industrial technology for producing high-strength masonry mortars using ultradispersed active mineral additives based on rice husk ash. The introduction of ultradispersed active mineral additives based on rice husk ash into building mixtures increases: compressive and flexural strength, frost resistance, corrosion resistance of concrete and mortars. All this contributes to an increase in the durability of materials and the service life of buildings and structures.

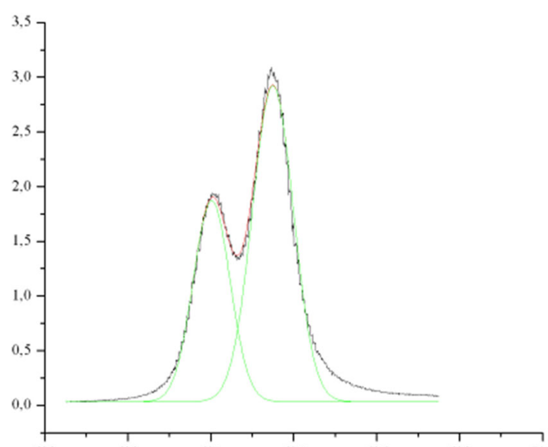

Fig. 3. Shows differential thermal analysis data for ultrafine amorphous silica.

Ultrafine active mineral additives based on rice husk ash is a waste. Therefore, the manufacture of building materials containing microsilica is associated with the disposal of a technogenic product. The study of the physicochemical features of various man-made products, their influence, when used as an additive, on the performance properties of cement slurries is an urgent and promising task. This is due to the fact that when using man-made products, the issue of their disposal is simultaneously resolved. Ultrafine active mineral additives based on rice husk ash are obtained by burning rice husks. In Uzbekistan, mainly in the Khorezm region, up to 50 thousand tons of rice husks are produced annually. The husk is very voluminous and its placement causes many problems for centralized rice factories. When the husk is burned, its weight is reduced by 5 times. Thus, the use of a man-made product for the production of building materials will solve the problem of utilizing agricultural waste - rice husks. IR spectra of mortars based on Portland cement with the use of MK (microsilica), UCM (ultradispersed silica materials), AUDK (amorphous ultradispersed silicon dioxide) additives were recorded at the age of 28 days, Figure 4. The spectra of the binder and binder with the addition of MC are distinguished by the presence of an absorption band at 857 cm'1, which is responsible for the presence of highly basic calcium hydrosilicates. Consequently, this form of highly basic calcium hydrosilicates is absent in the samples with the addition of UKM and AUDK.

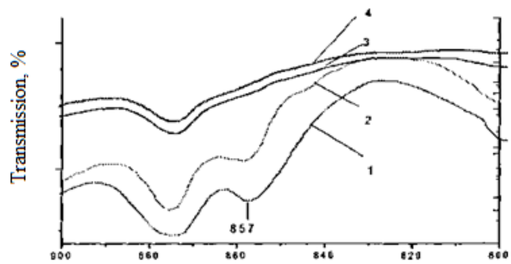

Fig. 4. IR spectra: 1 - cement stone without additives; cement stone with additives:2 - MK 10 %; 3 - AUDK 1 %; 4 - UKM 1 %.

Thermal analysis of cement stone (Portland cement PC500-D0) and cement stone with additives of superplasticizer S-3 and AUDK was carried out at the age of 7, 28 days. In the studied samples, chemically unbound water and portlandite Ca (OH) 2 are found. In the temperature range of the endo-effect of portlandite (105 ... 106 ° C and 454 ° C), the weight loss of the sample with the addition of AUDK in comparison with the non-additive sample at the age of 7 days is reduced by 2 times, at the age of 28 days - by 40%.

At the age of 28 days in the temperature range 600 ... 800 ° C in the sample with the addition of AUDK one peak is recorded at a temperature of 712 ° C, in the non-additive sample the peak has a complex shape with two peaks at 693 and 738 ° C. The complexity of the peak of the no-additive sample indicates a greater number of forms of highly basic calcium hydrosilicates.

Consequently, when AUDK is introduced into the binder, a decrease in the amount of portlandite is observed, and the amount of calcium hydrosilicates increases.

The X-ray diffraction patterns of a binder sample (PC500-D0) and a binder with the addition of a superplasticizer and AUDK (Figure 5) show peaks characteristic of portlandite, high-basic and low-basic calcium hydrosilicates.

According to the data of X-ray phase analysis, the amount of low-basic hydrosilicates of calcium in the cement stone with the addition of AUDK increases in comparison with the non-additive cement stone, while the amount of highly basic hydrosilicates and portlandite decreases. The X-ray diffraction patterns show peaks of tobermorite-like calcium hydrosilicates, as well as peaks corresponding to xonotlite-like calcium hydrosilicates.

Thus, according to the data of physicochemical studies, in a cement stone sample with the addition of amorphous ultradispersed silicon dioxide, in contrast to a cement stone sample without additives, the amount of low-basic calcium hydrosilicates increases. The gel of low-base hydrosilicates of calcium has an adhesive ability, which can help to increase the adhesive strength of the mortar.

Along with tobermorite-like calcium hydrosilicates (typical of no additive samples), peaks corresponding to a new product - xonotlite-like calcium hydrosilicates - are recorded. Crystallized elongated xonotlite-like forms of calcium hydrosilicates can reinforce the mortar, which should lead to a decrease in shrinkage deformations during solution hardening.

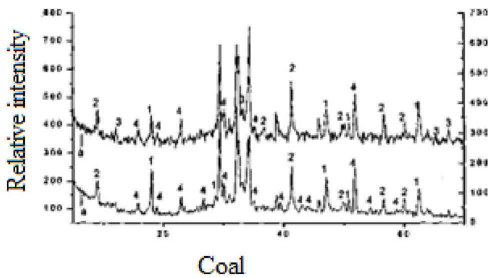

Fig. 5. Radiographs at the age of 28 days: a) cement stone; b) cement stone with the addition of AUDK 1%. 1 - portlandite; 2 - tobermorite-like calcium hydrosilicates C_5S_6H; 3 - xonotlite-like calcium gadrosilicates $C_6Б_bH$; 4 - highly basic calcium hydrosilicates.

The theoretical prerequisites for the synthesis of the strength and durability of high-quality building composites are a more complete use of the energy of Portland cement or other hydraulic binder, the creation of an optimal microstructure of a cement stone, a decrease in macroporosity and an increase in crack resistance, strengthening of the contact zones of a cement stone and a filler due to the targeted use of a complex of effective chemical modifiers, highly dispersed silicate materials with abnormal hydraulic activity, expanding additives with adjustable stress energy, as well as intensive production technology.

The positive effect of ultrafine active mineral additives based on rice husk ash in the form of active (amorphous) silica on the structure and physical and mechanical characteristics of the masonry mortar is due to the following reasons: firstly, the pozzolanic activity of ultrafine active mineral additives based on amorphous silica, and secondly, their high dispersion. In the densified state, particles of ultradispersed active mineral additives based on amorphous silica are 50-100 times finer than cement particles and their specific surface area is up to about 25000 m2 / kg. Silica in this form is capable of reacting with Ca (OH) 2 released during the hydration of the silicate phases of Portland cement with the formation of low-basic calcium hydrosilicates with the ratio CaO/SiO2 1,0-1,3

$$C_3S(C_2S)+H_2O = C\text{-}S\text{-}H+ Ca(OH)_2$$

$$Ca(OH)_2+SiO_2+H_2O = C\text{-}S\text{-}H$$

As a rule, the interaction between Ca (OH) 2 and amorphous silica becomes noticeable approximately 2-3 days after the start of hydration.

According to known data, about 100 thousand tons of rice husk-valuable raw materials for the production of silica are produced in the republic annually. Until now, the real field of application of rice husk does not exist. As practice shows, from 1 ton of rice 160-200 kg of rice husk is obtained, and when it is burned, about 20-25% husk ash is formed, consisting mainly of silica with a minimum amount of impurities.

In the process of roasting rice husk, undergoing oxidation and condensation, it forms an extremely fine product in the form of spherical particles with a high content of amorphous silica. Chemical analysis of rice husk ash shows that it contains SiO_2-86,5-88,0; Al_2O_3-1,3-1,5; CaO-3,3-3,5; $Fe_2O_3$0,5-0,6; MgO-1,7-1,9; SO_3 -0,3-0,4; Na_2O-2,0-2,1; K_2O-1,5-1,6; p.p.p.-1,5-1,7.

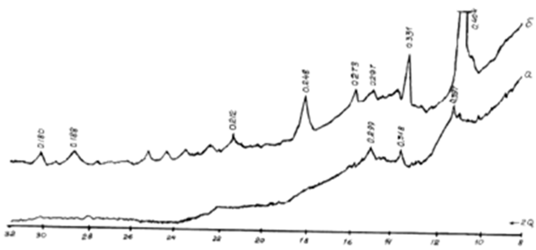

Fig. 6. Diffractogram of rice husk (a) and its ash ($T_{roasting}$-1000^0C) (b).

Table 1. Physicochemical parameters of ultrafine amorphous silica.

#	The name of indicators	Sample Indicators
1	Mass fraction of silicon dioxide, %	85.0
2	Mass fraction of water, %	0.8-1.0
3	Mass fraction of losses on ignition, %	4.0-5.0
4	Mass fraction of free alkalis, (Na_2O, K_2O), %	2.0-3.0
5	Mass fraction of calcium oxide, %	2.0-3.5
6	Mass fraction of sulfuric anhydride, %	0.2-0.3
7	Activity index, %	85.0

Physicochemical parameters of ultrafine amorphous silica were investigated according to the methods described in [13, 14]. Appearance of the obtained powder: fine-grained, powdery material of white, light gray or light yellow color. Table 1 presents data on the physicochemical parameters of ultrafine amorphous silica.

As can be seen from the data given in Table 1, the resulting initial product contains in its composition chemical elements identical to natural materials used in the processes of obtaining masonry mortars. In this case, it is important that the mass fraction of silicon dioxide in the composition is amorphous, which are confirmed by X-ray studies. The compositions of masonry mortars containing ultrafine amorphous silica, calculated by the absolute volume method, are shown in Table 2.

Table 2. Developed compositions of masonry mortar.

Compositions	V/C	Consumption of raw materials for 1m3/kg				
		Cement	Sand	Water	Plasticizer	AKR-85
Kl-T	0.48	250	1125	120	6.5	0
Kl-1	0.52	250	1125	130	6.5	1.0
Kl -2	0.56	250	1125	140	6.5	2.0
Kl -3	0.60	250	1125	150	6.5	3.0
Kl -4	0.60	250	1125	150	6.5	4.0
Kl -5	0.56	250	1125	140	6.5	5.0

Kl-T-traditional composition used in the masonry of the walls of construction sites in Uzbekistan

The following building materials were used in the manufacture of samples-"twos": thick silicate brick M-150 by GOST 379-95 producing by OOO « Kushkupir silicate gisht zavodi» Kushkupir district of Khorezm region. River sand gray with $M_к$=1,73 river quarry of the Amu Darya, Urgench region, Portland cement M400 of JSC "Kizilkumcement".

The main component of sand-lime brick (85 - 90% by weight) is sand, therefore sand-lime brick factories are placed, as a rule, near sand deposits, and sand pits are part of the enterprises. The composition and properties of sand largely determine the nature and features of the silicate brick technology. Sand is a loose accumulation of grains of various mineral composition with a size of 0.1 - 5 mm. According to their origin, sands are divided into two groups - natural and artificial. The latter, in turn, are divided into waste during crushing of rocks (tailings from ore dressing, seeding crushed stone quarries, etc.), crushed waste from fuel combustion (sand from fuel slag), crushed waste from metallurgy (sand from blast furnace slags). According to their purpose, they can be subdivided into sands for concrete and reinforced concrete products, masonry and plaster mortars, silicate bricks.

In the production of sand-lime bricks, the granulometry of sands plays an important role, since it decisively determines the formability of raw materials from silicate mixtures. The best granulometry of sand is that, medium grains are placed between large, and small - between medium and large grains. Most researchers classify grains as sands 0.05 - 2 mm in size. V.V. Okhotin distinguishes two fractions: sand - 0.25 - 2 mm and fine sand - 0.05 - 0.25 mm. P.I. Fadeev divides sand by grain size into five groups: coarse (1 - 2 mm), large (0.5 - 1 mm), medium (0.25 - 0.5 mm), small (0.1 - 0.25 mm) and very small (0.05 - 0.1 mm).

Tests of three samples from two whole bricks made simultaneously with the wall masonry showed the value of the ultimate bond strength under axial tension equal to 1.4; 2.0 and 1.8 kg/cm^2. The nature of destruction: rupture in solution. Testing two out of five samples was not possible due to the limit of the test equipment capability (2.2 kg/cm^2). at this value, the sample did not break.

This effect is explained by the pozzolanic activity of ultra dispersed amorphous silica [15]. Being in an amorphous state, at ordinary temperatures, it reacts with Ca (OH)2.

$$Ca(OH)_2 + SiO_2 + H2O = CaO\ SiO_2\ 2H_2O$$

The formation of highly dispersed hydro silicate with increased binding properties instead of Ca (OH) 2 leads to an improvement in the properties of the cement stone.

It is known that silica additives are used to improve the performance properties of mortars and concretes based on Portland cement. The ultra dispersed additive, micro silica, has found wide application.

The introduction of micro silica into building mixtures helps to increase: compressive and bending strength, frost resistance, corrosion resistance of concrete and mortars. All this increases the durability of materials and increases the service life of buildings and structures. Silica fume is used for the manufacture of waterproofing materials.

Micro silica is a waste product. Therefore, the manufacture of building materials containing micro silica is associated with the disposal of a techno genic product. The study of the physicochemical features of various man-made industrial products, their influence, when used as an additive, on the performance properties of cement slurries is an urgent and promising task. This is due to the fact that when using man-made products, the issue of their disposal is simultaneously resolved. In addition to micro silica, ultrafine silica materials are amorphous silicon dioxide.

Amorphous silicon dioxide is produced by burning rice husks. In Russia, mainly in the Krasnodar Territory, up to 50 thousand tons of rice husks are produced annually. The husk is very voluminous and its placement causes many problems for centralized rice factories. When the husk is burned, its weight is reduced by 5 times. Thus, the use of a techno genic product, amorphous silicon dioxide for the production of building materials, will solve the problem of utilization of agricultural waste - rice husk [3].

Micro silica isolated from rice husk ash was used as a filler. Binder component ratio: filler (10-20) ÷ (90-80). To increase the thermal insulation properties, husks were added to the mixture in an amount of 5-15%. The resulting molding mass was fed into a hydraulic press, where semi-dry pressing of products was carried out with a force of 5.0 kg/cm^2, followed by heat treatment at temperatures of 80 ÷ 90 ° C for 0.5-1.0 hours.

It has been established that the performance characteristics of mortars based on Portland cement depend on the morphological features of ultra dispersed additives (size and shape of primary particles and their aggregates). The scaly shape of the particles of the amorphous silicon dioxide additive causes the targeted formation of elongated structures of crystallized xonotlite-like calcium hydro silicates, which reinforce the mortar, which causes a decrease in shrinkage deformations during hardening.

In recent years, the world practice in the production of masonry mortars began to widely use active mineral additives containing silicon dioxide in an amorphous ultra dispersed state, which make it possible to produce and successfully operate materials of high and ultra-high strength, low permeability, and increased corrosion resistance.

The widespread use of amorphous ultra dispersed silicon dioxides (silicon dioxide (silica, Silicon dioxide) is a substance consisting of crystals with high strength, hardness and refractoriness. Silicon dioxide is resistant to acids and does not interact with water. When the reaction temperature rises, the substance interacts with alkalis, dissolves in hydrofluoric acid, is an excellent dielectric. Natural silicon dioxide, otherwise called silica, is widely used in construction (concrete, sand, sound and heat insulating materials) in cement masonry mortars at a certain stage, their relatively high cost was restrained, however, this factor has become less significant against the background of the rise in the cost of all components of the concrete mixture. In addition, in recent years, there has been a significant increase in interest in high-quality masonry mortars, in the production of which amorphous ultrafine silicon dioxide is an essential component of their composition.

Varieties of such high-quality masonry mortars are used in the construction of high-rise buildings, hydraulic structures, multi-storey garages, bridges, highways, etc. Starting from the 70-80s of the last century, some of the amorphous ultra dispersed types of silicon dioxide began to be used in concrete technologies or are actively studied in the composition of cement compositions. The use of such silicas, which are distributed in the concrete mixture in the form of particles, the sizes of which are finer than the grains of cement, and which interact with Ca(OH)2, is a way to obtain very dense and durable materials. At present, abroad micro silica is one of the key components of the so-called DSP - masonry mortars - masonry mortars compacted with micro particles, mainly consisting of amrophic SiO2.

One of the main sources of amorphous silica in the conditions of Uzbekistan is rice processing waste - rice husk (Rice husk is a grain shell separated during rice hulling. It is characterized by an increased content of silicon dioxide SiO2.), The volume of which in the lower reaches of the Amu Darya is about 40-50 thousand tons / year. Utilization of rice husk (Accordingly, the utilization of rice husk, which is a serious environmental problem due to its large-tonnage output, must be organized not only with the production of heat and / or combustible gas, but also with the production of a high-quality product from ash) have practically not been used until now, but in recent years, it began to be used as fuel for individual houses, greenhouses, boiler houses, etc. Last year's experiments show that when 1 ton of husk is fired, 150-200 kg of ash are formed (Ash produced at a low combustion temperature is soft, contains silica in a cellular non-crystalline form with a high surface area (50-60 m^2/g) and is a valuable product.) The main component of which is amorphous silica. When heating greenhouses with an area of 1 hectare, 400 tons of husks will be consumed, and for an individual house with an area of 100 m2, about 4-5 tons. for the winter season. Abroad, for example, in China, there are neighborhoods, for heating rice husk is used as fuel, and the resulting ash is used to obtain high-strength masonry mortars. Such experiments are also available in Russia, Vietnam, India and other countries growing rice.

4 Conclusion

Physic mechanical methods prepared samples of rice husk ash showed its acceptability of the modifier in the process of obtaining a masonry mortar satisfying the conditions of KMK - 2.01.03.96 "Construction in seismic regions" for masonry of the II category operating on the territory of the Republic of Uzbekistan.

Fired and mechanically activated samples of rice husk ash are ultrafine amorphous silica with a SiO2 content of at least 85.0%, it also contains calcium, sodium and potassium oxides in insignificant limits.

Thus, the developed composition of masonry mortars with various contents of ultra dispersed amorphous silica was tested for adhesion in the "silicate brick - masonry mortar" system and, as a result, showed that the adhesion strength of the samples within 28 days meets the requirements, according to paragraph 3.5.4. KMK 2.01.03-96 "Construction in seismic regions.

It has been established that the performance characteristics of mortars based on Portland cement depend on the morphological features of ultra dispersed additives (size and shape of primary particles and their aggregates). The scaly shape of the particles of the additive AUDK determines the targeted formation of elongated structures of crystallized xonotlite-like hydro silicates of calcium, which reinforce the mortar, which causes a decrease in shrinkage deformations during hardening.

The results of X-ray phase, thermal and IR-spectroscopic analyzes have shown that the composition of the hardening products of cement stone with the addition of AUDK includes, along with tobermorite-like low-basic calcium hydro silicates (characteristic of an additive-free solution), their xonotlite-like forms. The resulting crystallized elongated forms of xonotlite-like calcium hydrosilicates reinforce the solution, preventing shrinkage deformation during hardening.

With the addition of MK micro silica (micro silica-covering heat-insulating mixture based on rice husk ash is a chemically inert powdery material of dark gray odorless color. It has high thermal insulation properties, high melting point, low bulk density and high porosity. These qualities, and also the economy and ease of use make this material widely demanded in the steel industry. Currently, supplies of a cover heat-insulating mixture based on rice husk ash), UCM (ultra dispersed silica materials), AUDK (amorphous ultra dispersed silicon dioxide) in the mortar adhesion strength the concrete surface rises accordingly by 2.5; 3.5 and 4.5 times compared with no additive solution. This is due to an increase in the amount of low-basic calcium hydrosilicate gel, which has an adhesive ability.

The structure of the surface of the mortar with the addition of amorphous ultra dispersed silicon dioxide in the amount of 1% has greater homogeneity compared to a solution containing 10% micro silica, which leads to an improvement in the performance of the solution. The particle sizes of the additive of amorphous ultradispersed silicon dioxide, comparable to the size of the Portland cement particles, contribute to their more uniform distribution over the volume of the mixture.

It was found that the high reactivity of additives AUDK (due to increased pozzolanic activity and surface activity, the degree of amorphization

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