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THE USE OF NEW RAW MATERIALS AND TECHNOGENES IN THE SYNTHESIS OF DECORATIVE-FACING GLASSES

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Abstract
The article describes modern requirements for quartz sand raw materials used in glass bottles, and describes the major deposits of quartz sand in Uzbekistan. It is possible to improve the quality of the first quartz sand samples on the production of high-quality glass bottles with the addition of sand drying and sharp cooling at the temperature of 750-800 ° C, resulting in the formation of sand fracture surfaces, 0. Quartz sands, with a content of iron oxides in the range of 4-0.1 mm (0.04-0.03%).

Keywords: quartz sand, chemical composition of quartz sand, iron additives, granulometric composition, enrichment of quartz sand, glass bottles, glass containers, glass melting, quartz-feldspar sand, defecate, spent catalysts, decorative-facing glass materials, phase composition, properties, X-ray phase analysis, optical microscopy.

Introduction

In modern construction, a big attention is given to the design and decoration of the erected buildings. As you know, the dynamic development of architecture and construction design is largely determined by the presence of decorative and finishing materials with high operational and consumer properties [1].

In this connection, the scientific and technical problem of obtaining synthetic finishing materials possessing a complex of required technical, operational and decorative properties isactual. Such materials are, firstly, glass and glass-crystalline materials. Being inexpensive in production, they completely or partially mimic the mechanical, optical and decorative properties of natural stones.

Glass technology opens up wide opportunities for the synthesis of artificial decorative materials using natural and technical raw materials. A large number of compositions of decorative glasses and glass-crystalline materials are known, in the production of which coloration and muffling processes are used to achieve the decorative effect [2,3].

A particular scientific and practical interest are the works in the field of composition development and the synthesis of decorative glass materials having high indicators of operational, technical and aesthetic-consumer properties. To prepare experimental blends of the developed glasses, natural and technical raw materials used in glass production, chemical reagents of the brands "h", "hch" and "chda" were used.

For the synthesis of glass Na_2O-CaO-B_2O_3-Al_2O_3-SiO_2system was used. In order to reduce the temperatures of boiling and the production of glasses, this system is modified by introducing oxides B_2O_3.

The following requirements were set for the developed compositions of charge and glass:

- low temperature of boiling and glass production;
- absence in the charge of scarce, toxic and highly volatile components;
- intensive staining of glass mass using inexpensive dyes;
- the indices of the physicochemical, thermal and aesthetic-consumer properties of the glasses being developed must satisfy the requirements for decorative and facing glass materials [4,5].

As a basic composition of glass, colorless glass is being used, having the following chemical composition, mass. %: SiO_2 = 62.00; CaO = 10.00; B_2O_3 - 7.00; Al_2O_3 - 4.00; Na_2O = 15.00; MgO -2.00 [6]. The glass batch for the production of colored decorative-facing glass materials consisted of the quartz-feldspar sand of the Yangiarik field, the defect-waste of the sugar production ("Khorazmshakar"), calcined soda, feldspar of Sultan Uvaisiy Ridge (Kyzylsai site) and boric acid. The chemical composition of used raw materials and technogenic resources are shown in Table. 1.

Table 1. The chemical composition used in some raw materials

No.	Name of raw materials	Oxides, wt. %								
		SiO_2	Al_2O3	Fe_2O_3	CaO	MgO	Na_2O	K_2O	SO_3	Lp
1	Quartz-feldspar sand of the Yangiarik field	97,32	0,27	0,05	0,20	0,22	0,3	0,90	0,76	
2	Feldspar of Sultan Uvais Ridge (Kyzylsoy site)	68,57	16,81	0, 19	0,55	0,3	2,92	9,98	-	0,99
3	Defekat - waste of the sugar production of JSC "Khorazmshakar"	2,65	0,58	0,43	48,43	1,17	0,05		0,53	46,2

In the aim to determine the optimum temperature of the glass boiling, the temperature of the complete reflow of the charge was determined. Evaluation of the boiling ability was carried out visually. The synthesis of glasses was carried out in alundum crucibles in electric furnaces with silicate heaters in the temperature range 1350-1400 ° C with an exposure for 1 hour. Glass samples were molded by casting. The results of the studies of the synthesis of decorative glasses made it possible to establish that the complete completion of the physicochemical processes of melting glass melt occurs at 1350 ° C.

Silicate formation is completed in the temperature range 950 ... 1150 ° C by the formation of a porous sinter consisting of silicates, boron and silica aluminosilicates, left in an amount of about 25% of its content in the charge after silicate formation and gases. When the temperature is raised to 1250 ° C, the formed silicates and aluminosilicates are melted and quartz (SiO_2) is unreacted in the melt during the silicate formation. At the stage of clarification and homogenization of the glass mass, when the temperature is raised to 1350 ° C, gas bubbles and fibrils are completely removed, which ensures the formation of a uniform glass melt.

The evaluation of the quality of synthesized glass is presented in Table 2.

Table 2 Characteristics of decorative and facing glasses

Glass№	Colorant			Boiling temperature of glass ° C	Glass quality assessment	
	Cipher	Temperature application interval° C	% by weight of batch		Transparency	Glass color
1-1	Manganese-containing waste	700-1000	1.0	1350-1400	Transparent	brown
1-2		700-1000	3.0	1350-1400	Transparent	dark brown
2-1	Cobalt-containing waste	700-1250	1.0	1350-1400	Transparent	pale blue
2-2		700-1250	3.0	1350-1400	Transparent	blue
7-1	Chromium-containing waste	700-1150	0,5	1370-1400	Transparent	green
7-2		700-1150	1.0	1370-1400	Transparent	dark green

As shown in Table 2, the resulting glasses acquire a color predetermined by the additive mixing of colors initiated by the d- and f-elements that make up the compositions of spent catalysts of chemical and galvanic production.

For example, an experimental sample containing manganese-containing waste has a brown color. This is due to the additive mixing of colors reported to the glass by Mn (brown), Fe_3 + (green) and Fe_2 + (yellow) ions.

Table 3 Results of the chemical resistance test of glass

№	Glass№	Quantity of HCl solution used for titration, ml	Quantity of leached Na_2O, mg
0,5% of the dye (colorant)			
1	1-1	1,87	0,58
2	1-2	1,87	0,58
3	2-1	1,57	0,49
4	2-2	1,80	0,56
5	3-1	1,76	0,55
6	3-2	1,70	0,53

As can be seen from Table 3, the amount of Na_2O that passed into the solution when testing the synthesized glasses for chemical resistance is in the range of 0.53-0.58 mg, which allows, according to a known technique, to classify experimental glasses to the III hydrolytic class [7, 8]. This, in turn, characterizes the experimental glasses of the first series as solid hardware, which are chemically resistant to the effects of aqueous solutions, wet atmosphere and acid solutions (except hydrofluoric and phosphoric), meet the standard requirements for glassware used in construction and architecture [8, 9, 10, 11], and can be used both in interiors and in exteriors.

As you know, density is such property of glasses, which depends additively on their chemical composition. The density of synthesized glasses was determined by the pycnometric method [7, 12].

The results of determining the density of glasses are presented in Table 4. Different values of the density are due to the different chemical compositions of the dyes used.

As can be seen from Table 4, the synthesized glasses have density values in the range of 2439 ... 2446 kg / m^3, which practically coincides with the density indices of the known industrial glasses- 2470 ... 2560kg / m^3 [7,12].

An investigation of the temperature coefficient of linear expansion (TLCL) of experimental glasses was carried out using a known technique with the help of a quartz dilatometer DKV-4 in the temperature range 20-400 ° C [7,13]. The values of the TLCL of experimental glasses range from 82.2 x 10-7 to 83.9 x 10-7 ° C-1, and the thermal stability is -88-90 ° C [14].

Table 4 The results of the determination of the density of glass materials

№	Glass№	Weight of empty pycnometer G, r	Weight of pycnometer with glass G_1, r	Weight of pycnometer with glass and xylene G_2, r	Weight of pycnometer with xylene G_3, r	Glass density, kg / m^3
0.5% of the dye						
1	1-1	17,5458	18,5535	61,7083	61,058	2442
2	1-2	17,5458	18,5535	61,7089	61,058	2446
3	2-1	17,5458	18,5521	61,7076	61,058	2444
4	2-2	17,5458	18,5528	61,7082	61,058	2445
5	3-1	17,5458	18,5517	61,7066	61,058	2439
6	3-2	17,5458	18,5531	61,7075	61,058	2439

Evaluation of aesthetic-consumer and organoleptic properties of glasses and glass materials was carried out according to the definition of their color, transparency, texture in accordance with the requirements of STT [10].

The phase composition and structure of glasses and glass materials were studied by microscopic, electron-microscopic and X-ray diffraction (XRD) analysis at the DRON-3 facility.

The values of the interplane distances corresponding to the reflection maxima on X-ray patterns for a given type of radiation were determined from the Wolf-Bragg formula [9]. The calculated values of the interplane distances were compared with the reference distances and the phase composition was identified.

Sodium borosilicate glass is a striking example of glasses with a pronounced tendency to structural heterogeneity and segregation. In the structure of such glasses there is a highly siliceous skeleton in combination with a highly selective frame. Even with a time-limited temperature treatment, the process of structure differentiation proceeds very rapidly and leads to a clearly expressed phase separation [15].

Samples of the experimental glasses were heat treated at 750 ° C, which led to the conclusion that glass samples with a dye content are less transparent than their non-heat-treated analogs, since there is a slight clouding of the glasses. With an increase, in the amount of the dye up to 3%, partial surface crystallization is observed, and more than 3% is the silencing of the glasses.

Synthesized glass is the basis for obtaining decorative-facing glass materials, in particular colored glass mosaic tiles.

Based on the foregoing, it can be concluded that the production of decorative - facing glass materials, in particular decorative glass mosaic tiles, is based on a complex mechanism for the formation of its structure, including the above-mentioned crystalline phases, including color-bearing, predetermining high performance, glass materials [5, 16].

Thus, based on the conducted studies of the operational and technical properties, as well as the structure and phase composition of colored glasses, it can be concluded that they can be used both as stained glass and as the basis for decorative architectural and construction glass mosaic tiles.

The results of the conducted studies show that the decorative-facing glass and glass materials obtained have high values of operational-technical, aesthetic-consumer and organoleptic properties, and allow to make a conclusion about the expediency of their production.

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